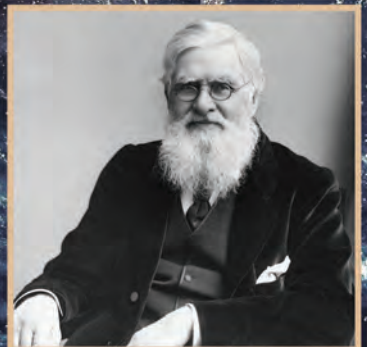
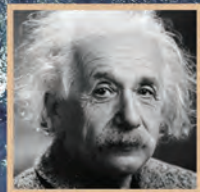
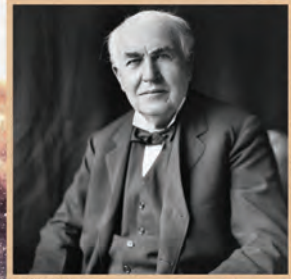


The Human Story Behind Scientific Discovery

Joseph Jordania



The Human Story Behind Scientific Discovery

by Joseph Jordania

Program LOGOS

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Dedication

The book is dedicated to the memory of Charles Darwin, Alfred Wallace, Leonardo da Vinci, Thomas Edison, and other brilliant thinkers who did not have the proper professional education in the fields of research they became known for but had a keen eye and passion for the research. The book is also dedicated to Albert Einstein, Marie Curie, Linus Pauling, and those professional scholars who performed scholarly research for a living but managed to maintain their romantic love for the subjects of their research.

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Introduction

People use different strategies to grasp the general idea of a new book they stumble upon. The title of a book or the name of an author is usually the first stage of getting interested or putting the book aside. If the title gets the reader's attention, the next step would be to read the back of the cover, or possibly have a look at the intro, the table of contents, or the index. If you were interested by the inviting title of this book and are now looking at the introduction, then allow me to make the best use of your time.

There are different types of readers and although I believe some readers will find this book refreshing, others will probably hate it. The central problem is how to determine what kind of the reader are you before even you start reading it. To help you with this, I designed a short, fifteen-second test. Please, read these four simple statements and note in your mind how many of them you agree with:

- Scientific research must be undertaken and developed by professional scholars only;
- If a person does not have a Ph.D. in the relevant field, no one should take any of her/his new ideas seriously;
- Peer review is a fair system of evaluating scholarly works and recognizing new important ideas for the advancement of science;
- Most of the significant problems of the natural world are already solved, so there can be hardly any more ground-breaking discoveries;

If you agreed with all these ostensibly reasonable statements, I suggest you put this book down without reading it any further, as there is a significant probability you will get frustrated and possibly even angry as you read further.

If you agreed with only one or two of these four statements, you might find this book confrontational, albeit you might still enjoy reading it, and might even agree with some of the comments and ideas.

And finally, if you disagree with all these four statements, this book is for you.

So, what this book is about? It is about how scholarly research is organized in our human society. We will discuss how our future scholars are educated and prepared for the rich creative work that scholars are supposed to do. We will also discuss how scholars are acknowledged and rewarded for their scholarly

activities. Most importantly, we will discuss some mechanisms in academia that hamper the free development of scholarly ideas. We will discuss, for example, how the existing system of grants, coveted university positions, and the continuous demands for the number of peer-reviewed publications put immense pressure on professional scholars and turn them from creative thinkers into shrewd, calculating businessmen. We will discuss why and how professional scholars often do not have the freedom to develop their work most creatively in the direction they consider to be most productive. We will see they often have to bend their ideas and proposals to fit with the demands of funding bodies and publishers. Sadly, scholars are required to continuously pen articles with the anticipated outcomes for most of their productive years and publish them in peer-reviewed journals to make their employers at the university happy. Many professional scholars spend most of their professional lives, as a Russian poet Mayakovski once said poetically, by “stepping on their own throat while singing,” to keep their positions and grants rolling.

The book has several aims. One of the most critical messages of this book is that scholarly research is not something only professional scholars should do. Contrary to popular belief, some of the most celebrated scholars in the history of science were not professional scholars. Charles Darwin, one of the icons of scholarly progress, did not have a Ph.D. in biology, zoology, or geology. He did not even have a master’s degree in biology, and even more, he did not even possess a bachelor of science.

As far as his formal education was concerned, Charles Darwin was a pure amateur, his highest educational achievement being a Bachelor of Arts. That’s why throughout his life he was known as “Mr. Darwin,” not as “Dr. Darwin,” or “Prof. Darwin.” Despite this fact, we can all probably agree that Mr. Darwin did contribute to the development of biology more than many professors and scholars with Ph.Ds did. The same goes for another great scholar of evolutionary science, Alfred Wallace, who did not have a Bachelor’s degree or even finish school. Gregor Mendel, widely recognized as the father of genetics, is still another example. So, let us remember from the very beginning, science is done not only by professional scholars; non-professionals can make spectacular contributions to the advancement of various scholarly fields.

Another important message of this book is that our existing system of education is too rigid to prepare scholars the way we would expect them to be: free and creative thinkers, who can think outside of the box, and who are striv-

ing to make significant changes in their spheres. I will argue that our system of education is methodically and mercilessly fighting against natural human curiosity from the very beginning of our educational process to the very pinnacle of educational achievement – the fabled Ph.D. As a direct result, we are raising future scholars primarily as obedient thinkers, who can work very well when they are told what to search and where to search, but who are afraid to enter uncharted seas. And uncharted seas, we all know, are the only place where one can discover new continents. The result of the existing system of professional education is that some of the most creative parts of our future scholars drop out of the formal training at different levels, tired being a part of the rigid school of obedience.

I will also argue in this book that although to become a scholar one needs to have sufficient education, there are also born scholars, who have no formal training. For very different reasons they had never been fully educated as scholars, but they still are scholars just by the very type of their cognitive ability, the ability to notice things around them others fail to see. They naturally have scholarly inquisitive and creative minds and sometimes can leave a brilliant legacy in various academic fields. Sure, some scholars luckily combine both: they are born with an inquisitive scholarly mind and are also educated as professional scholars. We will discuss in detail what our system of education is doing to such lucky professionals at all levels, including tertiary school and getting the Ph.D.

Then, of course, there is an issue of money, or more precisely, funding for scholarly activities. Most of the works on the history of science neglect this profoundly important sphere. Contrary to popular belief, the existing system of funding is a mixed blessing for the development of science. Most of the professional scholars who make a living from their scholarly activities soon become dependent on the funding bodies, so in the existing system of funding, it is the fund-giving bodies that pressure scholars to follow their vision and needs, not the scholar's imagination.

Sadly, the current system of grants and financial rewards feeds scholars, but not the advancement of science. We will follow the route of excited young enthusiasts of scholarly progress, with their romantic ideas of the development of the science, and see what happened to them when they encountered the real world with the strict rules of funding and the atmosphere of competitive obedience towards the existing paradigms and the older generation. Let us also

remember that the proponents of the established paradigm, as a rule, are the majority among the most established and mainstream scholars of the day, and they usually hold key positions in funding bodies and the most prestigious peer-reviewed scholarly journals.

As you can see, the subject of this book is dauntingly big. Of course, no single human can have a comprehensive view of this vast topic, so I do not even dream to present that in this book. Contemporary scholarly research is conducted in an array of disciplines and methods; there are countless problems and specific details in each of these spheres that must be taken into consideration. So, I must declare once again from the outset that I am not going to address these problems comprehensively. This book is rather a stream of thoughts and arguments from a scholar who had the recklessness to wander into various scholarly fields with unorthodox ideas and met with many professional and non-professional scholars in the process. The only reason for writing this book is that, in my view, there seem to be many common problems that both non-professional and professional free-thinking scholars face, so sharing my personal experiences might give food for thought to those who are interested in the topic of how scholarly activity is organized in our society.

I am by no means the first scholar to address this issue. There is a special field of scholarship known as the history of science. This book probably falls into that category although I am not going to discuss the main historical stages of development of the scholarly ideas. Three important thinkers contributed significantly to the history of science and provided our understanding of scholarly progress: Karl Popper, one of the most revered philosophers of the 20th century, Thomas Kuhn, physicist and an influential self-styled historian of science, and Paul Feyerabend, Austrian philosopher of science. The best-known contribution from Popper's legacy is the idea of the fallibility of the hypothesis. According to Popper, no hypothesis can ever be declared "correct" or "true," and new ideas are not necessarily closer to the truth than the older ones. The viable hypothesis, according to Popper, should make predictions that allow other scholars to falsify it. Those hypotheses that are based on assumptions that cannot be falsified cannot be considered viable. The best known of Kuhn's legacy is the idea of a paradigm shift. Kuhn's idea of "paradigm shift" describes the dynamics of the development of science, characterized by long periods of "normal science," interrupted by the short times of violent scientific revolutions, labeled as a "paradigm shift." And finally, another influential thinker of

the field was Paul Feyerabend, who argued that there can be no clear demarcation line in terms of method between science and any other form of investigation.

Most of the aspects of scholarly life discussed in this book affect the everyday development of science, but they had never been discussed seriously by Popper, Kuhn, or Feyerabend. Kuhn, for example, wrote: “...except in occasional brief asides, I have said nothing about the role of technological advance or of external social, economic, and intellectual conditions in the development of the sciences” (1962:ix-x). Scholars and their ideas are presented in their works mostly separate from their life stories, without any reference to their education, way of making a living, financial situation, ethical standards, and personal beliefs. For example, the simple and telling fact that Charles Darwin was by education a Bachelor of Arts, and that he never depended on his scholarly activity to make a living, is not even mentioned in most of the writings on the history of science. On the contrary, I will specifically address these and similar questions such as: How is the existing system of education shaping future scholars? How do the problem of funding the science and policy of grants affect scholarly development? How do the academic requirements of the universities influence scholarly progress? How does the peer review process work? I will also mention such fleeting and overlooked notions as the problem of scholarly integrity, scholarly reputation, and scholarly corruption. We will also touch on the sensitive issue of the political sanctioning of the “correct” research topics and research outcomes. These all are topics that fundamentally affect the real everyday lives of thousands of fellow scholars, both professional and non-professional, and have a profound influence on the development of science.

At least some readers might guess that the rebellious flair of this book comes from the fact that I have no “proper” professional education, or any other scholarly credentials, like many of my heroes of this book. Sorry, but I have to disappoint such readers. I studied how to become a professional scholar in my sphere of expertise for two long decades, including specialized primary, secondary, and tertiary education, followed by all the subsequent postgraduate studies, including obtaining a Ph.D., even two of them.

After finishing my professional education, I have been involved in scholarly research and the university education system for over three decades. I have written five books and many articles as an ethnomusicologist and evolutionary musicologist, had been a Head of the Board of the professional encyclopedia in

my sphere, served as a professor and the head of the International Bureau of the International Research Center, and successfully supervised MA and Ph.D. students. I was also involved in the establishment of a new International Research Center and had been closely involved in organizing international scholarly conferences and symposia with the subsequent publication of conference proceedings. In 2009, I even received the most prestigious international award in the sphere of my primary expertise (ethnomusicology).

So in this book, I am criticizing academic scholarship, though, in a way, I represent the very scholarship I criticize. As I consistently followed the topic of my lifelong fascination—the origin of the human passion for choral singing – during the last three decades, I had many experiences of approaching scholars from very different scholarly fields, from physical anthropology, linguistics and evolutionary biology to speech pathology and behavioral ecology. During these long years of Odyssean travel through the various academic disciplines, I met with many professional and non-professional scholars and found both admirably wide and extremely narrow thinkers in both groups. I gradually learned not to get frustrated by the negative responses and neglect of new ideas, and finally decided to share some of my experiences with those who might be interested.

The ultimate message of this book is that those studying the exciting world around us for the love of the subject, without monetary remuneration, should be happy and content for the opportunity to do so. And those who have positions and receive funding for doing the same thing are not necessarily better scholars.

And finally, as the main direction and the spirit of the book are more or less clear for readers, I would like readers to have an idea about the structure of the book.

There are seven chapters. The first is dedicated to the problem of how we educate future scholars. Everything starts with education. The educational goals of our society shape the next generation of our young citizens, including scholars. Does our educational system prepare future scholars to be independent and critical thinkers? Of course, not all humans become scholars, but arguably all humans need to have independent and critically thinking brains. We probably all can agree with this statement, but is this what our system of education is doing? Are we preparing our citizens and scholars to have an independent thinking mind and to be able to tackle Big Problems? I will argue that

our educational system completely reverses the natural circle of development of the human brain, and instead of thinking and creative humans, we are mostly raising obedient citizens who are afraid to think out of square.

In the second chapter, I argue that the critical feature of a scholar's individuality is not a scholar's intellectual life, but the scholar's emotional life. I will argue that the most important feature of scholar's nature is their integrity, sincerity, and natural inability to follow the mainstream if they do not sincerely agree with it. When Charles Darwin's future wife, Emma, who was by the time of their marriage considered much better educated and established than her husband, was asked the most charming feature of her future husband's nature, she answered "sincerity." She added that Charles was the only person she knew who was always saying exactly what he was thinking. Well, is this so important in scholarly life? We'll discuss exactly this. We will also talk about how the emotional sincerity of a scholar and the awe of nature are vital for the fulfillment of scholarly life.

In the third chapter, we discuss whether there are any objective means to judge more or less the success of a scholar. Can this be measured by the number of grants and amount of funding money secured by a scholar? Or by the number of publications in peer-reviewed journals? Or possibly by the number of published books? What about the number of citations their publications received? What about a scholar's professional and general popularity? We will see that many of these ostensibly clear indications of the success of scholarly assessment might be misleading. As the dominating paradigm dictates the mainstream of academic research and directs the bulk of scholars towards the "normal science," or "puzzle-solving" (as Kuhn put it), more inventive and revolutionary scholars are pushed aside and their work often labeled as "bad science" or "fringe scholarship." Truly revolutionary ideas, as a rule, stay off the mainstream publications for a long time and find acknowledgment and acceptance only if they are lucky. So, the received grants, peer-review publications, and books produced by the top publishers might be just indicating that the scholar (or the institution) is indeed an established and conservative one, with little or no ability (or desire) to bring any revolutionary changes to the field of science.

The fourth chapter discusses one of the most important practical issues of contemporary science: the problem of funding for the development of science. I argue that the perennial search for financing often makes professional schol-

ars forget about their passionate involvement with the subject of their research. By making scholars paid professionals who do science to make a living, we turn them from independent thinkers into paid mercenaries, whose priority is to have a good and stable income, instead of maintaining their initial romantic drive of developing their scholarly fields. With the existing system of grants and funding, we are turning most of the natural-born rebels who want to change the world into paid content clerics. We know from the history books that not every revolutionary and rebel stays loyal to their initial calls after reaching the top positions of power. That's why the controversial example of Comrade Che is still so fascinating to many, mainly the young romantic rebels. The scholarly world is no different. With the problem of funding naturally comes the issue of professionalism with the system of elaborate professional "clubs," where they build impenetrable barriers between their professional caste and the rest of the community. Such barriers are built around the internal rules of respecting the status quo, their secret technical language, their vigorous own popularity contests and their disdain for "tall poppies" among their colleagues with broader popularity.

In the fifth chapter, we talk about the central issue of science development, the all-important paradigm shift. We will discuss the relativity of the Kuhn idea of the crisis in science and will see that it is impossible to detect any such explosive "critical" situations. Most established scholars have no idea and no feel for the looming crisis. The scholarly establishment tries to keep the old paradigm alive and influential as long as possible, or at least until the end of their scholarly careers. They have all the motives to keep the doomed paradigm connected to the life support system. The paradigm shift is nothing short of the true "Environmental Catastrophe" that will inevitably wipe out plenty of species from the Planet of Science, particularly those who represent the "mega-fauna" of the scholarly establishment. The ultimate dream of every generation of an academic establishment is that their scholarly field has reached the pinnacle of its development and no breakthrough is expected in the next 100 or 1000 years, or even forever. We will see how serious and sincere scholars are in believing such myths.

In the sixth chapter, we discuss the scholarly establishment's means of keeping new dangerous ideas from gaining acceptance in order to keep the current paradigm clear of danger. The institute of peer review is the primary keeper of the holy gates of the scholarly establishment. Professional mastery of

skeptics is impressive in refuting all the potentially plausible suggestions, although they often fail to notice even the smallest blemish in the existing paradigms. Methods of scholarly mobbing and neglect are the most widely used tools.

We discuss here also why professional scholars have an innate dislike for amateur scholars, although amateurs almost never compete with them directly for university positions and lucrative grants. We also discuss why and how professional scholars attack their professional colleagues if the dangerous-for-the-old-paradigm ideas come from within their circle of peers. Yes, professional scholars also suffer from the same attitude from their peers towards their views, if their new ideas do not agree with the dominating paradigm. The scholarly fraternity subconsciously pushes towards developing neophobia among peers.

Scholars who refuse to follow this unwritten trend are seen as whistle-blowers who can irreparably damage the prestige of institutions, scholarly fields, and the most revered eminent scholars. Such whistle-blowers are seen as egoists who, for the sake of their own agenda, threaten the well-being and financial security of their colleagues. I argue that true scholars by their nature are always whistle-blowers. They are rarely appreciated for their activities; on the contrary, they are often mobbed (or abused by another extremity – total neglect) by the established scholarly community.

Finally, in the seventh chapter, we discuss the fundament of many scholarly fields: the axiomatic truth that is clear to everyone except for heretics. We will review several cases when the postulates that seemed axiomatic turned out to be wrong and how the resulting cognitive dissonance effect pushed established members of the scholarly academia towards more extreme defensive measures. Despite being wrong, these axioms put powerful and long-lasting holds on acquiring new knowledge and reaching a new understanding. We discuss that some of the well-known old problems that many tried to solve possibly need not a successful answer to the question but comprehending that the question was not formulated correctly in the first place. Most importantly, we should remember that we all are humans, and like all humans, from the head of a national defense force to the most dedicated and proud wife or husband, we usually make our biggest mistakes in life not when we are hesitating, but when we are absolutely sure.

So the background is set. You had a chance to stop reading this book. In case you have not stopped reading and are ready to follow me into the rest of the book, let us move forward. In the first chapter, as we remember, we are going to tackle the problem of the education of future scholars.

Chapter 1

EDUCATING FUTURE SCHOLARS OR WHO'S THE FIRST
TO ANSWER A QUESTION?

Easy Questions

When the passionate educator Maria Montessori was asked when to start a child's education, her answer was very precise: childhood education should start nine months before a baby is born. Hungarian educator and folklorist Zoltan Kodaly put the start date for the child's music education even earlier: "*Music education begins nine months before the birth of the mother.*" Thomas Verny's fascinating book *The Secret Life of the Unborn Child* confirms that the child before birth is conscious, aware, and receptive (Verny & Kelly, 1988).

Both of these statements are most likely correct. And still, let me not agree with them. I do not believe there is a need for early intervention from human educators in order to develop a child's intelligence. Nature, more precisely, natural selection, has provided every normal human baby with the best possible tool for their intellectual development. This truly magic tool makes an appearance very early in every human life and can stay with us until the end.

The name of this magic evolutionary tool is the ability to ask questions.

Forget about measuring intelligence by answering questions, which is so prevalent in our current system of education and testing. During my 40+ years of teaching at various levels of education, I came to a firm conclusion that the questions students ask are a far better indicator of their intellectual and creative power than a good memory, early acquisition of the alphabet, or mastery of mathematical formulas. One of the most prolific inventors in human history, Thomas Alva Edison, is a good example of this claim. As a child, Edison struggled to acquire written language (he would today be labeled dyslexic), but he plagued his family members with myriads of questions. It is not accidental, then, that with his extremely inquisitive and creative mind, Edison became one of the most celebrated inventors in human history. Incidentally, Edison was highly critical of the existing official educational system and scholarly academia.

The crucial factor for our current discussion on education is that the ability to ask questions naturally appears in every child's intellectual development, without any efforts from their elders. For several months after birth, every normal human baby begins to ask questions. This happens much earlier than the ability to acquire syntactic structures, and even earlier than the correct pronunciation of words (Ferguson, 1977; Crystal, 1987:235, 243, 248; Moskowitz, 1991:147). How, you might ask, do babies ask questions if they cannot really speak? They simply use the rising intonation and ask one-word questions

like “dada?” (Meaning: “Dad, are you there?”), or “kaka?” (Meaning: “Can I have another piece of cake?”).

Questioning Revolution

Here's a bit of evolutionary history. The ability to ask questions was a revolutionary step in our species' prehistory. To put it simply, it was probably the defining feature of human intelligence, as arguably no other animal species on our planet is endowed with the ability. I dedicated a whole book, *Who Asked the First Question?* to this topic (Jordania, 2006; see also the second edition of *Choral Singing in Human Culture and Evolution*, Jordania, 2015).

“Wait a minute,” an informed reader might ask at this point. “What about apes? They are known to acquire various means of communication in human laboratories and have conversations with their trainers. Is it possible that all these conversations with humans are conducted without questions?” Of course, this is impossible. There are plenty of questions in human-ape conversations. The striking fact though is that all the questions are asked by humans only. Not a single ape has ever asked a question. Let us briefly consult the wide literature on the education of apes.

Describing Nim's ability to be engaged in conversations on many topics, Herbert Terrace notes: “*His teachers would ask him questions such as What color? What name of? Who? ... Nim showed his comprehension by making an appropriate response....As his ability to sign improved, Nim began to reply to his teachers' questions with more than one sign*” (Terrace, 1980: 166-167). It became clear from the beginning of the ape education projects that apes are very good at answering questions and requests. On the other hand, the ability to ask questions proved to be much more difficult, maybe even impossible.

There was a time when teaching how to ask questions to apes seemed not so difficult. In the 1970s, Ann and David Premack designed a potentially promising methodology to teach apes to ask questions. Here it is:

“In principle, interrogations can be taught either by removing an element from a familiar situation in the animal's world or by removing the element from a language that maps the animal's world. It is probable that one can induce questions by purposefully removing key elements from a familiar situation. Suppose a chimpanzee received its daily ration

of food at a specific time and place, and then one day the food was not there. A chimpanzee trained in the interrogatives might inquire 'Where is my food?' or, is Sarah's case 'My food is?' Sarah was never put in a situation that might induce such interrogation because for our purposes it was easier to teach Sarah to answer questions" (Premack & Premack, 1991 [1972]:20-21).

More than a decade after writing these promising words of how to teach apes to ask questions, the Premacks have changed their attitude. You can probably feel a note of disappointment in the following excerpt from their 1983 article:

"Though she [Sarah] understood the question, she did not herself ask any questions -- unlike the child who asks interminable questions, such as What that? Who making noise? When Daddy come home? Me go Granny's house? Where puppy? Sarah never delayed the departure of her trainer after her lessons by asking where the trainer was going, when she was returning, or anything else" (Premack & Premack, 1983:29).

Amazingly, Sarah would sometimes "steal" the words from the trainers and then happily repeat the questions (!) asked by trainers to her a few minutes previous, and then repeat her own answer. Still, she never herself formulated and asked trainers any questions.

Earlier, Washoe also failed to formulate and ask questions, though that was one of the aims of the Gardners' project (Gardner & Gardner, 1969, 1975; Bronowski & Bellugi, 1980:110; McNeill, 1980:152-153). Despite all their dazzling achievements, famous bonobos Kanzi and Panbanisha did not seem to possess the ability to ask questions as well. At least, Sue Savage-Rumbaugh and her co-authors have not claimed such (Savage-Rumbaugh, 1986; Savage-Rumbaugh and Levin, 1994; Savage-Rumbaugh et al., 1993, 1994, 1998, 2001, 2006; Rumbaugh et al., 2011).

I am aware of only one claim that an ape asked a question. That was the chimpanzee, Lana, who participated in Duane Rumbaugh's experiments in the 1970s. "When the [food-giving] machine was broken and food could not be loaded, Lana was able to ask: 'You move food into room?'" (Savage-Rumbaugh & Levin, 1994:143-144). Even if this is the case of an ape asking a question, it

would be very difficult to understand why Lana asked only one question in her lifetime. Given the natural curiosity of the apes, it would be natural to expect that if apes know how to ask questions, they would be asking plenty of them, very much like small children do during their intellectual development.

Questioning is a materialized curiosity. Curiosity among animals is widely known, and you do not need to read lots of scientific literature to learn about this; having a dog or a kitten as a pet is enough to know about their curiosity. Strange as it might seem, curiosity among many animal species exists, but the ability to ask questions seems to be absent.

In all cases, when apes begin a conversation, their utterances are either statements ("Bird there") or orders/requests ("Play me", "Tickle me", "Me more eat", etc.). But not questions.

Some contemporary scholars believe that the finding that apes do not ask questions is unimportant for the comparative study of human and animal intelligence. According to their logic, as apes occasionally can produce more difficult syntactic structures than simple questions, the absence of questioning behavior does not matter. However, many readers probably would agree with me that apes' inability to ask questions tells us something very important about the cognitive difference between humans and their closest living relatives.

Can Parrots be Smarter than Apes?

In my search for questioning animals, I contacted Irene Pepperberg, an animal psychologist from the University of Arizona (later from Harvard), and asked her if Alex, arguably the world's most famous talking parrot, possessed the ability to ask questions. To the surprise of many scholars studying animal cognition, including myself, Pepperberg's response was clearly positive. These words are from her letter of March 18th, 2011:

"Alex consistently asked questions... he learned the label for 'carrot' by asking what we were eating, the color 'orange' by asking the color of the carrot... he learned 'grey' by seeing himself in a mirror and asking 'what color?'... He only asked questions about things that interested him, however... at the time of his passing [at the age of 31], he was asking us about things that were brown, trying to learn to say the label" [see also Wise, 2002:107; Pepperberg, 2008].

It is truly tragic that Alex died so young. African grey parrots usually live for about sixty years. It is a pity we will never have a thoroughly documented study about his ability to ask questions. The positive thing, however, is that if Alex had the ability to ask questions, there is a good chance we will learn about other African grey parrots who can also ask questions. Otherwise, it is highly unlikely to propose that Alex was the “sole genius” among all the grey parrots. If Alex is found to be the only parrot with the ability to ask questions, this might mean that the ability was a result of genetic mutation, and it might appear independently in various species (not only mimicking birds) that have a relatively high cognitive ability.

If African grey parrots are generally found to have the ability to ask questions, scholars will have lost yet another supposedly “uniquely human” cognitive ability that separates us from animals (Jordania, 2006). On the other hand, if African grey parrots are found to lack the necessary neural “hardware” to ask questions, and if Alex was the only so-far known non-human with this ability, checking the genomic sequence of Alex against other parrots of his own species might be extremely important to get closer to the mystery of this question-asking ability.

If any of the readers of this book still have suspicions about Alex’s ability to ask questions, listen to an extremely interesting interview Irene Pepperberg and Alex gave to a BBC channel in 1991. During the interview, Alex tried to reverse the interview and instead of answering questions, started himself asking Irene questions:

“Alex, I’m going to ask you some questions. We are going to do some work.” Irene shows the wooden square and says, “What color?”

And in his little birdie voice Alex says, “No, you tell me what shape.”

“Okay, Alex, it’s four-cornered. Tell me what color.”

“Tell me what matter,” says Alex.

“Okay, Alex, it’s wood. Can you tell me what color?”

“No, how many?”

“Alex, there is only one toy here. Alex, come on, what color?”

“No, tell me what shape.”

“Okay Alex, time out, you are misbehaving,” and you hear Irene’s heels click, clicking as she starts to walk out the door, giving him a timeout, and then comes a little birdie voice,

“I’m sorry ... come here ... orange.”

Alex's tendency to reverse roles and ask questions himself became a problem with the education of other parrots in the laboratory. Here are Irene Pepperberg's words from a later communication to me:

"Unfortunately, Alex dominated the other birds in the lab so greatly – interrupting all their sessions, asking them questions other than the ones we were posing, giving out the answers – that none of my other birds have yet progressed to his stage" (from the letter of October 1, 2015).

Some readers might reject offhand the idea of a "thinking parrot" because of the long-held cultural belief. "How is it possible," they would ask, "that parrots, which in many cultures are considered the symbol of foolish repetitiveness, are smarter than the closest human relatives, the famed chimpanzees and bonobos?" Well, we should not exclude any possibility until we know more facts about the matter. We should also not exclude that the ability to ask questions might have arisen more than once and in more than one species. We should also remember that the intellectual abilities of birds are usually underrated in the popular imagination. For example, who would have guessed a couple of decades ago that crows and magpies can be more intelligent than dogs and cats?

Ontogeny: How do We Develop the Ability to Ask Questions?

The ability to ask questions is a part of human genetic makeup, or in other words, is hardwired in our genes. What is difficult is to predict whether there is a specific and unique "questioning gene" that is responsible for our ability to ask questions, or whether there is a complex combination of several genes that enables all normal humans to ask questions. Hopefully, in the decades to come, some clinical/genomic research will be conducted on this fascinating topic.

An important question is how this ability comes alive after babies are born. Is this an instinctive ability, like swimming skills among ducklings? We know that ducks can swim even if they have never seen the water before. So there is no need to teach ducklings how to swim. As there is virtually no human around who cannot ask questions, it might seem that asking for humans is as natural as swimming for ducklings, but apparently, this is not the case. Let us have a look at the only available well-documented case when a human baby was put in complete isolation for years.

The tragic story of a Californian girl, known to a scientific community as “Genie,” gives us a glimpse into the mystery of how the ability of questioning develops. “Genie” was kept by her abusive father in a family cellar for a long 13 years. Genie was finally rescued by her mother, herself a blind and sick woman. This was not a case of a long-running sexual abuse from a despotic father, better known to us from recent years. Instead, the father tied the girl to the chair in the cellar and kept her in total isolation during the long 13 years. During these years, he himself did not communicate with the girl in a human language. The motive of the father still remains a mystery, as he committed suicide after the news of his daughter came out from the media.

After her rescue, Genie received plenty of attention, care, and training from foster homes and scholars. Thanks to her after-rescue caregivers, Genie was able to develop some language skills, but unfortunately, she was unable to develop full language. Among the skills she failed to develop was the ability to ask questions (Wills, 1993:288). This fact strongly suggests that, although questioning is obviously a genetic ability of every normal human mind, it needs a social environment to trigger the development of this ability (Jordania, 2006:342-343).

As for a mechanism triggering children’s genetic ability, I suggest parents teach their children the art of asking questions by talking to them in a specific way, known in scholarly literature as “motherese.” There are also other names for this phenomenon, like “infant-directed speech,” “child-directed speech,” “caretaker speech” and a few other non-formal terms. Most importantly for us, motherese consists predominantly of questions and cuddly play-words, pronounced with wide modulations of the voice. Infants love hearing this kind of speech and respond excitedly. As questions and the phrases with the rising question intonation constitute a large part of “motherese,” it would be natural to conclude that it is critical for teaching young children to the crucially important art of asking questions. We teach our children this crucial cognitive ability without even realizing what we are doing.

Most importantly, asking questions is not only an expression of our curiosity. This is a fundamental strategy of human intellectual development, a strategy designed by human evolution. Asking questions is a crucial element for every human being to develop critical thinking and to become creative, loving, happy human beings. And obviously, the ability to ask questions is crucial for the process of educating every human child. We will come back to this point later and

will see what happens when children go to school. But now let us discuss a different related topic, the fabled Theory of Mind.

Asking Questions and TOM

Theory of Mind (or TOM) is the ability of individuals to understand the mental state of others. There is a specific “Sally-Anne Test,” designed to check the presence of TOM in young children. This test establishes that young children are unable to realize that other children around them may not have the same knowledge they possess. During the test, children are introduced to two dolls, Sally and Anne. Sally takes a “marble” and hides it in her basket. Then she goes out from the room, and the Anne doll shifts the marble from Sally’s to her own basket. When Sally comes back, a child is asked a critical question: “Where will Sally look for the marble?” If a child is able to take Sally’s perspective, knowing that Sally was not present when the marble was shifted, she will answer correctly, but if she cannot take the perspective, she will be sure that Sally knows as much as she herself knows. Based on this popular test, it is believed that children develop TOM at the age of about four and a half years (Astington & Gopnik, 1991; Roessler, 2013).

For a long time, it was believed that humans were the only species able to understand the mental states of others. This is hardly surprising. Attribution of any complex mental abilities to our species as “uniquely human” has a long history. Plenty of our mental abilities, from the “designing features of a language,” displacement, the duality of patterning, traditional transmission, openness, arbitrariness, and productivity (see Hockett, 1959 and Hockett & Archer, 1964), to the TOM have been considered at different times to be “uniquely human.” Amazingly, all these “uniquely human” mental abilities were gradually found in the animal kingdom as well (and not only among the apes). Today, many agree that apes can learn successful communication virtually with all these features. TOM is no different. Apes are quite masters of deceiving each other, behavior that clearly requires understanding the state of mind of others.

Not only apes are capable of this. Lions also show complex behavior, suggesting that they can understand the state of mind of their pride members, and use this ability to deceive them. Let us listen to George Schaller:

“After having killed, a lion either begins to eat immediately or else moves the carcass to another location. On several occasions, the prey

was caught in high grass by a lion which then sat down and looked around casually for as long as 5 minutes, as if its hunt had been unsuccessful. It gave the impression of trying to conceal the presence of the carcass from the others that had taken part in the hunt, for as soon as these lay down or moved away it began to eat” (Schaller, 1972:268).

In such cases, lions demonstrate a clear understanding that other lions, who have not seen the result of the hunt, have no knowledge of the presence of the available kill.

I am not going to discuss the presence of TOM among various animals. But I do suggest that we pay attention to the correlation of the presence of TOM and the ability to ask questions among humans. At first sight, it might seem obvious that to be able to ask a question, one needs to have a TOM, as one needs to understand that others have different knowledge that they might inquire into. So the idea that someone might have an ability to ask a question without having a TOM might seem absurd. Well, we should always remember, that whatever theoretical postulates you believe in, you must give priority to the existing facts.

The facts are quite stubborn in this case and they go against this sensible proposition:

(1) In normal children’s development, the ability to understand that others have a different knowledge from them, or the TOM, appears at about the age of four and a half years (Astington & Gopnik, 1991:12; Roessler, 2013);

(2) In the development of the same normal children, the ability to ask questions appears in the form of a correctly pronounced question intonation much earlier – before a child’s first birthday (Crystal, 1987:241, 143).

So humans do not confirm the seemingly axiomatic statement that to be able to ask questions, one must have a TOM. Human children from the age of one to four can ask questions, but they have no TOM! This amazing fact has somehow still escaped the attention of scholars.

If there is a close link between the ability to ask questions and the TOM (and it seems it should be), the controversy over the earlier onset of questioning might have two explanations. First, one might posit that the ability to ask questions was the primary cognitive function in the evolution of our mental abilities, and the TOM came later, possibly even partially based on the ability to ask questions. A second explanation might be that in this case, children’s intel-

lectual development does not represent the evolutionary sequence of forming human cognitive abilities.

Which of these explanations might work?

(1) The first explanation cannot be true, at least if we believe that we are evolutionarily closely related to apes. Apes, as discussed above, have TOM but have no ability to ask questions. Therefore, TOM was most likely present in the common chimpanzee-human ancestor. This fact strongly opposes the possibility that the ability to ask questions appeared among human ancestors earlier than TOM.

(2) What about the second explanation? How to deal with the “ontogeny recapitulates phylogeny” argument? Well, we need to take into account that the “ontogeny recapitulates phylogeny” (also known by scholars as the “recapitulation theory”) has become at least partially discredited (For example, Kallinka & Tomancak, 2012). This brings us to the conclusion that the early onset of the ability to ask questions in children most likely does not represent an evolutionary chronology. Most likely, the ability to ask questions is phylogenetically late, but in ontogeny, it starts developing earlier because of its immense importance for the intellectual development of every member of the species. The matter needs further research, although we are not going to pursue this line, at least in this book.

It seems clear that the ability to ask questions is a crucial tool for the intellectual development of every human being. Basically, we are humans because we can ask questions. We probably do not want to imagine what would happen if society and parents try to suppress our children's urge to ask us questions. Well, if you believe this unimaginable intellectual barbarism over children's intellectual development is just a horrible fantasy, you might receive a shock very soon.

Now, after discussing the immense cognitive importance of our ability to ask questions for our intellectual development, let us now go back to the existing educational strategy.

It is time to go to school!

Cognitive Tragedy, or Let's Go to School!

So, natural selection provided every human baby with the best possible way to develop a young human's intelligence and creativity. By asking myriad questions, young children independently develop their intellectual abilities. Basically, every young child's brain is a powerful self-developing system. All those who have had to answer thousands of questions coming from their children and grandchildren know the strength of this ability. This powerful process of self-education continues until children go to school. And as soon as formal education kicks in, something quite tragic happens. What exactly? Children stop asking questions.

Why?

I believe there is a simple explanation for this complex question: It is our schools, our educational system that forces our children to stop asking questions!

If you think this is a ridiculous allegation, please calm down and recall your time spent at school. You might agree that as soon as children go to school, they are gradually taught several all-important lessons:

- (1) When it comes to school, if they want to be considered good students, children need to learn how to *answer* questions, not how to *ask* questions;
- (2) At schools, it is teachers who ask questions;
- (3) Good students are those who are the first to answer the questions.
- (4) So, in order to be loved and appreciated at school and by parents, children should forget about their insatiable urge of asking questions for good, and concentrate on answering them.

Of course, at school, children are not banned from asking questions, but still, there are important limitations. As a rule, children are allowed to ask questions after a teacher gives permission with the words: "Does anyone have questions?" Teachers see such questions as a welcome expression of interest from students. By the way, this does not occur in every educational system. At Chinese schools, for example, asking a question to a teacher is usually seen in a negative light, but we will discuss this a bit later.

So, although students are still allowed to ask questions, at least in Western schools, it is difficult to argue against the idea that the general strategy for being a good student is to be able to answer questions, not to ask them. Our whole educational system is based on this principle. We check students'

knowledge during lessons by asking them questions, we ask them to answer questions on the tests and exams. State educational bodies check their progress by asking them questions. International bodies of the study of student educational progress ask students from all over the world to answer the questions and complete tests.

This is, in my opinion, the core problem of our educational strategy. The problem is created by a fundamental difference between the natural self-educational strategy of the human brain, provided by our evolutionary prehistory, and the strategy of our current system of education based on students answering teachers' questions. Instead of keeping children's natural curiosity alive, providing them with new materials and educational tools to enhance their self-development, most mainstream schools are forcibly shutting down children's curiosity and creativity. Schools enforce the unitary schedule of what should go into the pupils' heads, and when. So instead of the joy of self-discovery (what our brains are best at, and what they are naturally designed to do), all the knowledge is presented to children in a form of ready-made facts. Students just need to remember these facts and they will be considered good students, doing well at the tests and exams of various levels. Creativity and the joy of discovery are replaced by memorization.

Let's look at the problem of early childhood education from another point of view. Who knows, perhaps our children are better off with human-designed systematic education than with the chaotic process of acquiring information in the form of their haphazard questions and the even more haphazard answers from adults or the available sources. Is not it better to gradually explain to our children all the basic knowledge that humanity has managed to obtain over its history, instead of answering thousands of their silly questions?

Leonardo da Vinci once said: *"Human subtlety... will never devise an invention more beautiful, more simple or more direct than does nature, because in her inventions nothing is lacking, and nothing is superfluous."* I agree with Leonardo. There is something much more important in children's self-education, than the most efficiently organized boxes of knowledge in various spheres. The passion for the search, the process of the search and the joy of discovery in itself are more important for human intellectual development than the passive acquisition of existing knowledge.

The most important function of our brain is the ability to search, receive and organize knowledge in a unique and creative way, and our brains are al-

ready designed to do this. It is crucial for educators to remember that children naturally have the skills to think and to learn. Our educators are committing violence against human intellectual abilities when they try to teach children how to think. Instead of the natural “search-and-learn” strategy, educators supply a “listen-understand-and-remember” strategy of knowledge acquisition. The goal of this strategy is very much like teaching ducks how to swim or teaching young pre-school children their native language. These are, so to speak, “crimes against nature,” as the mechanisms by which ducks know swimming and children acquire their native language are much more complex and sophisticated than any educational strategies humans can ever create. And interfering in these complex processes is nothing short of being a crime against nature.

Actually, the term “crimes against nature” does exist, and is sometimes used in our contemporary world, but never in the sense that I just mentioned. If you try to consult law books or even a Wikipedia page, you will soon find out that the term “crimes against nature” refers mostly to the various sexual activities that we, humans (not nature!), consider unnatural, for example, homosexuality, oral sex, bestiality, or other similar violations of various religious views on sexuality. It is quite incredible how we pronounce our human-devised, arbitrary cultural values to be the “Laws of Nature....” And as if this were not enough, do not forget that very little consensus can be found across various cultures for what is the “natural” and “acceptable” and “unnatural” and “unacceptable” in human sexual life.

Let us leave this emotionally charged topic in peace and return to the ways of educating young children by natural and humanly organized systems of education.

If we compare children who are taught very diligently from the beginning of their educational process to learn the facts of the world with naturally self-developing children, we might find that the former know more, but in the process of acquiring the set of facts, something more important is lost. Most formally educated children are deprived of the joy of discovery, the joy of looking at every new fact of the world in awe, and continuing to question everything from their own unique perspective. With strict formal education, we are raising obedient students but destroying their potential for being great scholars. It is vital to retain this initial natural curiosity and the constant search for the new wonders of nature during one’s whole life. Every great scholar has residing inside of her or him a curious child, one that never stopped asking silly yet pro-

found questions. And by the way, a silly question today might seem a profound one to the next generation of thinkers.

It is inevitable that, with the current system of education, the natural process of creative self-education turns into the corporate coercive process of acquiring a set of facts and prejudices. Only a few intellectually robust individuals are able to maintain their inner integrity and creative urge for self-education, while most of the children at school quickly realize the easiest way to please their teachers and parents is to remember what they are taught and to answer questions. Great scholars, as a rule, managed to maintain for life the urge to ask questions about everything that comes to their senses. There are no great scholars who did not at least partially self-educate themselves. Self-education may lead to spectacular results in financial matters as well: *"Formal education will make you a living; self-education will make you a fortune,"* said Jim Rohn, American entrepreneur and author.

It is symptomatic that professional education looks at the idea of self-education with deep irony, believing that children should acquire the ascribed set of facts and ideas in an organized way. The result of this approach is that the whole educational process from primary school onwards becomes a rat race in endurance and perseverance for both teachers and their students. Schools work hard to prepare students to answer any possible questions for the all-important tests from the state educational bodies.

Do you think this is correct? Don't you think our educational system would be better off if we continue encouraging our young students to further their natural thirst for the facts of the natural world around us, using their natural ability to ask questions?

Let us look at what great thinkers of humanity have said about the needs of education.

"The one real object of education is to have a man in the condition of continually asking questions," said 19th-century British historian, Mandell Creighton. Unfortunately, this is exactly the opposite of what our schools are doing. According to developmental psychologist Jean Piaget: *"The goal of education is not to increase the amount of knowledge but to create the possibilities for a child to invent and discover, to create men who are capable of doing new things."* And here are a few quotes from Einstein:

"The important thing is to not stop questioning,"

"The true sign of intelligence is not knowledge but imagination."

"It is, in fact, nothing short of a miracle that the modern methods of instruction have not yet entirely strangled the holy curiosity of inquiry; for this delicate little planet, aside from stimulation, stands mainly in need of freedom; without this, it goes to wreck and ruin without fail. It is a grave mistake to think that the enjoyment of seeing and searching can be prompted by means of coercion and a sense of duty."

You might say Einstein was talking about the educational system of his childhood, or at least of his lifetime. Yes, things have changed, and for example, most contemporary schools have stopped physical punishment, but the fight against the natural curiosity of students still rages on, from primary to tertiary education.

Should we be surprised then that there are complaints about adults' lack of interest when compared with young children's inquisitive mind? Here is frustrated Freud: *"What a distressing contrast there is between the radiant intelligence of the child and the feeble mentality of the average adult."* This "distressing contrast," in my opinion, is the direct result of the resounding success of our own educational strategy, based on uprooting the natural curiosity of children. Many others have commented on the same phenomenon:

"Men are born ignorant, not stupid; they are made stupid by education."—Bertrand Russell

"I suppose it is because nearly all children go to school nowadays, and have things arranged for them, that they seem so forlornly unable to produce their own ideas."—Agatha Christie

"How is it that little children are so intelligent and men so stupid? It must be education that does it."—Alexander Dumas

"Why is it that in most children education seems to destroy the creative urge? Why do so many boys and girls leave school with blunted perceptions and a closed mind? A majority of young people seem to develop mental arteriosclerosis forty years before they get the physical kind. Another question: why do some people remain open and elastic into extreme old age, whereas others become rigid and unproductive before they're fifty? It's a problem in biochemistry and adult education." — Aldous Huxley

So let us make it clear: education in itself is a wonderful thing, but the current mainstream system of education is based on a controversial method, and instead of firing up the imagination of children and encouraging their natural curiosity, it fills the brain with ready-made facts, uprooting their natural curiosi-

ty. Henry Adams, American historian and author, wrote: *"Nothing in education is so astonishing as the amount of ignorance it accumulates in the form of inert facts."*

A reader might ask: if so many prominent humans are critical of the existing system of education, why it is still so popular?

The most probable answer to the question of why schools are so rigid and restrictive is found in the so-called "domestication theory" (see Simler & Hanson, 2018: 238-240). The center of the theory is that schools, with their strict rules, prepare children for their future life as adults who will have to spend most of their lives working their day jobs from 9 to 5.

And there is a more direct financial reason as well. Stephen R. Donaldson, contemporary American author, successfully pointed out probably the most attractive side of the existing system of education, together with the ugly side of it: *"Whatever the explanation, it's perfectly obvious that our educational system has nothing to do with education: it's a babysitting service designed to replicate the worst qualities of the parents."* Yes, our schooling system is just too convenient for many families (and employers) to discard. But even if we need to take children to school for several hours five days a week, schools do not have to be rigid and conservative to the point they close off children's curiosity. There are some rare positive examples. For example, Montessori schools do not violate children's natural way of self-development. On the contrary, they support it. We will discuss the Montessori system a bit later.

Boris Sidis, Russian-American psychologist and philosopher of education of the 20th century, gave another, fuller description of the strategy of the existing method of education:

"The child is regarded as a sort of a little beast, a kind of young ape, at best a little savage. The child, accordingly, is trained to act not by the light of reason, but by the command of superior force. The child is ruled by fear. Our young generation is trained by fear into discipline and obedience. We thus suppress the natural genius and originality of the child, we favour and raise mediocrity, and cultivate the philistine, the product of education, ruled by rod, not by thought."

Because of this discrepancy between the natural development of human intelligence and the existing educational system many great thinkers were extremely critical of the existing system of institutionalized education. We already heard some of them. Listen now again to Albert Einstein: *"The only thing that*

interferes with my learning is my education.” Let us think about these words not only as a nice, if contradictory, sentence by one of the greatest geniuses of humanity, but also as something very sincere and direct. The educational process that Einstein was undergoing was a problem for his open-minded approach to the world. His teachers’ continual demand for answers and their total neglect towards the questions that their students generate was frustrating for the young genius. Besides, teachers’ requirement to remember the set facts did not leave much time and space for creative thinking. I wonder how many of the readers of this book can recall hours, weeks, months, or even years of wasted time because of the existing rigid system of education they received at school.

It is virtually impossible to find explicitly positive feedback about the existing formal educational system from world-famous writers, scholars or artists. British actor Robert Morley put this idea even into a form of a challenge: *“Show me the man who has enjoyed his schooldays and I will show you a bully and a bore.”*

On Coercion and Indoctrination

Coercion is possibly the single most criticized issue of the educational system. Although physical coercion is not practiced anymore in most of the Western world, intellectual coercion is still widely practiced. Louis Sullivan, the American architect known as the father of modernism, said in 1894:

“How strange it seems that education, in practice, so often means suppression: that instead of leading the mind outward to the light of day it crowds things in upon it that darken and weary it. Yet evidently the true object of education, now as ever, is to develop the capabilities of the head and of the heart.”

Great Jean-Jacques Rousseau wrote in *Émile*:

“It is very strange, that, ever since mankind have taken it into their heads to trouble themselves so much about the education of children, they should never have thought of any other instruments to effect their purpose than those of emulation, jealousy, envy, pride, covetousness, and servile fear – all passions the most dangerous, the most apt to ferment, and the most fit to corrupt the soul, even before the body is formed. With every premature instruction we instill into the head, we implant a vice in the bottom of the heart.”

Let us now listen to the harsh if fair words about the existing system of education from the late Doris Lessing, British novelist, Nobel Laureate in literature:

"Ideally, what should be said to every child, repeatedly, throughout his or her school life is something like this: 'You are in the process of being indoctrinated. We have not yet evolved a system of education that is not a system of indoctrination. We are sorry, but it is the best we can do. What you are being taught here is an amalgam of current prejudice and the choices of this particular culture. The slightest look at history will show how impermanent these must be. You are being taught by people who have been able to accommodate themselves to a regime of thought laid down by their predecessors. It is a self-perpetuating system. Those of you who are more robust and individual than others will be encouraged to leave and find ways of educating yourself – educating your own judgements. Those that stay must remember, always, and all the time, that they are being moulded and patterned to fit into the narrow and particular needs of this particular society.'"

It can be said safely that developing a more creative educational method that would not be indoctrination of a child has been a dream for many thinkers.

Coercion and indoctrination have been a big part of our educational system for centuries, if not millennia. And the process of this coercion starts as soon as children come to the primary school, and when they are taught to suppress their natural urge to ask questions and freely develop their creativity and knowledge. This is, in my opinion, the beginning of the intellectual violence that humans undergo while they are at educational institutions all the way through from primary school to obtaining a Ph.D. If we do not deal with this problem, if we prohibit our children to continue their intellectual development by asking questions, forcing them instead to answer our questions, our efforts will be mostly wasted.

Let Us Listen to the Other Side

Is it possible that all these prominent men and women happened to be at bad schools with bad teachers? Why not listen to what educators themselves say about the aims of education?

The 16th-17th-century German clergyman, philanthropist and biblical scholar, August Hermann Francke said these widely known words about raising a child: *"The most important thing is that the natural will of the child be broken."* No doubt it sounds scary to many readers to read that breaking of the natural will of a young child is proclaimed to be the foremost aim of the education. I cannot speak about many other countries, but in Soviet Georgia in the 1960s, when I was at school, this idea was quite a popular one, at least for an older generation of teachers and parents.

I concede the situation may have changed during the last century. Let us have a look at what more contemporary educators say about the aims of education:

"Schools should be factories in which raw products, children, are to be shaped and formed into finished products... manufactured like nails, and the specifications for manufacturing will come from government and industry."

When I saw these words for the first time, I thought it was a joke, or possibly an excerpt from the lyrics from another anti-establishment song, from something like Pink Floyd's song "Another Brick in the Wall." But no, apparently these are not humorous words. On the contrary, they are dead serious. They were pronounced by an influential American educator, actually, a pioneer of the American educational establishment, Elwood Cubberly. After pronouncing these candid words in 1905 in his Ph.D thesis at Columbia Teachers College, Cubberly had a brilliant career, as a professor for many years, becoming Dean of education at Stanford University from 1917 until 1933.

From the same formative period we find the following words from the 1906 book *The Philosophy of Education* by William Torrey Harris, United States Commissioner of Education:

"Ninety-nine [students] out of a hundred are automata, careful to walk in prescribed paths, careful to follow the prescribed custom. This is not an accident but the result of substantial education, which, scientifically defined, is the subsumption of the individual."

"The great purpose of school can be realized better in dark, airless, ugly places ... It is to master the physical self, to transcend the beauty of nature. School should develop the power to withdraw from the external world."

Actually, governmental interest in education is understandable. *“Education is a weapon whose effects depend on who holds it in his hands and at whom it is aimed.”* These words might insult some readers who consider education primarily to be a tool towards achieving greater freedom and enlightenment for each member of society, but the same words might equally bring the agreement of many who support the unified governmental policy of education. And who said these words? Joseph Stalin, one of the most well-known dictators in world history. The words of Italian fascist, Benito Mussolini might also appeal to many governmental educators: *“It is the State which educates its citizens in civic virtue, gives them a consciousness of their mission and welds them into unity.”* What about the most iconic representative of fascism, did he have anything to say about the education? If not directly, Adolf Hitler was happy with the existing results of education: *“What luck for rulers that men do not think.”* This is how He acknowledged the resounding success of the existing system of German education in turning the members of the thinking species into non-thinking robots.

Here is yet another interesting quote from a high ranking governmental educator:

“What we need is to justify coercion, paternalistic control, blame, scolding, and punishment - all of which are less evident in trigonometry class than in a fourth grade learning long division.(...) I have argued that blame, scolding, and punishment in public schools - what I have called “the ordeal” - can be successfully defended. Students have a duty to learn, and can be held responsible for violating whatever rules, policies, or instructions are enforced to ensure that they do so.”

If you think these words come from the 19th or even from the beginning of the 20th century, you are mistaken. These words were put forth by Charles Howell, who served in faculty and leadership positions at several institutions and at the time of writing is a department chair at Northern Illinois University. Trained as a philosopher of education, Dr. Howell writes about the ethics and politics of educational institutions. As we can see, some elements of our current education are amazingly stable and close to the century-old principles of strict schooling.

I want readers to know that these words are given here not to criticize certain individuals, but to show the general direction of the official education sys-

tem. It is fascinating how many educators' words on education are close to the ideas on education from the world's greatest dictators.

We should be fair and say that not all high placed governmental officers were so conservative. The Secretary of Health, Education, and Welfare under the American President Lyndon Johnson, John W. Gardner, was not happy with the existing educational system. Ironically, he was educated at Stanford University, when Elwood Cubberly was the Dean of Education, but Gardner's opinion on education was very different: *"I am entirely certain that twenty years from now we will look back at education as it is practiced in most schools today and wonder that we could have tolerated anything so primitive."* Unfortunately, high-ranking government officials with such progressive ideas are not a common occurrence, and they sometimes do not fit their official position. It is indicative that Gardner resigned from his high governmental position as he could not support the war in Vietnam.

Oh, by the Way, When Should Children Go to School?

Precisely when formal education of young children should begin is a hot topic worldwide. Some readers might not be aware that children go to primary school in different countries at very different ages. In some countries (for example, in the UK and Australia), children are admitted to school when they are five and even four years old; in other countries, they start their education when they are six and even seven years old. The difference between four-year-old and seven-year-old children is enormous. Which is correct?

There are currently two conflicting models of educational philosophy about the age to begin formal schooling. Most educators agree that children should not go to school too early. But what exactly is "too early?" A recent call from Australian educators suggested children should start schooling no earlier than age five (see the 2014 article on the website: *Principals call for a national standard school starting age of five-and-a-half*). In Britain, where the idea of early child placement to school originated, educators went further and suggested that children should start school not before they turn six or seven (Smith, 2013). Experts say an early school start is causing "profound damage" in a generation that is not encouraged to learn through play. As we see, at least some educators vouch for the later start of schooling.

However, the UK governmental office opposed this suggestion. After dismissing the call of UK educators and academics as “misguided” by the Education Secretary Michael Gove, a contrary governmental proposal was announced. The proposal was to make early school more formal and to introduce tests in the first year of schooling. What is the reason for such a drastically different approach from educators and governmental bodies? Here we should remind ourselves that the early start of formal schooling was introduced in the UK not for the benefit of children, but for the benefit of employers who wanted to have working moms back to their working places sooner; the early start of school meant an earlier start of babysitting services by schools. Plus, very few governments in the world would decline the chance to have more obedient citizens indoctrinated from an earlier age.

It is hard to predict what the outcome will be of this contradiction between the British educators and academics on one side, and governmental policy on the other side. The “good for children” argument is undoubtedly very powerful, but even this might not be enough to outweigh the “good for profit” argument, particularly in Western profit-oriented economy and society. Agreeing with most of the educators and parents, I also support the suggestion of a later school start. Going to school later would give children an advantage of having a longer period of precious, questioning-based natural development. Children who are pushed to go to school too early are disadvantaged because their period of natural development, the golden period of asking myriads of questions, is cut too short.

My position is simple: if we are unable to change our educational system to one that can encourage children’s natural curiosity, let us at least give our children more time for the natural questioning-based development of their intelligence. If, however, the new generation of educators manages to create a new educational model to support the natural questioning self-development, the idea of the early start of schooling might meet much less resistance from educators and parents.

A Few Words about Special Schools for Gifted Children

For some children, the sudden end of their natural intellectual development happens even earlier. And these are usually the most talented and the most creative children. I am talking about child prodigies, who very early show bril-

liant intellectual capacities and whose educational history develops quite differently from other children.

We can start our discussion about gifted children from stating a fact well-known to educators: it is not as easy as it might seem to identify highly gifted students. Some are easier to identify than others, but others are notoriously difficult to notice. Let us remember that people with such extraordinary mental abilities as Albert Einstein and Thomas Edison were underachievers in primary school.

Six profiles of gifted students have been described in an informative article by George Betts and Maureen Neihart (1988):

(1) So-called “successful” students are the easiest to identify as gifted. These students seek teacher and parent approval and are easy to work with. On the other hand, they do not display independence and are not risk-takers. Often the brightest students in the class later become competent if unimaginative adults without much creativity and autonomy (Goertzel & Goertzel, 1962). Such students constitute about 90% of the students identified as gifted;

(2) So-called “challenging” students include creative children who sometimes become known for their rebellious behavior towards teachers and parents;

(3) So-called “underground” gifted students try to hide their giftedness in order to gain social acceptance among peers. These students are frequently anxious and insecure, though often endowed with a great sense of humor and are known as the funniest in the class;

(4) So-called “dropout” gifted students often have a long history of underachievement;

(5) So-called “double-labeled” are students who may be known for their physical, emotional, or learning difficulty, and at the same time have special talents (often neglected); and finally,

(6) So-called “autonomous learners” are independent and self-directed learners with strong interests.

Gifted students are categorized as gifted due to having cognitive and emotional abilities that allow them to learn at a much faster pace than their age peers. The most widely accepted practice used for the education of gifted students is acceleration. Acceleration is a strategy that enables gifted students to “progress through an educational program at rates faster or ages younger than normal” (Pressey, 1949, in Betts & Neihart, 1988).

There are also special schools for naturally gifted children. Some of these schools might not have the official definition, but their higher demands, a high rate of tertiary success, popularity, stringent entry requirements, and some other factors make them “special.” Gifted children are allowed to go through the school program at a faster pace, allowing them to progress through the core content of a school program at a natural rate, rather than being restricted by artificially imposed steps of progression.

Now let us discuss what happens when extremely talented children go to such schools. You might think that gifted children in these schools are given much more creative freedom than at “normal” schools, but that idea is sadly mistaken. Yes, in such schools, as a rule, there is more choice from a bigger range of subjects and better facilities. But when it comes to creative freedom, it is still in short supply. Educational strategy in special schools still follows the same old course of action: “stop asking questions, learn the program and answer questions.” The main difference between “normal” and “gifted” children schools is that the program for gifted students is often much fuller, as demanded by the strategy of accelerated learning. Besides, talented children are sometimes taken to educational institutions earlier than normal kids. So the undesirable change of learning strategy from a child’s natural curiosity to the structured “answer the question” strategy takes place at an even earlier age. This can be potentially disastrous for the creative development of a talented child, particularly if a child is naturally placid and non-rebellious, and cordially tries to please parents and teachers.

Sadly, in many contemporary educational institutions, students are viewed as computers with various memory storage capacities. The natural gift of talented students is utilised for acquiring and storing a much larger amount of information. So, for example, if in typical school children learn one foreign language, in schools for gifted children they might learn two or three. All programs are inflated to the limits in every subject. So the gifted students, who possibly had plenty of free time in ordinary school for their independent intellectual development, suddenly find themselves pushed to their limits by the inflated school curricula. Students have to use every minute of their time for learning the school program. This does not reflect well on the emotional state, educational progress, and personality of gifted students. On the contrary, from creative children, they often become the high achieving if frustrated and anxious adults.

I remember an extremely bright girl from Melbourne who was one of the most talented, successful, and happiest students I have ever seen while she was in an “ordinary” school. After going to a school for specially gifted children (and she was definitely extremely gifted, no question about that), she gradually changed. She started complaining that she did not have time to do things she always loved to do outside the school curriculum, for example, reading books, going on the internet, playing the guitar, or just socializing. A smile gradually disappeared from her lovely face and it is hard to say whether the success in her later life will be a worthy compensation for the lost feeling of natural happiness.

It is likely to assume that such gifted students at special schools do not have much time left to freely develop their intelligence and to be independent creative thinkers. It is particularly tragic if the desire to have a child in a school of gifted children comes from the parents, not from the student. Some parents prefer their children’s formal success to their happiness and fulfillment from life. And most of the gifted children, wishing to gain the approval of their parents and teachers, follow the lead. These students are from the category one, so-called “successful” gifted students, who might later disappoint their parents and teachers with their successful if quite an ordinary adult life.

“The mind is not a vessel to be filled, but a fire to be kindled.” Plutarch said these immortal words some 25 centuries ago. Malcolm S. Forbes, the publisher of *Forbes* magazine, agrees: *“Education’s purpose is to replace an empty mind with an open one.”* This idea would find plenty of supporters among educators and parents, but it is the opposite of what we are doing at our schools, including our schools for gifted children. We mostly use their minds exactly as vessels of various capacity and we are filling them as fast as we can.

Unlike computers with a huge memory, the most valuable part of every child is her/his creative thinking, the ability to see things in their own unique way. Above all, we should treasure a student’s emotional life.

The more talented a child, the more free time he or she should have—that is, free from school curricula.

An important note: We should not forget that gifted students can be very different from one other. I suggest dividing students with extraordinary intellectual capacities roughly into two categories: (1) students who need external stimulation and challenge in order to stay alert and interested, and (2) students who are happy to be left alone, as they are constantly motivated to follow their

own interests. We can call the first category of students “prodigious learners,” and the second category “autonomous learners.” Both are extremely gifted and can be extremely successful at school, but still, there is a big difference between them.

The first category of gifted students might be eager to go to the most prestigious schools and institutions where their gifts will allow them to learn an exceptional amount of information and shine among peers. These students might be moved by their ambition more than their love for the subject of study; they often try to get the highest marks in every subject. If this is the case, despite my critical view of the policy of exploiting children's memory, I would suggest giving such students a chance to go to the special school with overloaded programs. Ambition can be a driving force that is as purposeful and passionate as any other life-long human passion or desire. We need to remember that the first category of gifted students might become bored if they do not have enough challenge to keep their intellectual capacities up and running. There is an internal cognitive conflict in this category of students: their ability to learn is higher than their motivation to learn. Schools with extremely busy curricula will most likely be beneficial for such students. If such students are left at ordinary schools, they might gradually abandon learning (as “too easy” and “not challenging”) and might get into some unwanted activities (from using various substances to save them from boredom to criminal activities to get some excitement).

The second category of gifted students, “autonomous learners,” as a rule consists of avid readers, who can keep busy and interested without any external pressure. They are happy to use their free time for various activities, are highly motivated, and do not seem to be bored with extra free time. They actually do not seem to have any free time! They often have their favorite subjects at school and might neglect some other subjects. If you happen to know such a child, allow her or him some independence in their development. Do not take such children to special schools. Try instead to provide them with more books; take them to the libraries, bookshops, and various scholarly exhibitions. Also, if you can afford, allow them to see different countries and meet new people from various cultures. For such a self-developing or an “autonomous learner” student, going to a special school with overloaded programs might become a major source of discomfort and anxiety.

Magic and Failure of the Best Tertiary Institutions

I remember a conversation from 1981, when I was a postgraduate student finishing my first Ph.D. I was at the Moscow Conservatory and was talking to a young bright Russian student, a musicologist, the head of the Student Research Council there. Moscow Conservatory was the top musical institution in the former Soviet Union, and only the best of the best of the largest country of the world could dream to be accepted to study there. So what was the head of the student research body of such an exquisite organization telling me? To my total surprise at the time, she was complaining that musicologists from Moscow Conservatory had a very bad record in national competitions where students were sending their original scholarly essays. She could not understand why the students of other not-so distinguished conservatories were consistently receiving awards, while students of the leading institution were not among the winners. Can you guess what the reason was?

Yes, most likely you are right: Moscow Conservatory was (and probably still is) treating their gifted students as super-computers with extremely large memory space. As a result, they were putting much more information into the students' heads than any other similar institutions in the USSR, leaving almost no space and time for creative thinking. Writing good-quality scholarly essays needs primarily independent thinking and a free, innovative, creative approach.

In this section, we are discussing schools for gifted students, this time for tertiary education. If you think of prestigious tertiary schools, Harvard University is one of the first to spring to mind. Harvard has become a symbol of educational and scholarly achievement in the contemporary world. It consistently holds the coveted first spot in the world ranking of universities and, not surprisingly, there is an obsession among the most ambitious students (and parents) to have their children educated at Harvard. And of course, students would expect to have much more demands at Harvard than at any other "ordinary" universities. Only the best and the most ambitious of gifted students, most of them probably from the category of "successful" gifted students, will have the opportunity to eventually write in their CV that they were educated at Harvard. Pressure for the students there is understandably very high. And there is a price for this. Did you know, for example, that the rate of student suicide at Harvard is about double than at any other university (Hatoff, 2012)? There are other more negative results as well, although not as tragic. Despite the dazzling array

of achievements as the world's top university, Harvard graduates are not that spectacularly successful in their later lives. If you check the list of Harvard graduates and alumni, you will find out that Harvard is very highly rated because some of the best scholars and teachers are invited to work there, and also because a large number of brilliant students completed their Ph.D. here. Most such scholars were educated as undergraduates at different, more "ordinary" universities in the first place. Of course, Harvard graduates are brilliantly represented in the world of politics, but the undergraduate students did not make the great impact in science as you would expect.

Consider the arguably most difficult math teaching program, the famous "Math 55" course. Of course, the course is from Harvard. Attending this year-long course is so difficult that only about half of the most talented and dedicated of the initial group can complete it. And how are those who successfully managed to complete this legendary course represented among the world's best scholars? As great inventors? An astounding number of Nobel Prize winners? Well, not exactly. To be sure, they know math brilliantly, no question about that, but as new thinking and new discoveries go, they are not as prominent as you might expect. Apart from very few distinguished professors that you can count on one hand, no other major scholars came out of this famed Harvard course. How many Nobel Prize winners? None. Very tellingly, the two most famous students from this course are Bill Gates and Richard Stallman, two computer geniuses who both dropped out of Harvard.

To be a brilliant student does not mean to excel equally in your later life. Just as the most effective political dissidents rarely make good political leaders, the best students do not necessarily make visionary scholars or successful businessmen. Remember the words of Harvard dropout Bill Gates: *"I failed in some subjects in exam, but my friend passed in all. Now he is an engineer at Microsoft and I am the owner of Microsoft."* Scholars of the future might remember that the credentials of the best tertiary institutions do not guarantee that a science student will have stellar scholarly achievements. The name of a famous university is definitely helpful when you are searching for a job, but no university's reputation can make you a great scholar. Be obsessed with the subject of your study, not by the name and reputation of the best university. Remember, no university is able to give you a better education than your own obsession and a constant search for the existing literature and your own crude experiments. It is

your obsession with the subject of your study that will get you the best possible education.

Instead of being proud of your university, try to make your university proud of you.

Do We Need a New Educational Strategy?

If readers have been following my argument, they probably can guess at least some of my conclusions about the existing system of education:

(1) A child's brain is a powerful self-developing system, and early and heavy-handed intervention in natural intellectual development is highly undesirable;

(2) Children, and particularly gifted self-motivated children, need to have space and time to follow their internal interests independently.

(3) By stopping children from asking questions, our existing system of education goes against the most natural way of the development of human intelligence; I believe there will be a time when mainstream educational policy will be assessed as a "crime against nature."

(4) Starting school at an early age is not beneficial for young children, as the current system of school education interrupts their natural intellectual development;

(5) The most prestigious schools use the greater learning ability of their students' primarily as hard drives of an extraordinary capacity to store a vast amount of information;

(6) If we want to raise independent and creative thinkers from gifted children, particularly from the "autonomous learners," we should give them more independence, and allow them to have a hand in their own education.

These conclusions bring us to a perennial question about the need for a new and better educational strategy.

Jean Jacques Rousseau criticized the educational system during his lifetime with the following words:

"I will say little of the importance of a good education; nor will I stop to prove that the current one is bad. Countless others have done so before me, and I do not like to fill a book with things everybody knows. I will note that for the longest time there has been nothing but a cry against

the established practice without anyone taking it upon himself to propose a better one."

Rousseau himself gave the foundations of a new system of education that was later labelled as "free education." His ideas were used as a basis for several contemporary educational systems, including the Montessori and Steiner (Waldorf) systems, probably the two best known alternative systems in the Western World today.

The author of this book has no ambition to propose a new educational system. But I wish to propose a small, although probably a potentially important detail to be used for a new approach to children's intellectual development. This detail can be utilized more or less in various educational systems, including mainstream as well as alternative methods.

What exactly I am talking about?

In my 2006 book, I proposed a new Latin motto to define the human intelligence: "Interrogo ergo Cogito" (translation: "I ask questions, therefore I think"). We already discussed that we are humans because we ask questions. This is the reason children of all cultures and races start their intellectual development by asking questions. And then, as we have already seen, during the most active period of their development of intelligence, children go to school, and suddenly are restrained in their urge to ask questions. Instead, they are trained for the next ten to fifteen years how to answer questions. This is a tragic coercion of our brain and the sooner we realize this, the better. So why don't we try to change that? What I am proposing is to change our current educational strategy to a more natural and evolutionarily more justified one, based on encouraging young students to ask questions.

Instead of restraining children to ask questions, we should encourage them to do so, in different ways and by different strategies. And I suggest using this educational tool throughout most of the primary, secondary, and tertiary educational institutions.

How can this be realized? In a paper dedicated to the subject and delivered at an educational congress in Delhi in January of 2011, I proposed a list of various techniques and strategies of how we can encourage students to ask questions at different educational levels. If anyone is interested in more practical, nuts-n-bolts suggestions, they can see my paper "Should we teach children how to answer questions or how to ask questions: Towards the New Educational Strategy" (Jordania, 2011a). I propose there must be some quality time during

the educational process, including special classes, fun games, tests, and strategies that will encourage students to continue asking questions. I believe these classes, games, and tests will make educational processes more creative, more open to new suggestions, more interesting, more educational, more engaging, and more fun both for students and teachers.

Education from Different Points of the View: Teachers and Students

We can look at the educational process from two different points of view: how teachers see it, and how students see it. There can be enormous differences between these two perspectives. How can we recognize a good teacher? Are the weighty formal qualifications, like M.Ed or even Ph.D. in education, enough to consider their owners good teachers? I remember from my school period in the former Soviet Union that some teachers were considered very knowledgeable in the subjects they were teaching, although for some reason students had big problems gaining knowledge with these expert teachers. Good knowledge is a basic requirement for a teacher, but it alone does not guarantee that a teacher will be a good teacher. Communication of the knowledge and the ability to inspire students, to fire up their emotions and imagination, are possibly even more important than expert knowledge. From the student's point of view, the most important features of a good teacher are exactly these: the ability to communicate complex ideas easily and to inspire students.

On the other hand, how can we recognize a good student? From the perspective of the majority of teachers, this is a student who is focused and diligent during his or her studies, who follows the teacher's instructions and prepares homework in time. On the other hand, some of the smartest students are sometimes unfocused, are in a world of their own, and, with their questions and desire to do things their own way, maybe distracting for the teacher and the planned lesson.

It is difficult to answer directly which perspective is more important for a healthy educational process: a student's desire to have teachers who can inspire, or a teacher's wish to have focused and diligent student who follow their instructions.

Readers might guess that with my recognition of the importance of child's natural curiosity and desire to learn, for me the key factor should be the stu-

dent perspective in the educational process. I am definitely not alone in my preferences. *"Education does not start in teachers' words. It starts in students' heads"* correctly remarked Ignacio Estrada, director for grants administration at the Gordon and Betty Moore Foundation. Another of Ignacio's sayings is more precise: *"If a child can't learn the way we teach, maybe we should teach the way they learn."* Simply brilliant. Mark van Doren, American poet and writer, points to the role of teachers in supporting, not dictating the learning process: *"The art of teaching is the art of assisting discovery."* Patricia Neal, American actress, delicately puts the differences between the master and the teacher: *"A master can tell you what he expects of you. A teacher, though, awakens your own expectations."* William Arthur Ward, American writer, made a useful categorization: *"The mediocre teacher tells. The good teacher explains. The superior teacher demonstrates. The great teacher inspires."* Human qualities of teachers are crucial in the subtle process called education.

For me, the best quality of a teacher is to inspire students in their thirst for knowledge. At least, a teacher should not become a rigid obstacle for already inspired students, who need more intellectual freedom for their education. It is exactly these students who have the potential to become visionary scholars.

A Few Words about Maria Montessori

For those who are aware of various existing educational strategies, it is easy to notice that my educational views come closest to the educational system proposed by Italian physician and educator Maria Montessori. What Montessori came to realise was that children who were placed in an environment where activities were designed to support their natural development had the power to educate themselves. Montessori put many different activities and materials into the children's environment but kept only those that engaged them. She was later to refer to this as auto-education. In 1914 she wrote, *"I did not invent a method of education, I simply gave some little children a chance to live."* Self-development is the key to the Montessori system. As any true pioneer, Montessori was heavily criticised by some mainstream educators, among them by an influential educator from the USA, William Heard Kilpatrick. It might be interesting to have a look at the Montessori system through the lens of her most ardent critic. It is fair to say Kilpatrick himself was very impressed by the bravery of the Montessori revolutionary novelties. *"Few in the history of educa-*

tion have been capable of breaking so completely with the surrounding school tradition as has this Italian physician," he wrote in his 1914 critical essay. (This is probably true even after more than 100 years that lapsed after 1914, as the Montessori method still remains revolutionary.) For example, Montessori stressed the reliance of self-education, seeing a teacher as a facilitator, not a "teacher" in the traditional meaning of the word. According to the Montessori method, lessons lasted much longer (usually about three hours, instead of the traditional 45 minutes), and children were free to have a rest at any moment if they wanted to. In order to criticise Montessori's new ideas, Kilpatrick brought the historical past of humankind as a positive model, and made a case for the continuation of the same existing system of education and other humane activities:

"This is as true of clothing, shelter, methods of procuring and preparing food, of art and literature, as it is of ethical concepts and legal procedure."

"The 'funded capital of civilization' consists exactly of all the devices thus far contrived for the fullest expression of what we are, for our fullest possible development. Education is thus, in truth, the completest possible development of the individual."

Readers should remember that William Heard Kilpatrick himself was a quite progressive educator. His educational method was rejecting such hallmarks of traditional education at the time as rote learning, strictly organized classroom space with the desks in rows with students always seated at the desks, and typical forms of assessment. And still, Montessori novelties were a bit too much even for him. *"The child is a body which grows and a soul which develops,"* wrote Montessori. *"We must neither mar nor stifle the mysterious powers which lie within these two forms of growth, but must await from them the manifestations which we know will succeed one another."* And she said: *"We cannot know the consequences of suffocating a spontaneous action at the time when the child is just beginning to be active: perhaps we suffocate life itself. Humanity shows itself in all its intellectual splendour during this tender age... and we must respect religiously, reverently, these first indications of individuality...If any educational act is to be efficacious, it will be only that which tends to help toward the complete unfolding of this life. To be thus helpful it is necessary rigorously to avoid the arrest of spontaneous movements...The school must permit the free, natural manifestations of the child if in the school scientific pedagogy is to be*

born...The aim is to accord to the child's 'complete liberty' ... discipline must come through liberty."

By the way, discipline for Montessori meant self-control: *"We call an individual disciplined when he is master of himself."* Kilpatrick was not impressed: *"It has always been known that following one's own sweet will does not of necessity bring either the most of knowledge or the best of conduct. It is, indeed, the insistent obtrusion of this easily observed fact that has led parents and teachers in all times to set such severe limitations upon the free expression of the child's spontaneous impulses"* (pg. 19-20). One of the central points of criticism of the Montessori system was the role of play in childhood education. According to Kilpatrick,

"happy childhood knows no stronger or more fruitful impulse than imaginative and constructive play, still, in these [Montessori]schools playing with the didactic apparatus is strictly forbidden, and usually no other play-material is furnished. Madam Montessori has, in fact, been publicly quoted as saying, 'If I were persuaded that children needed to play, I would provide the proper apparatus; but I am not so persuaded.'"

It is true that the Montessori method puts emphasis on skills for real life, not fantasy and imagination. Montessori came to this conclusion after she noticed that children would prefer to do things "for real" if there were a choice between pretend-play and interacting with reality. In contrast, the Steiner method, established later, is based primarily on a development of children's fantasy and creativity via playing over all other elements. The conclusion of Kilpatrick's article is strict and quite conservative:

"It is evident from the foregoing that, after all has been said, the Montessori curriculum affords very inadequate expression to a large portion of child nature. Such a limitation of opportunity is, in effect, nothing less than repression, a repression destructive alike of happiness and mental growth. From every consideration, the proposed curriculum proves inadequate and unduly restrictive."

Kilpatrick's critique had quite a lasting impression on American educators, and for a few decades negatively affected the dissemination of the Montessori method in the USA. However, from the second half of the 1940s Montessori made a strong comeback in the USA and has since become an important part of American educational system. According to NAMTA (North American Montessori Teacher's Association) currently, there are about 4500 Montessori schools

in the USA and about 20 000 in the world. To compare the Montessori system with arguably the second best known alternative educational system, Steiner (Waldorf) system, according to the Alliance of Public Waldorf Education, at the time of writing (beginning of 2018) currently there are about 200 Steiner schools in the USA and more than 1000 in the world.

The freedom of expression and self-reliance fostered by the Montessori system might not gain approval from every culture and every parent. Some parents believe their child needs more restrictive schooling and more structured education than the free Montessori method, but the fact that some of the highest placed and caring parents choose Montessori system for their children (like Princess Diana and Charles for their boys, or Hillary and Bill Clinton for their daughter), tells us that the acceptance of this once revolutionary method has gone a long way. I would add here that when it comes to educating young restless spirits who are fascinated and motivated strongly by the world around them, the ones who one day might become scholars and inventors, the Montessori system seems to be the best suited for the free creative development of their intellectual capacities.

Education and Changing Generations

Despite the frequent disapproval of the old for the new generation, their norms, behaviours and tastes, we need to accept as a scientific fact that every new generation is generally more prepared, faster thinking, more open to changes, and more progressive than its predecessor. The belief that “in our times children were better, education was better, and life was better” is fundamentally flawed.

Glorifying the time “when we were young” is a general human tendency, but in education and scholarship, this sentiment is particularly dangerous. Every professor should remember that most likely there are students in his or her class who are cleverer than their professor. Students, on the other hand, should know that they are expected to do better than did the generation of their teachers. They also should be prepared for the eventuality that they will themselves be representing a senior generation of professors and scholars, and there will be a younger generation of students that will be better prepared, faster thinking, more open to changes, and more progressive than they. Univer-

sity professors and senior officials sometimes forget that universities exist primarily for students, not for professors.

Another significant problem of education is that academic scholarship is often forced upon university lecturers and professors. As with any forced endeavour, this does not always bring positive results. It is not revolutionary to state that great scholars do not necessarily make great teachers and professors. (Albert Einstein is a prime example.) On the other hand, some of the most engaging and inspirational teachers might not have talent and passion for scholarly research and will be better off left free from the demands of contributing to new scholarly publications. Basically, these two spheres (education and scholarly research) are much farther from each other than many believe. People with the passion for education are by their nature more extraverts, and born scholars tend to be more introverted. So, a person with a passion for both education and research is more of an exception than the rule.

When estimating the potential of their students, it is worthwhile for professors to remember that easy-to-work-with students rarely make visionary scholars. Good and comfortable students make good followers of the existing schools of thought. They rarely have their own new ideas, and rarely challenge existing paradigms. Let us remember, only those who do not blindly follow existing traditions and schools have a chance to start a new tradition or a new school of thought. Comfortable and easy-to-work-with students are often ready to compromise their scholarly integrity to the demands of peers and teachers in order to avoid confrontations. Such students might have good analytical thinking but are sometimes too shy and scared to receive criticism for their ideas, or social ostracism from their colleagues. I would suggest that such students to follow their heart and trust their own instinct if they believe their idea to be better than the existing one. At the same time, they need to remember that challenging the existing paradigm is a tough road. Scholars who follow this path jeopardise their opportunities of getting tenured positions or publishing in peer-reviewed journals. This is particularly tough as the existing system of education favours easy-to-work-with students and easy-to-govern teachers who readily follow the lead and are happy to look in the direction where their heads are turned. Even the highest learning in education and scholarship, the doctorate, is basically a test of obedience. The reason so many talented students drop out from the Ph.D. is that it is too square and unimaginative for them.

Uncomfortable (but not bad) students have a much better chance of becoming visionary scholars. There might be several different reasons for students being uncomfortable, and these different reasons lead to different outcomes. Some students are too independent in their work and try to steer in totally new directions; some irritate professors by not trusting their words, checking everything and finding gaps; sometimes such students generate too many uncomfortable questions; some have too many ideas or have too lofty ambitions; some are too unfocused and easily get into other, seemingly unconnected spheres; and some are too uncompromising to accept any criticism of their ideas. In this colourful list of reasons for being uncomfortable students, their human qualities often become a crucial factor. We will be discussing the importance of character and the scholar's emotional life in the second chapter of this book.

Heritage, Baggage, or Both? Education as a Mirror of Our Cultural Prejudices

Some of the problems of the existing educational strategy are connected to a more complex web of problems involving the evolution of *Homo sapiens* and the origins of human culture. This is a huge sphere, and I am going only to scratch its surface.

We can probably agree that *Education is a mirror of a Culture* (Tagliacozzo, 1962). But what is culture? To slightly paraphrase the well-known words, culture is a set of rules, beliefs, and unavoidable prejudices presented to new generations as true facts of life that they are expected to follow. Most of the representatives of the cultures of the world take these rules at a face value, without question. They follow them as much as they can until their death and teach the next generation the same values and behavioural norms. People give various explanations for their cultural practices, ranging from mythical and religious to scholarly beliefs. And if you think that scholars are truly objective and open-minded thinkers, free from existing prejudices, you are sadly mistaken. Even in our seemingly enlightened 21st-century, scholars are tremendously affected by existing cultural and ideological norms of a society. By the way, don't forget, the word "culture" comes from the word "cult".

Scholars often work hard to justify existing cultural and moral norms by providing "objective" scholarly evidence to existing cultural prejudices. It is in-

credible to see how the representatives of evolutionary psychology try to provide evolutionary roots to all of our current cultural norms and social prejudices, proclaiming that for millions of years we have been a monogamous species, that all men by their nature are jealous of all other men, or that we want to raise only our own children and care only about our kin. We will discuss some of such axiomatic cultural prejudices in the last chapter of this book.

And what can we say about education and existing cultural prejudices? We cannot really have the good education we strive to achieve unless we examine and discard our existing prejudices. Such a process is long, often painful and sometimes dangerous process. Such a venture is particularly difficult, not because it is difficult to prove them scientifically wrong, but primarily because they have such an enduring hold on our values and living standards.

Cultural prejudices are regarded as cultural axioms. It has been this way throughout human history, although the various cultural norms vastly change over time. Chinese sources of the 9th century describe barbaric tribes that lived north from their territory. According to Chinese historical writings, among the most barbaric cultural practices of these tribes was that they wore the left side of their clothes on top of the right side, not the reverse, as was accepted in Imperial China (Levin & Cheboksarev, 1951). People of today might laugh, but if someone says that their current cultural norms and beliefs will cause laughter in readers of future generations, they will probably be puzzled.

We Are Not Animals! Or Are We?

Now let us briefly discuss a possible origin for the contradictions that lie at the heart of humanity's conflict with its own cultural norms. Nino Tsitsishvili (in press) has proposed a potentially ground-breaking idea that the origin of human culture might have come from the desire of our early ancestors *to distance themselves from the animal world*.

According to Tsitsishvili (in press) "we are not animals" was very likely the central sentiment of human cultural practices in our evolutionary past. Defying our animal roots is still very common and strong among our fellow humans and may have been the overriding force in the creation of cultural norms and restrictions. This crusade against our natural animal instincts contributed many of our current cultural taboos and behavioural norms we take for granted.

As a result, we are in a unique situation. All animals, as we know, behave naturally; therefore, a major part of the initial human culture was firmly based on taboos and bans *against our own natural (“animal”) instincts and behaviours*. Establishing unnatural norms of behaviour was only one part of our initial cultural heritage. Apart from creating these newly established taboos, the set of newly established beliefs that justify these unnatural behaviours was needed and was readily provided. These two elements (tabooing our animal behaviours and rationalizing these taboos) became the overriding force for human culture, mythology, religion and later science. Like some politicians and political parties who do not behave according to their own inner beliefs and agenda, our ancestors started using the model of animal behavior as a negative model that was to be rejected as “animal,” “savage,” and “uncultured.”

This rejection of our “natural” or “animal” desires probably reached its pinnacle at the height of religious dogmas during the infamous medieval “dark ages.” This was the time when to be a good human meant to reject all earthly pleasures, a time when all expression of human sensuality was condemned and when the highest moral authority was ascribed to monks who were living alone, far from society, without any earthly social ties or any other life pleasures. In the relatively enlightened 19th century, when Charles Darwin proposed that humans originated from the animal world, this was the biggest shock to human pride and beliefs. Even today, many of our fellow humans find it difficult to accept that in our origins and instincts, we have such close links to animals. One of the perennially attractive features of the “Intelligent Design” hypothesis for many fellow humans is the profound separation of humans from animals.

Neglecting our emotions and biologically essential pleasures, in fact going against them, became the hallmark of human culture. Freud was correct when he declared human civilization and culture to be a set of restrictions and limitations. It is another interesting topic how the general desire to be different from animals has been manifested in various cultures. The initial desire to be different from animals later changed into the desire to be different from the representatives of other cultures. The sheer variety of their cultural norms is often used by the carriers of various cultures to demonstrate their uniqueness and their difference from a rival culture. The initial rivalry with the animal kingdom from our long evolutionary past left a long-lasting impact, and for many cultures and many languages the worst descriptions of “other” human culture is that they are like “animals.”

Having an impenetrable wall between humans and animals became one of the hallmarks of human cultures from its outset, and if animals as a rule behave according to their natural desires and long-formed instincts, it became an overriding force in humans to behave against their natural desires. As Talleyrand said, if we use human language to hide our true feelings, we can say that we use culture to cover our true nature and desires.

We, humans, went so far in asserting our uniqueness in the world of the inhabitants of our planet that we seriously try to present the animal world as completely devoid of basic feelings. God forbid if someone ascribes feelings of love, or loyalty, or betrayal, or remorse, or empathy, and so on, to animals. In the world of professionals who study animal behavior, such a tendency is known as “anthropomorphism” and is to be avoided like the plague. This is a grave fallacy, and from this fallacy, our understanding of the animal inner world suffers greatly. Yes, we may not understand animal feelings as they feel them, but to consider them devoid such feelings is a fallacy that will make our descendants view our scholarly beliefs as ridiculous as we view today the attitudes of our recent forebears towards slavery, women’s rights, homosexuality just a few decades ago.

Almost 150 years ago, the great naturalist and human, Charles Darwin warned us against human blindness and claims of human superiority. Listen to some of his expressions on this topic from his 1871 book *Descent of Man*:

“My object in this chapter is solely to shew that there is no fundamental difference between man and the higher mammals in their mental faculties” (Vol 1:35)...

“The love of a dog for his master is notorious; in the agony of death he has been known to caress his master, and everyone has heard of the dog suffering under vivisection, who licked the hand of the operator; this man, unless he had a heart of stone, must have felt remorse to the last hour of his life” (Vol 1:40)“

“All animals feel wonder, and many exhibit curiosity. They sometimes suffer from this latter quality, as when the hunter plays antics and thus attracts them” (Vol 1:42).

On the contrary, in “serious” science, the use of anthropomorphic language that suggests animals have intentions and emotions has been severely criticized as indicating a lack of objectivity. Despite the fact that no biologist will deny today our relationship with the animal world, most of them avoid mentioning

that animals might share any of the same mental or emotional capacities of humans. This strict rejection of emotions and feelings among animals has a long history and is clearly indicated in the works of T.H. Huxley, who could see the emergence of morality in humans only via combating the effects of natural selection. The father of classical conditioning, Ivan Pavlov, also preferred to study animal behavior without any reference to the emotional behind a behavior. *The Oxford Companion to Animal Behavior* (1987) directly warns experts that "one is well advised to study the behavior rather than attempting to get at any underlying emotion." Despite the impact of the ideas of Charles Darwin in *The Expression of the Emotions in Man and Animals* ethology has generally focused on behavior, not on emotions. In the last few decades, some of the new voices in the field of animal behavior have granted emotions to animals. Such scholars (Jane Goodall studying chimpanzees, Dian Fossey studying gorillas, Biruté Galdikas studying orangutans), as a rule, were severely criticized because of their anthropomorphism. The biggest proponent of behavioral congruity between animals and humans is arguably Frans de Waal, who directly said: "To endow animals with human emotions has long been a scientific taboo. But if we do not, we risk missing something fundamental, about both animals and us" (1997:50).

Alongside these welcome approaches has come increasing awareness of the linguistic abilities of the great apes and the recognition that they are tool-makers and possess individuality and culture. Yet there is still a long way to go to comprehend that, after all, Charles Darwin was correct.

The 21st century seems like a pinnacle of progress in every aspect of human activity, but this feeling of achievement is deceptive, and this false euphoria will vanish with the advance of the next century. We should never forget that the same grand pride in the achievement of humanity was true in each of the previous centuries.

Our scholarly knowledge is an important part of our cultural heritage and the existing norms of society. It is handed down to us as a part of our intellectual heritage and most of us keep it intact until we die. "*It is impossible for a man to learn what he thinks he already knows,*" once said the Greek philosopher Epictetus, a well-respected name in United States military. No wonder old paradigms usually die when their carriers die (Kuhn, 1962). With the existing system of mainstream education, the old paradigms of behavioural norms live much longer.

We are an animal species that, in order to be special, claims we are totally different from the rest of the animal world. Working out a life strategy from a negative example has never been a fruitful strategy. The tragic side of this political manoeuvre is that we are forging our new identity at the expense of neglecting our most fundamental inner feelings and desires. It is because of our cultural and ideological heritage that we are in a constant struggle with our true inner self.

So, let us ask ourselves a very difficult question:

What Was our Primordial, Animal, True Inner Self?

First of all, let us check what we mean when we say “animal” and how accurate this word is. The term has a heavy negative heritage emanating from our language and our humano-centric cultural and religious views and beliefs. For most human societies, the adjective “animal” means cruel, badly behaving, violent, savage, and unsympathetic. On the contrary, the adjective “humane” means kind, gentle, cultured, and sympathetic. There is hardly a worse epithet for any human than to be called an “animal.” “They behave like animals,” or “they treated me like an animal” tell us the story of the worst possible behavior and treatment.

If the reader of this book is an animal-loving and critically-thinking human, she/he will probably agree that we, as a species, consider ourselves as the best behaving, the kindest, the most sympathetic species. But in reality, we outrun virtually any animal species with our aggressiveness towards other species and even towards each other.

Think of these facts:

- No animal species has caused the disappearance of so many species in the history of the world as humans.
- About a dozen human lives are lost to sharks every year. On the other hand, we kill and eat about 150,000,000 (one hundred and fifty million!) sharks every year. And we call sharks man-eaters.
- None of the animal species kill each other en masse, in order to achieve genocide. We, humans, are the only species to do so.

So, both for others and for our own species, we are the most aggressive and violent. And we still label the worst of our own behavior as “animal” behavior and the best of behavior as “humane” behaviour. Martin H. Fischer, German-

American physician and author was probably correct in declaring, *"We humans are the greatest of earth's parasites."* The great naturalist and humanist Jim Corbett wrote a moving story labeled the "The Law of the Jungle" as a response to claims made by Second World War newspapers that their foes, Germans, were behaving according to the law of the jungle. Corbett gave moving examples to prove that the law of the jungle is much kinder and less aggressive than that of human behavior during conflicts.

With regard to Nazi Germany and its appalling behavior, it might be good to ask our readers how they would behave if they were citizens of Nazi Germany in the 1930s and the early 1940s. Would we support the aggressive policy filled with hatred towards other races and "different" human beings, or realize the ugly nature of the state (OUR state) policy? Now let me draw a parallel: we, as members of the human species, behave at least as aggressively towards other animal species as Nazi Germany did towards other nations and races. So let me ask a rhetorical question: is it possible to close our eyes to the fast depletion of life on our planet living resources as a result of our own activities?

Our view of ourselves is so human-centric that even some of the kindest humans among us, even those who stopped eating animal products out of sympathy, still take for granted our human superiority over the animal world.

I do not mention these facts simply to show my sympathies towards animals. I want to show how appalling are the results of combining our deep-seated desire to be different from animals with our blind pride towards our own technical achievements and dominance over the whole living planet. We suffer from a superiority complex, and the sooner we realize this, the better.

It is fascinating to watch how similar are the strategies used by humans of higher political/financial/celebrity background to assert their status and to distance themselves from the ordinary layers of society. They occupy the next level of the same culturally constructed, unnatural rules of behaviours, displaying the dress codes, musical tastes, etiquette at the dinner table (with a greater number and kinds of dining utensils), "refined" language, accepted topics of conversations and accepted norms of expressing emotions.

One's culture is the central element of human identity, and there is always a dichotomy of "us and them" when it comes to cultural identity. Indeed, we have multi-layered cultural identities. On a basic level, we are all humans (never forgetting, of course, that we still are different from animals!), but at the

same time, we feel like representatives of our religions, our countries, our neighborhoods, our age groups, or our social classes.

It is interesting to have a quick look at the list of our differences from animals, and at the same time, to see the differences we created between the layers within the seemingly monolithic cultures:

- Animals do not use clothes, but we cover at least some parts of our body. Humans with higher social/financial status go further and use much more expensive and custom-made clothing. Some items of a wealthy Western citizen's wardrobe are worth more than an annual income of a whole village from another part of the world;
- Animals do not use transport, but we do. At first we used other animal species for transportation (horses, donkeys, camels, elephants, and so forth) and also used other humans (slaves). Next we utilized animal-drawn carts and chariots, and finally put technology at our service to move through land, water, and space. At the same time, we always had certain differences in the means of transportation within societies. Today higher society representatives almost never use public transport. Having more extravagant transport items (like a yacht or private jet) is a way to distinguish them from the rest of the population.
- Animals do not cook their food, we do. Humans with higher social/financial status go further and use the help of personal chefs with the ever-increasing complexity of their food menu with exotic ingredients.
- Animals obtain their food from nature; we grow our food and breed domestic animals (formerly prey) for food. People with higher social/financial status have more options and more advice from health professionals and various food-growing companies.
- Animals eat their food without utensils; we use them. Humans with higher social/financial status go further and often use many more utensils than are needed, particularly on ritual occasions when they assert their high social status and the knowledge of etiquette over the rest of the population.
- Animals never know and never pay attention to their dates of births and death. They live in the moment, following their natural instincts, protecting and caring for their offspring, and fighting predators and enemies. We, as a rule, cherish our date of birth and want to be remem-

bered after our death. The birthdays of the most important human subjects are often celebrated by entire countries through centuries.

- When we find out that animals have a trait that we also have, we feel awkward and try to restrict claims that would suggest that they are “like us.” For example, it is hard to argue against that animals have languages, music, or emotions, but not all of us are ready to accept this;
- For some people, animals do not have language or at least speech; we do. By the way, humans with higher social/financial status use more refined language than humans from lower classes – remember how much pains it took to teach a beautiful young girl the language of high society in “Pygmalion?”
- For some people, animals do not have music, only humans do. Even the great scholar and humanist John Blacking defined music as “humanly organized sound” (so there can be no question about animals having it). Humans with a higher social/financial status listen to more high-status music and go to more expensive concerts, refraining from indulging in widely popular musical genres.
- For such people, animals do not have emotions of love, loyalty, remorse, guilt, only humans do. And again, humans with higher social/financial status go further and claim that they have a higher social sense and better moral values than lower classes. They forget or overlook that acts of murder, treason, blackmail, and other vices are quite usual among royal dynasties or the highest-ranking politicians.
- Early humans’ behavior was probably close to that of other animals and closer to their own natural identity, but at a later stage of developing civilization, with newly imposed restrictions, they changed their attitudes and their rules of the game.
- For example, a number of animal species practice cannibalism. We know that our ancestors and early humans did the same (White, 2001). This was most likely a ritualized act, involving deep respect and love towards the deceased, and was very likely selected by the forces of natural selection as an effective means of predator control (Corbett, 1944; Jordania, 2011, 2014; Also see later in this book). Later, with the advance of civilizations, humans declared cannibalism as the most barbaric behavior, creating an unbridgeable gap between civilized and uncivilized peoples. The implication of this gap is that cannibals are closer

to animals than humans. Some have even claimed that cannibalism among humans is a complete myth (Arens, 1979).

- Or another example: animals may have incestuous relationships. Early humans most likely did the same, at least this was not rare in earlier human civilizations, particularly among the royalty. And not only. For example, more than half of the Egyptian population consisted of incestuous families, including many siblings (Frier & Bagnall, 1994; Shaw, 1992). Later, the rules of the game changed and incest became a horrible taboo, although the extent of the taboo varies enormously from culture to culture;
- Another example? Animals do not need to observe special rituals to create families and procreate. Early humans most likely also had a quite free attitude towards finding sexual partners, and some tribal societies have no wedding rituals, but later, humans created numerous rituals and taboos concerning families. Weddings of royalty, and the rich and famous, usually become the center of the cultural life of a country or even of the entire world.

Because of humans' cultural prejudices towards our animal origins we are deeply biased in our scholarly goals as well. For example, evolutionary psychology is intended to be an objective scholarly field that investigates the evolutionary history of human psychological development, trying to understand the forces that shaped our past, current practices and future developments. Instead, many evolutionary psychologists are often only trying to *find justification* for our current arbitrary cultural customs, social rules, and prejudices, portraying them as the inevitable outcome of our evolutionary past – even in cases when various human groups have wildly different cultural practices.

We have other smaller differences from animals as well, stemming naturally from the differences in our lives. For example, animals run around in order to find food, and usually rest after finding it. We eat food in order to run around, forcing our bodies to work even though after eating a meal all we naturally want is to rest. Or, animals never do any extra physical activities, as getting food and surviving is enough for staying fit. The biggest challenge for many fellow humans (at least from the Western world) is too much food and too little physical activity, so that people have learned to do some physical activities just for the sake of the activity. This list can continue and readers can add other examples here, but my central point, I hope is clear: that in a frantic race to dis-

tance ourselves from animals we distanced ourselves from our inner self as well, and we are suffering from the existing contradiction between our *natural* and our *cultural* identities.

In his widely known essay, “Civilization and its Discontents,” Freud put forth an interesting argument, explaining the existing conflict between the original nature of humankind and the limits that civilization puts on these natural instincts. It seems to me that Freud’s model came out of the widely held belief of contrasting the “cruel and violent animal world” with a “kind and gentle human world.” According to Freud, pre-civilized humans had an insatiable instinctual urge for killing and sexual gratification until civilization constrained these destructive instincts (hence the “discontents” of civilization). Freud does not explain how pre-civilized humans, living in small bands, could survive with these anti-social instincts. Freud’s model is in a stark contrast with what we know today about the social life of our closest relatives – chimpanzees and particularly bonobos. If he had known the bonobo behavior, he might have considered the possibility that pre-civilized humans (and hominids) might have been more peaceful towards each other than we civilized humans are. Not only the examples of chimpanzees and bonobos, but arguably some of the oldest human populations of Africa (like Pygmies and San people) tell us that Freud’s still popular and influential views were far from historical reality.

Let us try to imagine “civilizing” a band of bonobos, and most importantly, putting severe taboos and restrictions on their pan-sexuality, Freud’s favorite subject and arguably one of the central points of difference between human cultures. What do you think would happen to bonobos? It would be natural to expect that such restrictions on their sexual life would lead to an increase of violence in this extremely peaceful species. There is a positive correlation between sexually restrictive societies and the amount of interpersonal and inter-group violence in such societies, as more sexually restrictive societies seem to lead to a higher level of interpersonal violence. So, we should not discount the possibility that humans became more violent after one of the central elements of their social bonding, sexual games and sex, were severely restricted by cultural and religious dogmas. Contemporary Western civilization is gradually heading towards abolishing some of these medieval (and artificial) religious taboos; as a result, humans will be probably gradually getting closer to their original, less violent nature.

Freud was absolutely correct in his observation that civilization basically is a set of restrictions on human desires, but his place in history has assured that he was probably mistaken in viewing these restrictions very narrowly (civilization only leading to a decrease of violence). In reality, when the restrictions on natural human desires (particularly sex) were at their height, the level of violence was probably at its pinnacle as well. It is no wonder this period of human history is known under the symbolic term “Dark Ages.”

Educating Future Scholars

For some professions, people say you must be born to become one. Scholarship is one such profession. It appears that, like musical or athletic proficiency, some individuals are born with an inbuilt and natural passion for the world around them, and this steers them to future scholarly work. Being good with numbers, with physics or chemistry, does not automatically make a person inclined to scientific research. Apart from the capacity to understand these subjects, a person should have, even more, a natural tendency to do things in her/his own way, to search for new ways of solving existing problems. Forcing a person without these characteristics to become interested in scholarly research will be a futile and possibly damaging endeavor. Born scholars are the most avid self-educators, as their thirst for knowledge virtually has no limits. For a strong-willed and passionate student with an interest in science, there is no better educational strategy than self-education.

If a gifted child shows passion for something and is engrossed in natural self-education, putting such a student through vigorous schooling programs, as we described earlier, might lead to disastrous results. In the best-case scenario, the student will abandon formal study and continue with self-education. In a somewhat worse option, the student will try to combine forced education with self-education. In the worst-case scenario, the student will abandon his or her own intuition and follow the well-trod agenda of an established school and its existing paradigms, gradually abandoning the sparkle of creativity.

If you compile a list of great scholars who have greatly contributed to the progress of science, even if they attended university, you will soon find that virtually all of them had a big hand in their own education. We can even surmise that the bigger the scholar, the bigger is her/his contribution to self-education. Some of the greatest scholars and thinkers were even entirely self-

educated. No university can claim they educated Leonardo da Vinci or Charles Darwin or Alfred Wallace.

Biographies of great scholars are full of examples of how future scholars were educating themselves, sometimes even contrary to school requirements. We might remember that Einstein complained that his education was interfering with his learning. We can find ever more examples to add to those cited earlier in the chapter. For example, Sir Walter Scott, the Scottish novelist, proclaimed the importance of self-education when he declared *“All men who have turned out worth anything have had the chief hand in their own education.”* One of the most creative rock musicians of the 20th century, Frank Zappa, was more direct and blunt: *“Drop out of school before your mind rots from exposure to our mundane educational system. Forget about the Senior Prom, go to the library and educate yourself if you’ve got any guts.”* If we look deeper into history, we find similar expressions: *“Natural ability without education has more often raised a man to glory and virtue than education without natural ability,”* these are the words of Cicero, the Roman philosopher. One of the most prolific and most acknowledged educators of the 21st century, Sir Ken Robinson, labeled the current system of education a “death valley” and called for a more creative approach to educating our children (one of his popular talks on the YouTube is titled “How to Escape Education’s Death Valley.” See also Robinson, 2009; 2011).

Remember, if you are interested in reading, have a keen eye, have access to the internet or a library, and most importantly, have a passion for the search, start educating yourself. Even if you have lost plenty of time at a school or university, there is always time left if you follow a true passion.

Making personal contact with a distinguished scholar might give a great boost for such a passionate science student. But you should remember that the name of a distinguished scholar alone does not guarantee a fruitful contact. Some of the most distinguished scholars of the day are extremely conservative thinkers who cannot (and do not wish to) see anything beyond the existing paradigm. But when a distinguished scholar is a non-conservative and wide thinker with a keen eye for new developments, a young student with a passion for science might be transported to heaven by such a contact.

Two Questions from Chinese Students

My pursuit of the spectacularly unique singing tradition in dissonant seconds among Aremai Tibetans and Aba Tibetans took me to China in October-November of 2011. I spent a week in Beijing at a conference and about a week in Chengdu, the world-renowned capital for panda bears. With the help of Chinese friends, Prof. Yang Xiao from Chengdu University, and local expert Mr. Wong, I was lucky to have an opportunity to meet in Chengdu traditional singers from distant villages of Sichuan Province and record their unique style of singing. Apart from this, I presented lectures and attended meetings both in Beijing and Chengdu.

It was after these lectures that a pair of Chinese students asked me two questions that made me think very hard. These two students (one from Beijing and another from Chengdu) were among the best Chinese students I met in China; both were proficient in English (which is still rare in China), with one of them almost winning a national competition in English in subsequent years and continuing his studies in the UK. Possibly the most amazing thing about these two questions was that they were virtually identical. So, what was the actual question I am dedicating a chapter in the book to?

"Tell me, professor," they both asked me, "In schools and colleges, Chinese students are the best in the world. But later, when they finish studies and become scholars, they do not make any big scientific discoveries. Instead, European and American scholars, who were not as good at school as Chinese students, start making most of the big discoveries. Why is this so?"

If you have ever been interested in the educational ranking system of world countries according to mathematics, science and reading tests, you probably know that these two Chinese students were not bragging about the domination of Chinese students in the world of primary and secondary education. China and other East Asian countries boast the greatest achievements in school test scores. They are just as dominant in the PISA reports (Program of International Student Assessment) as The Beatles were in American pop charts in the 1960s. Shanghai (China), Singapore, and Hong Kong are usually the top three spots on the list. Other East Asian countries follow them, only debating the top places among themselves. From other countries, the first appearance of the Western world is Finland, coming in at the fifth place in science and sixth in reading tests.

Wait a minute, a reader might ask, where are the students from the USA, Germany, UK, or France? Well, they are well below the top East Asian countries: the United States ranks number 36, 28, and 24 on the three tests, Germany at 16-12-19, the United Kingdom at 26-20-23, and France at 25-26-21. The home country of arguably the largest number of Nobel Laureates, Israel, can be found at a low and unexpected rank of 41-41-34.

The amazing achievements of Chinese students have created a loud buzz in the world of education, and there is a good reason for this. A number of international researchers suggest that East Asian students from schools have much better literacy and mathematical skills than European and American students because their system of education is simply better (see, for example, Jensen et al., 2012).

Unfortunately, researchers of the PISA lists have never looked at the reasons for the imbalance that these two Chinese students asked me about. And the fact that two students asked the same question indicates that this question is on the mind of many other Chinese students and probably at least some of the patrons of the Chinese system of education. Another fact to ponder is that millions of Chinese parents choose to educate their children in European and American universities, as these universities are much higher in World University Rankings than Chinese universities. The craze for Harvard, which we already mentioned, is truly legendary among Chinese students.

So what did I answer to these two Chinese students? I told them that in my opinion, this misbalance was due to the cultural beliefs and millennia-long student-teacher interaction practices in China and other Confucian cultures. Probably to their shock, I drew their attention to the possibly negative side effect of the Confucian teaching ideology. Confucianism is often credited with the great achievements of the Chinese school education system but let us examine some possible negative implications of the Confucian teaching strategy.

I must apologize beforehand to the fervent supporters of the East Asian educational system. To them, my argument most likely will sound like an outrageous accusation. Despite that, here is my answer to a question from the two Chinese students.

One of the great aspects of the Chinese educational system is that teachers are respected in China more than in any other country. China is possibly the only country in the world where the professions of teacher and doctor have the same level of community respect (although this sadly does not translate to

equal monetary remuneration). I see nothing intrinsically wrong with respecting teachers, of course, and yet – everything is good in moderation. I suspect that *too much* respect for their teachers, in the end, limits Chinese students' creativity and ambition. Let me explain.

For a Chinese student, her or his teacher is almost a god-like figure. According to cultural expectations, a Chinese teacher should have a ready answer to every question from students. A student who tries to challenge or question the teacher would be perceived as arrogant and a social outcast, a threat to the class, educational system, and society at large. We know many tales of how East Asian teachers treat their new students in order to teach them the utmost respect and even blind obedience. This extreme reverence is clearly seen even in the commercial action-packed kung-fu movies from Hong-Kong and Singapore, where the oldest, grey-bearded, and seemingly frail teacher is still the best fighter.

Total respect for teachers and past generations invariably leads to an atmosphere where past experience and the existing order of things become an overriding force in life, education, and science. This is the direct road toward overall mental and intellectual stasis. Sustaining the status quo becomes the most important driving force in many fields of life, and new ideas are viewed as a threat to the social health and well-being of the already balanced community.

As a result, coming up with new ideas is something that is very alien to students in the Chinese educational system. You might not be too surprised about this if you know that the legendary Confucius himself made a similar claim. According to Confucius's own words, he was seeking knowledge in the past, without trying to create any new knowledge himself: *"I am not one who was born in the possession of knowledge; I am one who is fond of antiquity, and earnest in seeking it there" ... "I transmit [knowledge] but I do not create"* (Chan, 1963:18-48). How on earth can we expect, that a Chinese student, educated in Confucian philosophy, will dare to create "new knowledge," if even the great Confucius did not try to do that?

Deep respect and reverence for teachers create another feature of the Chinese educational system that is hard to understand from the Western point of view on education. I am talking about students asking teachers questions. At the start of this chapter I complained that in Western schools we forcibly discourage children's natural urge to ask questions, although this ban is never too literal and absolute. Students can definitely ask questions (mostly at designated

times, with the teacher's permission), and most importantly, students who do ask questions, when encouraged, are usually seen as the most enthusiastic learners. It is very different in Chinese and other Confucian cultures. It is fair to say students are never explicitly banned from asking questions, but doing so is considered to be a negative phenomenon.

According to an article on the Chinese educational system, a question asked by a student at Chinese schools might mean one of the following two things: (1) the student is silly and did not understand what the teacher already explained (and what everybody else understood), or (2) the student is too ambitious and wants to show a teacher in a bad light—that the teacher cannot answer a new question (Starr, 2012). Both of these possible reasons for a Chinese student asking a question in a class are viewed as extremely undesirable behavior. Besides, virtually every Chinese student believes that questions asked by students waste valuable lesson time. Therefore, Chinese students are discouraged from asking questions. On these topics, you can see the writings of Don Starr, from the Center for Contemporary Chinese Studies, Durham University, Former President of the British Association of Chinese Studies (Starr, 2012).

According to the beliefs of Chinese students, the second-worst thing that a Chinese student might do (after asking questions) is independent self-education. At Chinese schools, the suppression of children's urge to ask questions and the neglect of natural self-education by children, crucial for any creative scholars, reaches extreme proportions. With the wide new possibilities brought about by the Internet and educational tools like Wikipedia, or YouTube, or Udacity, or Khan Academy, the negative attitude towards self-education that still permeates Chinese schools is surprising.

Is it then surprising that after being brought up with this educational strategy from kindergarten to the very end of the educational system, Chinese university graduates are shy of questioning existing views, shared by their respected professors, and coming up with new scholarly ideas? I already discussed that obedient students rarely make visionary scholars. Visionary scholars and inventors are often those who ask myriads of questions from their early childhood, those who try to do things their own way, and those who are always hungry for the reading of extra-curricular literature.

At the same time, we have to acknowledge that the Chinese educational system achieves excellent results in raising generations of hard-working and law-abiding citizens, who have a deep respect for their teachers and are very

knowledgeable in the existing set of educational requirements. It is well-deserved that they dominate the world ranking systems. We should not forget either, that Chinese and other East Asian students are brilliant in the USA and many other European countries with a very different system of education as well. They are sometimes referred to in publications as the “model minority” (Kao, 1995; Kao & Thomson, 2003; Chen, 2012).

Amy Chua, Chinese-American lawyer and author of the bestselling book *Battle Hymn of the Tiger Mother* (2011), formulated quite eloquently the above-mentioned principles of education that are held high in the Chinese traditional attitude towards education. They are so different from Western principles that Isabel Berwick called the “tiger mother” approach to parenting “the exact opposite of everything that the Western liberal holds dear” (Berwick, 2011).

What I am suggesting here is that the striving towards the brilliance of the Confucian educational system in exams and tests might have negative implications as well, by severely limiting student’s creativity and ambition from an early age.

Deep reverence towards the past, teachers, and existing rules is a great method to follow for maintaining a stable and easy-to-govern society, but it is probably not the best strategy for the development of a free, open society and, particularly, for the progress of science. Blind reverence towards the existing system of education, deifying the older generation of teachers and scholars, or the knowledge of the past might have negative consequences.

It is definitely a blessing for a society to have obedient soldiers, jurists, clerics, and drivers, who are good at following the rules. If you imagine an army where each soldier is ready to creatively debate every order he receives, it is not difficult to understand that such a democracy in the military would be disastrous for the army and national security. But the same “soldier attitude” is untenable in scholarship and other spheres of occupation where one needs to think creatively, and needs to challenge old ideas and come up with fresh and out-of-square ideas.

One of my Chinese students told me a popular Chinese saying about the goal of learning and education. In her translation, the saying sounded like this: “*You learn to pass the test, you pass the test to get a better job, and you get a better job to make you rich.*” Well, this is likely correct for the majority of students both from Eastern, Confucian, and Western cultural backgrounds, but

following this educational principle will not lead to a generation of visionary scholars and free-thinking citizens. When the final goal of education is seen in making someone's life more financially secure, romantic love for the science and scholarly progress goes out of the window. We will be discussing this sad fact of life and scholarly progress in the fourth chapter of the book, dedicated to the role of finances in scientific progress.

The big and exciting question would be whether it is possible to have the best of both educational systems—hardworking and law-abiding citizens on one side and creative scholars on the other. And on a more practical note, let us ask what type of education we should prefer for our children. Probably the best option is to give a chance to children and their parents to have a choice, so the presence of various school systems in society, and a wider knowledge of these systems in the general population would be helpful.

I can only suggest a very rough guide to assist parents and teachers. Possibly it will be beneficial for some children, good and successful students, who try to get high marks in every subject and are highly motivated to be on top of the class, to be taken into a school with a more strict approach, where their higher learning abilities will be tested against more strict curricula requirements and against other high-achieving fellow students. As for the other, more self-motivated and passionate learners, who clearly distinguish among school subjects their favorite and least favorite classes, the creative atmosphere and freedom of alternative schools with a free educational system will be more beneficial. In many countries, we already have such an option with schools with various educational systems. The problem starts when we try to “classify” children according to their natural tendencies. Although there are a small number of children who are relatively easy to “classify” into these two rigid groups, who decides which child should attend which type of school?

We can see how many additional questions the Chinese students' inquiry has raised. It is always the case; a good question gives birth to many other questions. It is always about questions, not answers. Every progressive movement, every scholarly idea, and every revolution starts with a question.

In China, students take their education extremely seriously, and their reverence for their teacher's words has no limits. Remember, these two ostensibly wonderful things for a good education might become enemies for the development of creative thinking. In total contrast with Confucian teaching, Leonardo da Vinci said: *“Poor is a student who does not surpass his teacher.”* My ad-

vice to students with a passion for the study of the world around us would be to try to do well in official education, but definitely leave a big chunk of time for your own education. Revere your teachers but try to do better than they did.

On the other hand, let me say it once again—every professor should remember that in every class there might be students who are cleverer than they are, and will do better than they did. Try to inspire in your students the confidence and belief to do better than you did. A teacher who tries to instill the belief in his students that he knows all the answers on every possible question is either a close-minded conservative who sincerely believes there will be no further progress in science, or a charlatan. If you are asked, and you happen to have, your own opinion, please say it, but do not present it as the final truth on the subject. And if a student is right in the argument against you, try to admit it. If you can do that, you truly are a great teacher. It is a very tragic situation if teachers are believed to be always better than their students. You will have an inescapable gradual decline of the state of knowledge, where every generation is worse than the previous one. Instilling this kind of attitude in students towards their teachers and towards their own abilities will destroy creativity and confidence, two hallmarks of progress.

Everyone who has taught Chinese students knows that in their majority they are very easy to work with. They listen carefully, they do their best at homework, and their respect towards teachers is legendary. European and American students, at least many of them, are quite different. Even if they do not explicitly show it, they have an inner confidence in their superiority towards the older generation, including their teachers. They often believe they understand things that the previous generation cannot understand, and most of them have ambitions to do much better than their teachers and parents did.

It is not a matter of what is better. It depends on what the educational aim is. If you want responsible, hardworking citizens who do their best in following existing rules, then a stricter education is definitely more effective. The downside of the strict educational strategy is reduced creativity. On the other hand, a more open and egalitarian teaching strategy, when teachers are not considered untouchable and their knowledge and authority can be questioned by students, boosts creativity and self-reliance, but on the negative side, citizens that undergo such a democratic educational strategy are not as obedient in following the existing rules and regulations.

It is up to us, educators, scholars, governmental bodies, parents, and citizens, to make a choice.

Conclusions: Are they possible?

What conclusions can we draw about the existing educational system and possible ways to improve it, particularly for future scholars? I have a few suggestions:

(1) Education is one of the best things that every child and every society should have. On the other hand, existing strategies of our mainstream education have been criticized as rigid and undemocratic by a vast array of prominent scholars and artists. It is particularly injurious possibly for scholars of the future, who should be raised as the most open-minded, creative thinkers.

(2) Every child is born with the best possible mechanism for her/his education: the ability to ask questions. This ability kicks in even before children are able to learn how to pronounce their first sentences and even first words. At our primary and secondary schools, we should try to design our classes so that we do not suppress children's natural curiosity. At the moment, as soon as children go to school, they stop asking questions.

(3) A later start of formal schooling would be beneficial for the development of young children. Society and political leaders should acknowledge that an early start of schooling benefits employers, not children, and not mothers. I propose that we should give priority to children's needs, in a "Children vs. Profit" argument.

(4) Schools for gifted children often have extremely inflated programs that might not fit the needs of every naturally gifted child. Such schools might be good for gifted children who are highly motivated to do well at school and has the capacity to do so. On the other hand, if a child is a highly motivated self-learner, the inflated program of the special schools might negatively affect such a child's education and creativity.

(5) Chinese or, more precisely, the Confucian strategy of education obtains brilliant results in satisfying the demands of contemporary schools, but at the same time, limits the self-confidence and creativity of students, making it extremely difficult for them to come up with any radical new ideas that might revolutionize a scholarly field.

(6) There is no perfect recipe for education. Education should be flexible, giving various opportunities to children and their parents. Children are naturally different from each other, with different natural inclinations, so the means of educating them should be different. Society should provide educational opportunities for a wide range of children, from more conservative to more free attitudes.

(7) Among the schools operating today, the educational system that gives the greatest freedom to children is probably the system that was proposed by Maria Montessori. The Montessori system is particularly well suited for the education of future scholars.

We should not try to raise all our children from early childhood as future scholars. There is no need for this, and we might damage their natural development. We must give them ample opportunities to find their true self, the activity that can make them happy throughout their lives. But we do need to raise them as free, unbiased and creative thinkers, who ask plenty of questions. Such free and creative thinking will be a great asset for them no matter whatever they desire and are destined to become.

By some magic coincidence, raising our children simply as free and creative thinkers is the best way to raise future scholars.

Chapter 2

EMOTIONAL LIFE OF SCHOLARS, OR SCHOLARS AS HUMAN BEINGS

Magic and Failure of the IQ Test

Ask a layperson the most important quality for a great scholar and you will probably hear that sharpness of mind is the most important part of a scholar's personality. Well, probably we can safely say that a sharp mind is a great asset in many fields of human activity, not only for scholars. Businessmen, computer experts, administrators, doctors, educators, negotiators, politicians, journalists, and many others would all benefit from a sharp, fast, clear reasoning.

So, we can probably agree with our argument, that sharpness of mind is very important for a scholar, but is this the most important feature of a scholar's mind? And if it is, is it possible to objectively check the sharpness of mind?

Let us start with the second question. The good news is that the sharpness of mind is relatively easy to check, or, at least, this is what's generally believed today. This is basically the fabled IQ. Probably we should simply check student's and graduate's IQ before accepting them as future scholars? Let us check if great scholars were known for their high IQ, bearing in mind that highest achievers in intellectual spheres, including distinguished scholars, are expected to score 140 or higher.

Quite amazingly, high IQ does not necessarily indicate the presence of a great scholarly mind. Some of the greatest scholars were not distinguished by dazzling IQ. Charles Darwin was one of them. Although he is the epitome of the greatness of a scholar, he was not distinguished by his high intellectual abilities, at least in his earlier life. None of his school friends could guess his tremendous influence on the development of science from their shared school years and they were quite surprised when he became a symbol of scholarly brilliance. His father also had a dim view of his abilities. Basically, he expected him to waste his life. These are the words that Robert Darwin famously said to his younger son, Charles: "You will be a shame to our family." Although Robert was himself a brilliant physicist and psychologist and was known for his sharp mind an instant evaluation of situations and people, he was dead wrong about his younger son. Charles Darwin is a pride of not only the Darwin's family and England but of all humanity. And ironically, we mostly know Robert Darwin because he was the father of Charles Darwin.

Darwin was not alone. Even those scholars who show brilliant cognitive abilities from early years, sometimes showed relatively low IQ results, lower than 130, which is considered inappropriately low for distinguished schol-

ars. One of the greatest minds of the 20th century, Nobel Prize winner physicist Richard Feynman's IQ was 126. Some readers might remember that the book about Feynman is tellingly titled *Genius*. American molecular biologist, geneticist, and zoologist, also a Nobel Prize winner, James Watson's IQ was even lower – 124 (by the way, he tried twice). American physicist and inventor, another winner of Nobel Prize, William Shockley also tried twice. The first time his result was low 129, and then, when tested again a year later, it was even lower, 125. American experimental physicist and inventor, and again the winner of Nobel Prize, Luis Alvarez's was below 135 (he failed to qualify for Terman Study). Father of sociobiology and biodiversity, E.O. Wilson's IQ was even lower, 123.

So, what do you think, how accurate is the IQ test for checking human intellectual abilities? Richard Feynman made sure everyone knew about the low results for his IQ test, confirming the absurdity of the notion of an IQ test. Feynman intuitively knew that a simple score from a subjective test could not accurately measure the complexity of human intellect. He was the walking counterargument for the absurdity of the test. The IQ test measures how well you do on the IQ test, nothing more, nothing less.

So, sorry to disappoint, but despite the hype in the contemporary world, IQ tests do not measure intelligence. Measuring intelligence with the IQ tests is probably not much more precise than the old method of phrenology – measuring human character and intellect with the shape of the head and facial details. Phrenology was a hype of the 19th century, and IQ tests are the hype of the 20th-21st century. Our future generations might laugh at us for our trust in the IQ test as we are laughing today about the phrenologists of the 19th century.

With the same success, we can probably measure the courage of people by measuring their balls or assess their morality by the form of their noses. Poor Charles Darwin actually failed the phrenology test as well and was almost sacked by the *Beagle* captain, brilliant Robert Fitzroy from the opportunity to take part in the historic trip on the *Beagle*. Captain Fitzroy, apparently armed with a good knowledge of phrenology, was sure that Darwin's nose shape was clearly indicating his low intellectual and character qualities. To put the last nail into the coffin of IQ, let me remind the readers that a machine, a computer made at the Department of Philosophy, Linguistics, and Theory of Science at the University of Gothenburg in Göteborg, Sweden, managed to receive 150 on the IQ test, indicating that a non-thinking machine apparently might have the cognitive abilities of a genius (Waugh, 2012).

So, if the fabled IQ fails to indicate the presence of the cognitive abilities of a great scholar, what else can we indicate as the all-important elements of a true scholar? Or, in other words, and a more personal note, what was the quality that made Darwin not only a scholar, but a great scholar?

To me, it was Darwin's passionate character and his sincerity. These are the two most important qualities of the character of a great scholar, and in the next two sections, I will argue exactly that.

Scholarly Research as an Obsession or How the Mind Works

*The successful warrior is the average
man, with laser-like focus*
- Bruce Lee

*If you are possessed by an idea, you find it
expressed everywhere, you even smell it*
- Thomas Mann

It is difficult to doubt Darwin's passionate character. He was passionate about various things throughout his life. In his earlier life, he was passionate about insect collecting. Then he developed a passion for shooting and hunting. Later, of course, he became passionate about scholarly research about evolution, about the origins of the species, about sexual selection, etc. He could practice his skills for shooting for hours and was investing lots of time, energy, and money in collecting various species of insects. He remained passionate for all his life. After inheriting a fortune from his father, he could have lived his life without any material needs or troubles. He never worked for a living. And still, the amount of work he did to follow his passion for science is astounding. His life was entirely dedicated to science. He dearly loved his family and was a dedicated and gentle father and grandfather. Still, scholarly research was his true obsession.

It is an obsessive love for a search, search for the answers to existing questions, that drives scholars and allows them to make revolutionary discoveries. Imagine meeting two graduate students, one of them with a brilliant mind but a bit too unfocused and another one with somewhat less dazzling mental abilities, but continuously interested in the field, obsessed with the search, plaguing everyone with questions, and never get bored with the subject of his or her search. If I had to make a choice, I would predict that the second student has a

higher chance of making a discovery than the first student with a dazzling if a bit unfocused brain.

If the first student needs a challenge, needs forces from the external world, the second one does not need an external challenge; every free minute is happily spent in going to new uncharted territory: *"Men of lofty genius when they are doing the least work are most active,"* said Leonardo da Vinci. *"It is not his possession of knowledge, of irrefutable truth, that makes the man of science, but his persistent and recklessly critical quest for truth,"* said Karl Raimund Popper. *"Character is greater than talent, genius, fame, money, friends – there is nothing to compare with it. A man may have all these and yet remain comparatively useless - be unhappy - and die a bankrupt in soul,"* said George Matthew Adams, an influential American newspaper columnist, founder of the George Matthew Adams Newspaper Service. Albert Einstein simply said: *"Most people say that it is the intellect which makes a great scientist. They are wrong: it is character."*

Charles Darwin expressed an interesting idea for the existence of the instinct for perennial research: *"I believe there exists, & I feel within me, an instinct for the truth, or knowledge or discovery, of something of the same nature as the instinct of virtue, & that our having such an instinct is reason enough for scientific researches without any practical results ever ensuing from them."* These words were written in April 1848, and the next one is from a letter to his son, written on December 15, 1871. Here, Darwin with characteristically open and emotional manner acknowledges that the possession of brilliant mind does not necessarily leads to discoveries: *"I have been speculating last night what makes a man a discoverer of undiscovered things, & a most perplexing problem it is.— Many men who are very clever,—much cleverer than discoverers,—never originate anything. As far as I can conjecture, the art consists in habitually searching for the causes or meaning of everything which occurs. This implies sharp observation & requires as much knowledge as possible of the subjects investigated. But why I write all this now, I hardly know—except out of the fullness of my heart."*

It is highly interesting that another certified scientific genius, Albert Einstein, was not very far from Darwin's opinion of those who make discoveries: *"I know quite certainly that I myself have no special talent. Curiosity, obsession and dogged endurance, combined with self-criticism, have brought me to my ideas."*

Obsession is the centerpiece of human nature. Humans have an inbuilt tendency to develop obsessions. Please, do not get me wrong—there is nothing wrong with being obsessed. For those who cannot see this word without a negative connotation, read “all-encompassing interest” instead of “obsession.” To me, a life without an obsession is a life without meaning. Obsessions can be very different. They can be positive and can be negative. Romantic love for another person is possibly the best-known human obsession. Unfortunately, romantic love, unlike some other obsessions, does not always last for life. Love for your family, your religion, your country, collecting wealth, gaining power over the lives of others, search for extreme emotions, following sports, helping others, love for animals, love for outdoor living, love for travel, for writing novels, writing songs, playing guitar, love for sex, for healthy food, for coffee, and of course for the scholarly research – all these activities and beliefs might turn into lifelong obsessions. On the other, sad side of the coin, obsession might lead to a tragic result, particularly when the nature of obsession itself is not very healthy, like an obsession for food, for gambling, for drugs, or for violence. Even obsessive love for someone, particularly when the love is one-sided, might turn into something ugly.

Potentially, any human being is prone to obsessions and addictions. The difference is what precisely the object of their obsession is. We could even coin a catch-phrase: “Tell me what your obsession is, and I will tell you who you are.” The reader can easily classify most of the obsessions from the list above according to their positive or negative impact on a person’s life. You are lucky if you develop a passion for a positive cause. Many subjects of obsessive love are neutral in themselves like many hobbies are.

Love for hobbies is considered to be a genuine character of the English. Here is English novelist George Orwell:

“Another English characteristic which is so much a part of us that we barely notice it ... is the addiction to hobbies and spare-time occupations, the privateness of English life. We are a nation of flower-lovers, but also a nation of stamp-collectors, pigeon-fanciers, amateur carpenters, coupon-snippers, darts-players, crossword-puzzle fans. All the culture that is most truly native centers round things which even when they are communal are not official—the pub, the football match, the back garden, the fireside and the ‘nice cup of tea.’” Hobbies and obsessions can consume some of the most successful people, who seem to have fulfilled their dreams by doing what they are best at. Collecting things

probably is the best-known form of hobbies. Some of the collectibles are widely spread (like a stamp or coin collecting), and some are very rare. For example, movie director Stanley Kubrick collects stationary; multiple Academy Award winner Tom Hanks loves collecting old typewriters; another Hollywood star, Johnny Depp, collects dolls; Angelina Jolie collects daggers; Brad Pitt collects metal arts and loves photography; singer Celine Dione collects shoes; father of the theory of the unconscious mind, Sigmund Freud, loved collecting mushrooms; one of the most celebrated First Ladies in USA history, Jacqueline Kennedy-Onassis loved collecting beer cans; and basketball legend Kareem Abdul-Jabbar loves collecting rugs.

Some hobbies and obsessions take an immaterial form. The director of “ET” Steven Spielberg is obsessed with aliens (well, you could probably guess this). On the other hand, perhaps it is more difficult to guess that another successful movie director George Lucas, director of *Star Wars*, loves feeding squirrels! Actress Cate Blanchett is heavily into the environmentalist movement.

Some addictions are more predictable and widespread. Playing video games occupies the minds of not only millions of children and teenagers, but some of the most successful celebrities as well. For example, Leonardo DiCaprio is addicted to video games and Nikole Kidman loves playing Nintendo. American comedian Jon Stewart loves crossword puzzles.

Such popular hobbies as playing golf or riding bicycles understandably have significant followings. Nobel Prize winner couple Marie and Pierre Curie loved bicycling so much that they went on honeymoon on bicycles. Cooking and baking are other popular pastimes. American poet Emily Dickinson was an award-winning baker.

Creativity understandably has a prominent place in the life of some of the creative people from other fields. For example, Bob Dylan and Paul McCartney both love painting, same as, if a bit surprisingly, George W. Bush. Steve Jobs loved playing the guitar, and English author Zadie Smith loves tap dancing.

Some are sports addicts. Tennis ace Justine Henin loves skydiving. Footballer David Beckham likes fencing with Tom Cruise and Will Smith; legendary American TV show host Bob Barker loves karate and had private lessons with Chuck Norris. Indian billionaire Anil Ambani is addicted to marathon running. Actress Susan Sarandon loves ping-pong and puts plenty of energy into popularising the game. Apple co-founder Steve Wozniak plays Segway polo in his spare time, and the author of the script for Friday the 13th, Victor Miller, shares

Wozniak's interest. Boxing legend Vladimir Klitschko, the rare Ph.D. owner in the world of heavyweight boxing, is an avid chess player. Ernest Hemingway loved hunting, and actor Liam Neeson loves fly fishing. Some are obsessed with animals and caring about them. Some are obsessed with mysteries and conspiracy theories about some of the most famous incidents, like JFK assassination, or 9/11, or the explanations of the phenomenon of crop circles.

Most of us might stare at the night sky with wonder for several minutes, but there are some, who are indeed obsessed by the stars above us and spend most of their free time watching the night sky. It is no wonder that there is a long list of amateur astronomers, some of them making important discoveries. The list of these amateurs includes Russell W. Porter (1871–1949), who founded Stellafane and has been referred to as the "founder" of amateur telescope making. Isaac Roberts (1829–1904) was among the early experimenters in astronomical photography. Grote Reber (1911–2002) pioneered radio astronomy by constructing the first purpose-built radio telescope and conducted the first sky survey in the radio frequency. Self-taught astronomer Sir Patrick Moore (1923–2012) was a presenter of the BBC's long-running program *The Sky at Night* and author of many books on astronomy. Terry Lovejoy discovered five comets in the 21st century and developed modifications to DSLR cameras for astrophotography, and George Alcock discovered several comets and novae.

Some hobbies are adorable. For example, Warren Buffett, a billionaire and philanthropist, loves playing the ukulele. Meryl Streep and Ryan Gosling love knitting. Some obsessions are more extravagant, like Nicolas Cage's obsession with buying castles and houses.

Hobbies and obsessions can sometimes seem strange and even contradictory. For example, Thomas Edison, the man who invented the system of sound recording, loved silent movies. Albert Einstein loved sailing, although he did not know how to swim.

A substantial amount of scholarly discoveries came from the activities of the obsessed amateurs, such as Antoine Lavoisier, whose contributions to the science of chemistry are significant enough for him to be considered the "father of modern chemistry." Another example is the experimentation in electricity that Benjamin Franklin undertook that resulted in his invention of the lightning rod. Charles Darwin should be in this list of obsessed brilliant amateurs, as he never got any formal studies of zoology, biology, or geology.

Hobbyists sometimes go into the subject of their interest so profoundly that they write articles and books. Russian-American author, the founder of philosophical system objectivism, Ayn Rand, collected stamps and even wrote a book on her hobby.

Some hobbies and obsessions left strong traces in the lives of the millions. For example, USA President Jimmie Carter loved winemaking, and while in the Office, he legalized homebrewing and made his wine. His passion for wine is not accidental, as he was raised on a farm in Georgia. Accidentally, Georgia is THE place where the first wine in human history was made some 8,000 years ago (but sorry, this is not Georgia in the USA, but the country Georgia in the Caucasus where the author of this book is from). The author of my childhood's favorite book on the adventures of Tom Sawyer and Huckleberry Finn, Mark Twain loved fashion and even registered a patent for the invention of suspenders. Editing Wikipedia has become one of the biggest 21st-century hobbies and, in some cases, an obsession. Thousands of intelligent people (many of them amateurs) are generously giving their time, knowledge and energy for free, and the result of their work is the most widely used encyclopedia of the world today.

Of course, some of the abovementioned pastimes are hobbies and some are true obsessions. A hobby is a milder form of obsession, and one can grow into the other. Both hobbies and obsessions can be transient, a bit like romantic love. And some obsessions, very much like some romantic unions, can last a lifetime.

Why is this obsession so vital to me for scholarly discovery?

The obsessed mind, particularly if the obsession is a search for information or a radically new explanation of the existing facts on a particular topic, is continuously brewing ideas in one's head, choosing and rejecting new explanations in the subject of obsession.

"All good research – whether for science or for a book – is a form of obsession."--Mary Roach.

"You become what you think about all day long."--Ralph Waldo Emerson

"The state of mind which enables a man to do work of this kind is akin to that of the religious worshiper or the lover; the daily effort comes from no deliberate intention or program, but straight from the heart."--

Albert Einstein

“Intellectual passion drives our sensuality.”—Leonardo da Vinci “One hasn’t become a writer until one has distilled writing into a habit, and that habit has been forced into an obsession. Writing has to be an obsession. It has to be something as organic, physiological and psychological as speaking or sleeping or eating.”—Niyi Osundare

“Color is my daylong obsession, joy, and torment.”—Claude Monet

“A man who dares to waste one hour of time has not discovered the value of life.”—Charles Darwin

“A man like me cannot live without a hobby-horse, a consuming passion – in Schiller’s words a tyrant. I have found my tyrant, and in his service I know no limits. My tyrant is psychology. It has always been my distant, beckoning goal and now since I have hit upon the neuroses, it has come so much the nearer.”—Sigmund Freud

So why is obsession so crucial for a revolutionary scholarship?

The brain in this obsessed state is best prepared to come up with entirely new creative, out-of-the-box ideas in arts, literature, and scholarship. Virtually no significant unorthodox discovery can come to a person who is diligently working at the office, and who forgets his working problems during the leisure time and on weekends. For a brain to find an entirely new path of development, as a rule, it must be positively obsessed.

By the way, the very same obsession might lead to both positive and negative results: *“Some people who are obsessed with food become gourmet chefs. Others become eating disorders,”* noted American author and freelance journalist Marya Hornbacher.

Our discussion on the importance of the all-encompassing obsession with a subject of study will benefit significantly if we discuss, even briefly, a crucial issue of how the mind works. Instead of going into complicated and confusing professional terminology of various localities in human brain hemispheres, or their interaction through firing neurons, or the complex system of modules, let us imagine a simple and quite serene situation: a person is sitting comfortably on a chair on a balcony, on a beautiful sunny afternoon, and is reading a fascinating book.

So, let us ask a question: how is the reader’s mind working at this moment? If you think the brain is fully involved in absorbing the content of an exciting book, you are mistaken. Our mind is never entirely concentrating on a single task. It just cannot afford to do that. Being focused on a single task would be

extremely dangerous for the survival of the individual and the whole species. Of course, it is improbable that a hungry lion will crawl up to our reader on a balcony today, but the same danger was not such a remote possibility a few thousand years ago, or even better, a couple of million years ago, when most of our behavioral traits were forming. It is because of our evolutionary past that even in the most relaxed situation our brain is continuing to work simultaneously in many fields.

Why is that? During this entire undisturbed and serene scene, the mind is continually checking for signs of potential danger coming from the environment. And this check involves all the available modalities and plenty of parameters. All the human senses are continuously receiving information and are transferring this information to the, let us call it “the local representative” of the Central Conscious Mind (CCM) for processing. All this is happening still on the subconscious level. Peripheral vision is processing the information on what is happening in the visual field in front of the reading person. Skin is checking information on the temperature and other tactile sources. Ears are processing all the available audio information, and our nose is processing all the smells that come from the surroundings. And if any of these senses detect anything indicating that there is something important for the reading person to concentrate on, the decision is taken by the local subconscious centers to inform the Central Conscious Mind, or CCM. It is now up to CCM to decide whether to stop reading and do something for the well-being of the reading person or to neglect the warning signal. Let me give you some simple examples.

Something (like a shadow) appeared in the corner of a peripheral vision of the reading person. Just some vague movement was detected. It is probably a shadow from a family member passing nearby, or a bird foraging in the backyard, but it could be a snake that sneaked into the garden from the nearby creek. Reading might not be interrupted if one of the brain centers on subconscious levels responsible for the received visual information decides this shadow is not worth informing the CCM.

The ears of the reading person are continually scanning plenty of sounds like birds singing, traffic noises, or a distant chatter of family members, etc. But if the ears suddenly catch a member of the family calling out for help, or the sound of a garden door squeaking, the centers of the brain that are monitoring the audio environment instantly send the urgent signal to the Central Conscious Mind. The person stops reading and rushes to see what the emergency is. Pos-

sibly, the call came from someone who just saw a mouse, but it could be a robber as well or even a pregnant wife going into the labor. We even have an in-built ability to hear the level of urgency in a call for help.

The skin of the reading person is relaxed in a shade of the balcony—but wait. While reading the last chapter the sun has changed its position, and the unprotected neck had been under the direct sunlight for the last few minutes. So, the change in body position is required. The change of position might happen even without the full attention of the conscious mind. On the other hand, imagine that something has just gently touched the skin of the bare left foot of the reader. It could be the family's beloved kitten or the same snake that came from the nearby creek to investigate the available food resources. Therefore, there are various reasons to distract a reading person, and various distractions need various actions.

The same way, the nose of a reading person is continually processing the smells around. It could be the arousing smell of BBQ from the neighbors, reminding the reader about the dinner time, but this could be a smell of something burning, coming from the fire that has just started in the kitchen. As the CCM receives the information, the person will react accordingly, checking the fridge for the available food, or checking the kitchen if all the stoves are switched off.

That's not all. Apart from the eyes, ears, nose, and skin, there are several other brain centers (or modules) in the head of the reading person, constantly monitoring what is happening inside of the body as well. Certain centers of the brain of the reading person are checking other sources of information about the state of internal organs. For example, the gradually increasing feelings of hunger might finally come to the central conscious mind, forcing the reader to decide whether it is time to search for food. Particularly if the nose just noted the inviting smell of BBQ from the neighbors.

Memory is another essential checking center, and it might send out a gentle (or urgent) reminder to the CCM about the approaching appointment with a dentist, or a date with the friend, forcing the reading person to stop and check the time.

Or, if the person has been reading for a prolonged period, the body might feel uncomfortable, asking for a change of position. And if the content of the exciting book makes such information get neglected as time goes on, the ten-

sion increases, and the call for a change of body position gets louder. So finally, the person changes the position to alleviate the stress on the body.

That's how our mind works: continually receiving information from many sources, continually analyzing the environment for the safety of the situation. It is the endless work of many different centers (modules) of the mind that is pivotal to the process of mind work. As we can see, even in the most serene situation, when seemingly only one source of information (the content of the book) comes to the brain, our mind is still working like a full-blown intelligence department of Homeland Security during wartime, continually checking incoming information from various sources and making quick decisions whether urgent response is required and what kind of action needs to be taken.

The same uninterrupted work is happening during another, even more tranquil activity – sleeping. Apart from the visual channel (which is usually switched off during sleep), all other channels are still working, sending information about the safety of the external world and internal bodily needs. And if there is a thief in the house, or a smell of a house fire, or a sore neck requiring the change of a position or a full bladder requiring attention, sleep is interrupted.

After changing position, going to the bathroom, or checking the safety of the house door lock, we continue to rest or jump into action. And if the brain for some reason is not functioning normally (for example, it is under heavy alcohol or drug intoxication), then the whole body is in grave danger. It is in such situations that intoxicated individuals die of choking during sleep, as the brain centers responsible for waking up the sleeping person with an urgent call for oxygen are virtually switched off. That's how legendary rock musicians guitarist Jimi Hendrix and Led Zeppelin drummer John Bonham passed away.

Reading a fascinating book and sleeping are among the most peaceful activities we can be involved in, and even during these relaxed activities many centers of our brain are constantly working, analyzing the received information from various sources, assessing the situation, and sending signals about the required action to the CCM. Can we imagine what is happening in our brain when we are, for example, driving a car? Or trying to solve a complex scholarly problem? Or preparing for a sporting competition? Or any other situation that requires quick thinking and vigorous bodily functioning?

This kind of constant complex and multitasking brain activity accompanies every moment of our life. With this strategy of mental working, now imagine a

person who is obsessed with someone or something. The object of obsession becomes something of crucial importance, let us call this a Dominant Subject of Interest (DSI), and the DSI is fully dominating occurring thoughts and sensations. The brain centers of such a person are *continually searching and finding connections* of any received multi-modal information to the obsession-inducing DSI. Such a person is prone to see the subject of his or her obsession (for example, a loved person) in almost everything that comes to the senses – various smells, sounds, visions, words. As a result, the brain of the obsessed person is continually looking at the DSI, or the subject of the obsession from various angles, perspectives, from the impossible points of the view. *This kind of obsessive concentration is precisely what the scholar who is trying to solve a problem needs.*

What is happening in the brain of an obsessed scholar is nothing short of a fabled “brainstorming” with just a single brain participating. Instead of many brains discussing the subject of interest from various angles and perspectives, multiple centers of a single brain are actively participating in the search for the solution of the problem, simultaneously attacking the problem from multiple points of views, including the most unlikely connections. It is the lingering obsession that makes the brain of a scholar to come up with genuinely unexpected and ostensibly non-logical relationships between the subject of obsession and the rest of the world.

It is not a coincidence that there had been quite a few so-called “incidental discoveries,” or when the searching person receives a hint from the environment, realizes the path to discovery that was never considered consciously. You probably remember the proverbial apple falling on the head of Isaac Newton who happened to be contemplating under the apple tree and the discovery of gravity, or the story of Archimedes, who, while relaxing in a bath, realized that the mass of a subject can be easily measured by the water it pushes out of the reservoir.

People with obsessed brains sometimes had their most significant achievements come to them in their sleep. Chemist Dmitri Mendeleev, totally obsessed and exhausted with the search for the order of the chemical elements, fell asleep on February 17th, 1869, and saw in his sleep the periodic table of elements. René Descartes was helped by his dreams to come up with the idea of “Reason”. Tired of the cold summer weather in 1816 (a result of the biggest volcanic eruption in recorded history, the eruption of Mount Tambora in 1815),

in company and competition with the creative geniuses of Lord Byron and Percy Shelley, Mary Shelley dreamed of about one of the best-known ideas of horror literature and movies – the idea of the Frankenstein monster. Madam C.J. Walker, frantically struggling with her hair loss, came up, in her sleep again, with the successful hair-growing formula that made her one of the first Afro-American millionaires. American textile expert Elias Howe gave humanity the working model for a sewing machine in September 1846, also after seeing in his dream the ingenious solution – the “eye” at the top of the needle. One of the most important and unexpected discoveries in scientific history, the discovery of the general relativity, also came after Einstein’s obscure childhood dream, which the scholar was trying to solve during his celebrated career. Another genius from physics, Niels Bohr, found the atomic model again with the help of a dream. And of course, closer to my sphere, Paul McCartney “found” the melody of probably his most famous song, “Yesterday,” also in his sleep.

It is clear these kinds of sleep discoveries come only to those who have been thinking hard in the field of the discovery. Nothing is accidental. Einstein would not dream about the idea of Frankenstein monster, and Paul McCartney would not dream about the general theory of relativity. The fact that several significant discoveries were made (or at least assisted) by dreams, confirms that the process of inquiry never stops when the brain is obsessed with the problem.

The bad news is that it is challenging to become obsessed if this is not in your inner nature. Of course, you can push yourself and practice a musical instrument or math tests for many hours every day, but this is not the same as the activity of a naturally obsessed person. If you are pushing yourself to sit for many hours to practice because you want to become a better expert in the field, you should know that this is very different from a natural desire to do the same. When you are naturally obsessed with an activity, you will love every minute of doing it, you will lose yourself in the activity, you will lose track of time, you might fail to notice that you are hungry, that you need sleep. All these talks from music teachers that great piano players were practicing eight or ten hours every day are off-target if we do not realize that it was not just strong will and sheer determination of the person who was pushing herself or himself to practice in the first place. On the contrary, an obsessed person was actually having a great time, great fun during all these hours of practice.

Thomas Edison, who often worked twenty hours a day, famously said: “I never did a day's work in my life, it was all fun.” Guitar geniuses Eddie van Halen and Paco de Lucia were happy to spend virtually the whole day practicing the guitar, and this was not because of their strong will and determination. Closer to home, and closer to our times, the story of a growing star, Tash Sultana, young and incredibly talented Melbourne songwriter-performer is very telling. As her father told his doctor, the biggest punishment for her, as a child, was taking away her guitar. It is clear that all the musicians mentioned above were genuinely obsessed and enjoyed the time spent in practice. If they preferred to spend time with their friends, or to go to a pub, or do some other activities, their brain would turn these long hours spent in practicing into torture and would do the different tricks that minds can do and avoid this torture.

And oh yes, our conscious brains can follow the subtle hints from our subconscious mind in a bid to avoid the hours and days of torture and can provide ample reason to stop practicing. In a way, the mind can manipulate our feelings and lead us to stop doing what we do not want to do. This can be done by a sudden appearance of one of the psychosomatic (psychologically-induced) symptoms, like headaches, high blood pressure, fatigue, or the urgent need for instant gratification in various forms (eating, shopping, going outside). By the way, on a more optimistic side, these work-avoiding activities might have a very positive influence on the health and well-being of an obsessed person. Remember, when a person is obsessed, the brain is not listening carefully to the needs of the body. Workaholic dependence can be fun, but at the same time might be damaging to the body.

If you are lucky enough to be obsessed with doing some positive, creative activity, like playing a musical instrument, or writing songs, or poetry, or painting, or drawing, or any other kind of intellectual or sporting activities, you should know that fate blesses you. You can be happy for hours, days, months and years. At the same time, you should be aware of the hidden danger of becoming too introverted, if the nature of activity demands this. You might start neglecting your social life as Darwin did in the second half of his life. Non-obsessed people find it difficult to understand such an obsession, and often propose to the obsessed people to take a rest from their beloved activity. It is difficult for non-obsessed people to realize that playing a musical instrument, or painting, or doing research for many hours, days and weeks is not done from sheer determination, but primarily because it is great fun. Brilliant Richard

Feynman put his all-encompassing love for physics this way: *"Physics is like sex: sure, it may give some practical results, but that's not why we do it."* (We need to remember that Feynman's authorship of this quote is disputed, but he would have definitely agreed with these words.) Izaly Zemtsovsky, Russian-born American ethnomusicologist, wrote powerfully on the importance of emotions in a scholarly life in his 2010 article (2010). Unfortunately, the article was published only in Russian, and has not been yet translated.

To be a scholar might sound like daunting and ungrateful work to most humans, as you are not interested in many things that others crave, and you are in a perennial chase for the elusive Truth, knowing you will never reach it. And still, if you were born scholar, there is nothing else in this life you would prefer to do.

So let us remember: we might be obsessed without being great scholars, but we cannot become great scholars without being obsessed.

Scholarly Research as Sincerity

If you think that sincerity was always admired as a great virtue of a human character, you are mistaken. As a psychological and moral phenomenon, sincerity had quite a rough past in human cultural history, with very little appreciation. It was arguably first discussed by Aristotle in his *Nicomachean Ethics* as a virtue of the noble individual. During the infamous Middle Ages, when most natural human desires were tabooed under strict religious bans, quite understandably, the notion of sincerity virtually vanished. It resurfaced again and became a virtue in Europe and North America from the 17th century. The Romantic Movement in Europe during the 18th-19th centuries was probably the highest point for the phenomenon of sincerity as a moral virtue.

In the best traditions of romanticism, British poet Robert Browning said directly in 1855: *"Best be yourself, imperial, plain and true!"* Great Norwegian dramatist, Henrik Ibsen seconded in *Peer Gynt* (1867) *"What's a man's first duty? The answer's brief: To be himself."* *"What comes from the heart, goes to the heart,"* said British poet Samuel Taylor earlier, in 1833, praising sincerity. On the other hand, British Conservative politician, Lord Hailsham, was probably correct when he cautioned in 1907 that sincerity does not automatically translate into good deeds: *"Some of the worst men in the world are sincere and the more sincere they are, the worse they are."* The virtue and the entire phenomene-

non of sincerity came under doubts relatively recently in the light of the ideas of psychoanalysis. It became merely challenging to trace the real forces behind our desires and actions in the Freudian balance of the conscious and unconscious spheres. On the other hand, postmodernist ideology, filled with irony and skepticism, also looked at the notion of sincerity as a late unnatural construct.

In a series of lectures published under the title “Sincerity and Authenticity,” influential American literary critic Lionel Trilling discussed the complex evolutionary history of sincerity and its relationship to authenticity, using many examples. His discussions, mostly exemplified by novels of Jean-Paul Sartre, debate the situations when characters are under external pressures to ignore their own moral and aesthetic objections to have a more comfortable existence. Uncompromising Sartre, who famously declined the Nobel Prize in literature, and declared Che Guevara to be “the most complete human of our age,” made the conflict between morally destructive conformity and authenticity as a center of his philosophical principles and theatrical productions.

Well, everyone might have their own opinions on the phenomenon of sincerity, ranging from “silly” and “naïve” to “cool” and “heroic.” One thing is for certain: sincere people, who remain faithful to themselves in the face of real-life danger are in a vast minority.

Sincere people make good dissidents. *“I am a very fragile person, and it is very easy to scare me. But I just cannot be silent when I see an injustice,”* declared Russian scholar Mark Markovich Markov, who was famous for his outspoken character during the dark Stalin period in Soviet Russia, times when most people were afraid to tell jokes to their spouses in their kitchens or bedrooms. On the other hand, dissidents rarely make good politicians, as sincerity is hardly a virtue for a successful politician. On the contrary, we probably can characterize most of the successful politicians as people with “flexible morality.” But let us go back to the scholarly world. Why is sincerity so crucial for a great scholar? What sincerity has to do with academic research?

We sometimes forget that scholars do not live somewhere in the abstract world of ideas. They live among us, as they lived in previous centuries among their contemporaries, with the existing cultural prejudices and values. Very much like their fellow humans, scholars had and have today their share of real-life problems, distractions, needs, hopes, and fears. They have friends and enemies. They try to feed themselves and care for their families and loved ones.

These are not empty words, and every scholar who sincerely follows the call of the heart and argues for cardinal changes in any of the scholarly spheres will inevitably face the price of going against the current. Here strong obsession and true sincerity are needed. Michael Polanyi said: *"A knower does not stand apart from the universe, but participates personally within it. Our intellectual skills are driven by passionate commitments that motivate discovery and validation."* The Soviet Union, a Communist country that disappeared in 1991, was a fascinating place. By the 1960s, everything was still orchestrated from the top: TV, radio, and film propaganda were unidirectional; very few (if any – I have not met anyone myself) still believed that we were building a Communist utopia; most of us knew we were all together living a big lie, and still very few had the guts to speak up about what most of us believed was correct.

The reason for this Big Silence was the imprinted lessons from a few decades before the 1960s. Up to the 1950s, arguably the greatest and the most successful scare mechanism built by Lenin and Stalin was in full swing. So you cannot blame the citizens for following orders blindly and even developing sympathy for the ideals and deeds of communism. In my opinion, it was a kind of mass Stockholm Syndrome at work (see for example, Adorjan et al., 2012). Everyone who potentially could have had a reason to dislike communists was ruthlessly exterminated. For example, my grandfather with his brothers, and their father, my great-grandfather, were all executed because they were relatives of the previous head of the Social-Democratic government of Georgia. My father survived the string of executions only because he was eight years old by the time of the Big Purge. From the 1960s, after Nikita Khrushchev's milder regime, although voting without alternatives and unidirectional propaganda were still in place, the mass executions and the great terror mostly stopped, and the big country, held together by the total fear for life, started the process of disintegration.

Citizens of Western societies who have never experienced state terror on this scale and never had to act from the primal fear for their lives, have another stressor at work: the need for money, prestige, comfort. There are basically these two ways of making people obedient and follow the rules of the state: "if you work well, you will have more money and will live better" promises the first approach, while the alternative is more dry and direct: "If you do not work you will be executed."

Although the fear of punishment is more effective for stopping dissent, it is surprising how effective is the factor of reward in stopping dissent as well in civilized and liberal Western World!

There are quite a few thinkers who can see the weak points of the dominating paradigm, but very few of them have the guts to make their disagreement very public and to suffer the consequences. We have mentioned already how many tangible privileges are endangered by voicing your true thoughts and feelings.

But it is much easier to speak up when your free thoughts do not endanger your security and well-being. It was always easier to criticize the Communist (or any other oppressive) regime for those who defected to the Western countries. The same with scholars: it is extremely hard to be directly dependant on your scholarly position, peer-reviewed good standing, and officially praised publications, and at the same time be a revolutionary scholar.

True scholars, in essence, are rebels. There are many more new ideas than people who can declare them despite all the shortcomings. "*From Galileo to today's amateur astronomers, scientists have been rebels,*" writes Freeman Dyson. Like artists and poets, they are free spirits who resist the restrictions their cultures impose on them. In their pursuit of nature's truths, they are guided as much by imagination as by reason, and their greatest theories have the uniqueness and beauty of great works of art. Dyson argues that the best way to understand science is by understanding those who practice it. He tells stories of scientists at work, ranging from Isaac Newton's absorption in physics, alchemy, theology, and politics, to Ernest Rutherford's discovery of the structure of the atom, to Albert Einstein's stubborn hostility to the idea of black holes. His descriptions of brilliant physicists like Edward Teller and Richard Feynman are enlivened by his own reminiscences of them. He looks with a skeptical eye at fashionable scientific fads and fantasies, and speculates on the future of climate prediction, genetic engineering, the colonization of space, and the possibility that paranormal phenomena may exist yet not be scientifically verifiable.

In an ideal world, all scientists would be rebels. *The Scientist as Rebel* is a 2006 book by the renowned prize-winning theoretical physicist Freeman Dyson. He is among the signatories of a letter to the UN criticizing the Intergovernmental Panel on Climate Change (IPCC), and has also argued against ostracizing scientists whose views depart from the acknowledged mainstream of scientific opinion on climate change, stating that "heretics" have historically been an im-

portant force in driving scientific progress. "[H]eretics who question the dogmas are needed ... I am proud to be a heretic. The world always needs heretics to challenge the prevailing orthodoxies." Have no illusions: starting a new line of thinking or proposing a new paradigm might be as challenging and dangerous as starting a new religion throughout human history. How far are you prepared to go in following your vision? As soon as you start going down this path, you will start getting hard lessons. These lessons will exert exponentially increasing pressure demanding that you follow the accepted behaviors, well-protracted roads of shared scholarly paradigms, or existing religious dogmas. You will learn soon that if you continue pursuing your beliefs, you might be abused, might lose your credibility as a scholar, your job, your family, or even your life. We do know religious and scientific figures that ended their lives ostracized, or were driven to insanity and died in a mental institution, or were burned at stake.

It was not only during the medieval inquisition that people were killed for their beliefs. In the enlightened 20th century, people were executed in thousands for their beliefs—in Soviet Russia, in Nazi Germany, and several other countries with dictatorial governments. Even in Western democratic countries, people might go to jail or even disappear without a trace for saying something they are not supposed to say. Being sincere and openly speaking your mind have never been an easy option, even in the most democratic countries, and even in the 21st century. I do not have very high hopes for the future in this regard and doubt that there ever will be an entirely safe time for being entirely sincere. Even Charles Darwin, probably one of the sincerest humans that ever walked our planet, was perhaps a bit afraid of full sincerity coming from fellow humans, proposing that *"The highest stage in moral culture at which we can arrive, is when we recognize that we ought to control our thoughts."* So if you are a researcher who studies the world around us, and happen to be a sincere person, who cannot, or does not want to be insincere, you need to be ready for your new idea that you believe is better than the current one to be called "absurd", your courage called "recklessness," your sincere statements called "a shameful or laughable statement against of common sense of a civilized person." Be ready for at least some well-wishing members of your own family and friends to be begging you not to be stubborn, to be reasonable, not to ruin your life, and instead, agree with your critics.

From the very beginning of the process of education, or should I say educational indoctrination, future scholars get many hints that following your path of

thinking brings conflicts and tension with teachers and professors. Future scholars realize from their school years that, if they want to be accepted among peers, they should listen more carefully to what others say and believe what others believe, instead of stubbornly following their own beliefs.

When a student who conforms to this general strategy of accepting the existing educational system stops asking uncomfortable questions and arguing with teachers and professors on various topics, when a student studies diligently what the teachers teach, and what teachers want to hear, that future scholar gradually learns how to make deals with his or her own conscience. Such compromises happen first during the interaction with school children, then among university students, and finally among peers in the scholarly field. Such deals with inner beliefs bring many tangible results. These results show up not only the newly-found love from teachers, professors, and peers, but also in the form of lucrative positions at the universities and various research grants.

We will be especially discussing the importance of financial incentives for scholars in one of the following chapters, but we can already say that there are too many tangible effects to ignore them for the sake of your ideas. You must have tremendous inner integrity to follow the calling of your heart when university positions, research grants, and a comfortable life are on the line.

But if you are sincere in the face of potentially losing your good name, your credibility, possibly your income, family, and even life, then you are sincere down to your back teeth, and you probably deserve to be called “crazy” by those who accept and defend the status quo. The sad truth about this heroic stance is that there is no objective way to know whether you are right in your ideas and beliefs and whether future generations will ever agree with your original ideas and understand the true meaning of your sacrifice. If you are a true scholar, you should know, that all your beliefs, however firmly you might believe in them, might be false. But who can tell for sure? Your peers? Or possibly somebody from the next generation, long after you are dead? It is impossible to say. On the more positive side, for many stubborn believers in their rightness, the fight itself is a good enough reward for all the troubles they are voluntarily getting into.

It is not necessarily the fear for one’s life that makes many creative people shut up. For a surprisingly significant number of original thinkers, the fear of being ridiculed or simply criticized is enough to remain silent about their new ideas. This fear is understandable, as at a fundamental level, we humans are

social animals, and doing or saying something that others are not doing and saying, is not in our character. Most of us merely want to follow others. But scholarship is a very different kind of human activity. Contrary to human social nature and the inner desire to stick to what others do, the development of science is very much an individual intellectual endeavor, requiring from a scholar coming up with new ideas that no one had thought about before. And coming up with a new idea is not the most difficult part. Taking the original idea to the wider, particularly professional, audience is usually the most challenging part. Even Charles Darwin was not willing to speak up about his thoughts on evolution, preferring his book to have been published after his death. We should be grateful to Alfred Wallace for pushing Darwin to open up about his theory while Darwin was still alive.

Many of us have probably seen people who have a new exciting idea, are happy to discuss it with friends, but have never spoken up about it officially, among the experts of the field, and never tried to publish it. Then suddenly they read in the newspapers or on the internet news that someone in the USA or Japan discovered “their” idea and became rich and famous. Well, that’s precisely what I am talking about. It is one thing to have an original idea, and it is something different to have confidence and guts to speak up about it without the fear of ridicule. And of course, this fear is real – revolutionary new ideas are not met with a friendly smile.

I believe there are many more people with great new ideas than people in position who can listen and appreciate these ideas. It is not the lack of thinking humans that makes the progress of science not as fast as it could be in our fast-moving and the Internet-connected world. It is the lack of self-motivated people among most of the unorthodox thinkers and the highly conservative mechanism of peer review that keeps scientific progress down. The new ideas do not necessarily come from great thinkers. Any person might come across a discovery due to an inquisitive mind, sharp eye, some luck, and most importantly ability to think out of square.

Finally, I believe there are a much more significant number of good and even great thinkers than people with high integrity and dedication, those who are ready to follow their path fighting for what they believe is right. And as usual, only on rare occasions do these two characteristics occur in the same person. But the result in such cases can be spectacular.

Bringing up sincerity in future scholars must be the centerpiece of education from an early age. Some of the great teachers were aware of the danger of suppressing a student's sincerity by their own teacher's authority. Cicero directly said: *"For those who want to learn, the obstacle can often be the authority of those who teach."* One of the greatest Greek philosophers of the Classical period, Socrates, together with Archelaus, the third-century BC Greek philosopher, the father of philosophical skepticism, believed that students need to be sincere and free to announce their doubts and arguments. To avoid this kind of suppression by the authority of teachers, they felt that teachers should allow students to speak first. This is entirely different from what we often do at our schools when we teach our students all the answers we want them to know, and then organize tests where we require students to answer our questions with the answers we've already provided. True sincerity comes only with internal freedom, which is crucial for the free and creative development of science. Einstein said:

"The development of science and of the creative activities of the spirit in general requires still another kind of freedom, which may be characterised as inward freedom. It is this freedom of spirit which consists in the independence of thought from the restrictions of authoritarian and social prejudices as well as from unphilosophical routinizing and habit in general. This inward freedom is an infrequent gift of nature and a worthy objective for the individual."

"I believe, indeed, that overemphasis on the purely intellectual attitude, often directed solely to the practical and factual, in our education, has led directly to the impairment of ethical values."

Many centuries before, Aristotle sent the same message: *"Educating the mind without educating the heart is no education at all."*

Emotional passion and sincerity are much more critical for a revolutionary scientist than great talent and energy. Plenty of incredibly talented people ruin their intellectual abilities because during their lifetime they did not manage to develop an all-encompassing passion for any of the fields in which they could use their talent and intellect. Or, possibly, more importantly, they lack the inner integrity to fight for their convictions. Instead of following what they believe would be the right direction to go, they follow the general trend, find their niche in the highly-structured world of professional scholars and diligently do what money-giving bodies ask them to do. They gradually convince themselves

that they are true scholars, although they never propose anything new (at least openly), and sometimes end up as sharply-minded cynics criticizing everything and everyone.

But there is a hidden danger for passionate scholars as well. The passion with conviction might lead from science to religion. Some scholars are true believers in the existing paradigm, or, on the other hand, believers of their points of view, the same way there are some who believe in the existence of God and others who believe in the absence of God. But if you manage to have a passion and the continual drive for searching, continuing questioning everything, including your ideas and convictions, you have a chance to become a great scholar.

The personality of Charles Darwin can be characterized by these two character qualities: passionate character and utmost sincerity. He was the same sincere person with his family, friends, and a scholarly community. He could not say something he was not thinking and could not conceal something he was thinking about. Knowing his uneasy relationship with religion, his father, Robert Darwin advised him not to discuss this issue with his future wife, Emma, a devout Christian. And what did Charles do? He addressed this complex issue with Emma at the very first opportunity. Luckily for Charles, instead of repelling his future wife and the greatest friend he ever had, this gesture made Emma appreciative of Charles's sincerity. You might remember from the introduction of this book that for Emma Charles's most charming quality was sincerity, that Charles was the only person that she knew who was always saying exactly what he was thinking. If we are lucky, we might meet one or two such individuals during our lives, not necessarily great scholars, but people with great integrity. Spinoza said:

"Of all the things that are beyond my power, I value nothing more highly than to be allowed the honour of entering into bonds of friendship with people who sincerely love truth. For, of things beyond our power, I believe there is nothing in the world which we can love with tranquillity except such men." Sincerity and emotional integrity were crucial factors in Darwin's and Wallace's long and productive interactions. The collaboration between these two great scholars was based on mutual respect of the highest order. Darwin sincerely believed that Wallace, who had no formal education beyond the age of thirteen, was his equal and even greater in some respects. Of course, Darwin himself possessed only a Bachelor of Arts degree, but the difference between him

and Wallace in family background and financial situation was tremendous. Darwin always encouraged Wallace and saw in him immense potential. After receiving Wallace's work, Darwin acted honorably and was even unwilling to present his work with Wallace's work. Wallace admired Darwin and trusted him completely. Following the publication of their history-making paper, Wallace expressed gratitude to Darwin for his support, instead of focusing on receiving greater credit and recognition for his contribution to evolutionary theory. Wallace was happy to call their shared discovery by the name of the Darwinian revolution – the most powerful paradigm biology has ever seen. Wallace was well aware of the tremendous importance of the new paradigm: *"Mr Darwin has given the world a new science, and his name should, in my opinion, stand above that of every philosopher of ancient or modern times."* On his side, Darwin sincerely admired Wallace's writing skills and intellectual power. These are Darwin's words, written to their shared friend Henry Bates (the author of the idea of Batesian mimicry): *"Some are born with a power of good writing, like Wallace. Others like myself & Lyell have to labour very hard & long at every sentence."* Darwin recognized not only Wallace's flowing writing style but his sharp mind as well, and when he was facing the problem of a colorful caterpillar, and after Bates failed to find the explanation for this problem, he wrote to Wallace, as both Darwin and Bates believed in Wallace's tremendous analytical power. And as we know, Wallace did help, giving birth to the idea of "warning flags" or aposematism, one of the most influential ideas of animal behavior.

In his other letter from 1866, Darwin sincerely praises Wallace's article, placing it higher than his own book that he was working on at the time (*Descent of Man*):

"I finished yesterday your paper in the Linnean Transactions. It is admirably done. I cannot conceive that the most firm believer in Species could read it without being staggered. Such papers will make many more converts among naturalists than long-winded books such as I shall write if I have the strength." It is funny that all children, by their nature, are born sincere, but it is so hard to find a truly sincere adult. It is the existing system of education and deeply ingrained cultural prejudices that affect children's development. Their initial innocent sincerity is checked from the early years. During their education, children become aware of many conventional ideas and behavioral taboos. And it is here when they sense a lurking feeling of suspicion towards any of these accepted ideas that the moment of truth comes for the first time for them. If a

child decides to agree with teachers despite the suspicions, that child is doing as many others have done – trying to fit in the general trend. Guaranteed comfort and the label of a “good child” certainly feel like a better deal than the eternal fight for the elusive and subjective “truth” and earning the label of “difficult child.” But if teachers fail to convince a child and if the child continues to pursue in search of another explanation of the existing facts of life, that’s where the great scholars and great discoveries might come from.

It is very important to understand: we might be sincere without being great scholars, but we cannot be great scholars without being sincere.

Conclusions: Emotions and Intelligence

I tried to argue in this chapter that for me the hallmark for true scholars are emotions: the passion for the research, and sincerity. A sharp mind is necessary but not enough. A sharp mind is of little benefit without passionate commitment and genuine honesty in the face of considerable resistance that revolutionary scholars have to face. This resistance and pressure come from both the scholarly establishment and community at large. Einstein once said: *“Numerous are the academic chairs, but rare are wise and noble teachers. Numerous and large are the lecture halls, but far from numerous the young people who genuinely thirst for truth and justice.”* Einstein’s favorite thinker, remarkable human and philosopher, Spinoza had extreme views on the interaction of reason and emotions. Although Spinoza shared many elements of stoicism, and both were dedicated to helping people achieve happiness, Spinoza rejected the Stoic’s argument that logic could defeat emotion. According to Spinoza, an emotion can only be beaten by a stronger emotion. I agree.

There is no question that emotions can influence our lives much more than our rational decisions. For example, Darwin’s life plans to become a doctor (like his father) changed after he attended two surgeries. A profoundly compassionate person, Charles could not stand the suffering he saw during the operation on the patients without any painkillers. In his own words (from his autobiography): *“I also attended on two occasions the operating theatre in the hospital at Edinburgh and saw two very bad operations, one on a child, but I rushed away before they were completed. Nor did I ever attend again, for hardly any inducement would have been strong enough to make me do so; this being long before the blessed days of chloroform. The two cases fairly haunted me for*

many a long year." We also know that because of his compassionate nature, Darwin could not stand witnessing cruelty towards animals, and all his life he was a vocal proponent for compassionate treatment of animals. And of course, we all know, that Darwin was strongly against slavery, and expressed his views directly even in situations that could jeopardize his well-being and comfort. On one occasion, after a bitter exchange of views on slavery with his "boss," the captain Fitzroy, Darwin was asked to vacate the cabin he was living in during his multi-year voyage on the *Beagle*.

Only very few, probably the most robust-natured children, can take their childish inquisitive mind and sincerity towards injustices of life throughout their entire life.

Marie Curie expressed this feeling beautifully:

"A scientist in his laboratory is not only a technician: he is also a child placed before natural phenomena which impress him like a fairy tale." On another occasion, Curie said: *"All my life through, the new sights of Nature made me rejoice like a child"* (Curie et al., 1923:162). In a letter to Otto Juliusburger, a German psychiatrist, on September 29, 1942, Albert Einstein expressed a similar sentiment: *"People like you and I [sic], though mortal of course like everyone else, do not grow old no matter how long we live... [We] never cease to stand like curious children before the great mystery into which we were born."* The importance of emotional integrity and sincere awe for the natural world for scientific research has been known for millennia. *"Wisdom begins with wonder"* wrote Socrates, and Einstein seconded: *"The most beautiful experience we can have is the mysterious - the fundamental emotion which stands at the cradle of true art and true science."* We can go even further and argue that without an emotional life there can be no intellectual life at all. Simply speaking, emotions give birth to our desires and feelings, and we use intelligence (and even our instincts) to fulfill our desires and emotions. Intelligence, very much like our instincts, is subservient to our emotions. Great Hume voiced his view on the primacy of emotion over reason: *"Reason is and ought only to be the slave of the passions."*

This creates a big philosophical and practical problem with artificial intelligence – it simply cannot exist without emotions.

If a computer is unable to feel the pain of the rust on its hardware, or the fear of destructive viruses, if it is not feeling sad when overloaded with useless files, if it does not feel exciting and happy when doing interesting activities, or

when getting rid of viruses, if it never tries to manipulate the owner to have its feelings met, like better ventilation, or a more stable current, it cannot be pronounced intelligent; it will be just a counting machine, a calculator of a higher order, nothing more. Finding the answer on a question of how much is 9954 multiplied on 8809 or winning a chess game against the chess world champion, or translating a text from one language to another does not make a machine (or a human) intelligent. Counting is not intelligence. Following orders and answering questions is not intelligence. Seeing the reasons behind the counting, or asking original non-programmed questions is intelligence.

So, true intelligence cannot exist in a machine if a machine does not have emotions and desires. One of the big failures of the current search for Artificial Intelligence is that the search goes on without realizing (at least, in popular belief) that no intelligence can exist without emotions. It is emotions that drive any kind of brain activity from the simplest organism's desire to survive, to the highest cognitive abilities of mammalian species, including human abilities. Intellect cannot reside inside of a non-living machine. Life begets emotions, emotions beget intellect. The idea of creating a true intellect inside a machine is as absurd as trying to teach a machine to love someone. This is the first basic demand for intelligence.

George Lakoff, an American cognitive linguist from The Rockridge Institute, brings an interesting argument to this line of argument: it was a popular belief that emotions get in the way of reason. The reality, apparently, is different: reason actually requires emotion. Brain-damaged patients who cannot feel emotion don't know what to want, cannot judge the emotions of others, and cannot make rational decisions. A famous case study of the patient "Elliot" came from neuroscientist Antonio Damasio. "Elliot" was a married businessman with a very high IQ. He lost part of his frontal lobe while having surgery to remove a tumor. After the surgery, Elliot still had a very high IQ, but he was devoid of emotions and was incapable of making decisions. *"I never saw a tinge of emotion in my many hours of conversation with him: no sadness, no impatience, no frustration,"* wrote Damasio in his 1994 book *Descartes' Error: Emotion, Reason, and the Human Brain*. Despite the surviving high IQ, Elliot's brain could no longer connect reason and emotion, leaving his marriage and professional life in ruins. So, reasoning cannot happen without emotions in the first place (Lakoff & Wehling, 2012). Animals are much more intelligent than the most sophisticated computers because they at least have emotions: they can avoid

danger and pain, even if they cannot make complex calculations, win a chess game, and act mostly through their instincts.

Currently, the best our most advanced robots can do is to recognize human emotions and simulate the presence of emotions (see, for example, Kleine-Cosack, 2006).

One more important philosophical question: Can feelings exist without one's being alive? Clearly not. In short, we are involved in a simple and very logical circle: if we really want to create an Artificial Intelligence, we need to endow the machine with emotions, and if we want machines to feel emotions, we need to make them alive first. We cannot create intelligence out of something that is not alive and has no feelings. Calculating machine – yes. Intelligence – no. Once again: true intelligence serves feelings and desires, it cannot be a self-sufficient system – just intelligence for the sake of intelligence.

We have emotions and feelings. We have the intelligence to search fulfillment of our feelings, by manipulating others, and by manipulating our own feelings. When we feel that in a difficult situation we should behave in a certain way (for example, tell the truth), but we understand that telling the truth will have many negative consequences, then we may start manipulating our own feelings and desires, we may try to prove to ourselves that telling the truth in this situation is silly, immature, non-professional, and after all, not so important. The easiest person for us to manipulate is probably ourselves. But for some of us, ourselves are the hardest to manipulate, as in the deepest corner of our heart we know we are not sincere.

True integrity cannot come from the feeling of duty. It must be a part of a human's inner works, a successful combination of genes, personality, life experience, and education from an earlier period of life. There are at least a few "Sartrean" situations in real life when accepting something that is widely shared in the community (beliefs, situations, rituals, ideas) can make life much easier and comfortable. And still, some cannot make deal with their feelings and stay sincere and true to their beliefs. *"A little sincerity is a dangerous thing, and a great deal of it is absolutely fatal,"* said Oscar Wilde, who knew painfully well the price you pay for sincerity.

Anyway, we need to admit that things are getting gradually better for uncompromising scholars. At least, free-thinking and sincere scholars are not jailed and executed in most of the contemporary countries. Freud famously said after Nazis included his books in their infamous book-burning campaign on

May 10th, 1933: *"What progress we are making. In the Middle Ages, they would have burned me. Now they are content with burning my books."* So, if you have a passion, and you are sincere in your beliefs, the 21st century is not a bad time for a life and scholarly research. If you cannot make a living, at least you are not going to die because of your research subject. So, you can feel free.

But what *is* freedom we might ask? The notion of freedom is open to individual interpretations. For me, true freedom is when you can be yourself and can dedicate as much time as you wish to your true passion. If you do not have passion, you will never feel what true freedom is. In a passionless life, freedom becomes, as a singer-songwriter and actor Kris Kristofferson beautifully said, *"just another word for nothing left to lose."*

Chapter 3

CAN WE OBJECTIVELY MEASURE SCHOLARLY ACHIEVEMENTS?

Lessons of Time Travel

To explain the difficulty stated in the title of this chapter, let us conduct an imaginary, but quite a precise experiment. Let us go back in time, say, a couple of decades after the beginning of the 20th century, or a couple of decades before the end of the 19th century, and survey the existing evaluations of scientific achievements in one of the most exciting and dynamic scholarly spheres, the sphere of human evolution.

Reviews from 1920 would be raving about the finding of the Piltdown Man remains in 1912 as the most exciting discovery in the field, and would glorify names of amateur archaeologist Charles Dawson and professional anatomist and anthropologist, director of the Royal Anthropological Institute of Great Britain and Ireland, Dr. Arthur Keith. It was they who made this sensational discovery and made long-ranging predictions of its importance in understanding the origins of human species. But wait a minute, as some readers might remember, there is another side of this story. This exciting finding turned out to be one of the most famous scholarly hoaxes, but this fact was not known to the academic world until 1953, more than forty years after the discovery.

Another review from a few decades earlier, in 1880, would note that although the seminal work of Gregor Mendel on the principal rules of genetics had already been formulated and published (Mendel, 1869), Mendel's name and work was virtually unknown in 1880. Mendel's revolutionary work was appreciated only more than three decades later after its publication, long after Mendel died.

We can probably all agree that the results of these time-travel expeditions, although imaginary, are understandably quite close to the reality, as our knowledge of the not-so-distant past is quite robust. We know too well that the infamous Piltdown Man hoax was unrecognized for over 40 years, and that the importance of the ingenious publication of Gregor Mendel was only acknowledged more than 30 years later. So, what can these expeditions in our past teach us about the nature of scholarly progress and the objective acknowledgments of scholarly achievements? They can show us only one thing that was, sadly, already known: accurate and timely assessment of significant scholarly findings is extremely rare. The greatness of an idea is only seen at a great distance. *"Greatness is a property for which no man can receive credit too soon; it must be possessed long before it is acknowledged,"* said American poet and phi-

losopher Ralph Waldo Emerson. Therefore, if we want to have an objective assessment of the full range of scholarly ideas that are available all around us today, alas, we cannot make the imagined time travel to our future as easily as we just did in our past. But we can be sure that if we had a chance to travel in time and survey the situation, for example, one hundred years from now, in 2120, we would be surprised to learn that some of the most popular ideas that seem today the pinnacle of scientific progress, are rejected and forgotten, and on the other hand, a few of the names and existing ideas that few of our contemporaries at the beginning of the 21st century recognize, gained the reputation of great scholars and significant discoveries.

Although it is notoriously difficult to objectively assess the true greatness of scholars and their ideas in current times, another more fleeting factor, success, both in science and in arts, is much easier to measure. Success can be easily expressed in economic metrics, like the numbers of a band's sold albums or the number of book copies sold for the authors, or the quantity of money paid at auction for the works of visual artists, or the quantity of money for the transfer deals of the famous athletes. We could do the same in science to evaluate scholarly success, expressed in various numbers of scholarly output and monetary remuneration. We can count numbers of scholarly articles, particularly those that appeared in the most prestigious peer-reviewed journals, or the number of books authored by a scholar; we can certainly count and compare numbers of citations; we can appreciate the number of high positions at the universities held by scholars as well. And of course, there is also the amount of received grant money – another objective indication of a successful scholar. And what about the professional awards and prizes for the most distinguished scholars of the sphere? So, we have plenty of ways to measure scholarly success.

At the same time, despite possible objections from some who claim these characteristics provide an objective evaluation of scholarly achievements, we have to acknowledge that none of these factors of academic success can guarantee the significance of scholarly ideas. True significance can be seen only from a distance.

So what to do? I am not going to suggest a magic recipe to evaluate the true worth of scholarly ideas. My aim is relatively modest. What I propose instead is to find some characteristic of scholars and scholarly ideas that might indicate the possibility of prospectively revolutionary ideas. Remember, alt-

though all great ideas come from revolutionarily thinking scholars, not all revolutionarily thinking scholars propose great ideas.

Classification of Classifiers: Types of Scholars

The scholars' passion for creating various classifications is widely known. They had been classifying everything, from the types of minerals and insects to the types of planets and economic and political systems of various states. Why not apply the same approach towards the classifiers and this time try to classify scholars from a seemingly monolithic scholarly community? Scholars are vastly different in their research styles and ambitions, writing style and use of professional language, beliefs, personality, family and ethnic background, financial situation, attitude towards success and tokens of recognition, towards monetary rewards, towards their colleagues, towards new ideas and newcomers to the field, towards their students, followers, and critics. I will do my best to incorporate these important characteristics of scholarly individuality in the classification below. Above all, we should always remember that every attempt of sweeping classification is a crude one, but like many other classifications, our classification might also provide interesting insight, in this case into the existing variety of scholars.

First of all, I have to mention that there already are various classifications of scientists on the internet. Some have classification dealing with the spheres of science, some solely rely on a scholar's attitude towards religious beliefs. The British organization "Science Council" has a very important and interesting classification of scientists, grouping them into ten categories (the Business Scientist, the Communicator Scientist, etc.). Let us have a look. Here are these ten types and their characteristics, as given on an excellent website of the Science Council:

1. The Business Scientist underpins excellent management and business skills with scientific knowledge, supporting evidence-led decision-making within companies and other enterprises. This type of scientist has the scientific and technical knowledge to be credible with both colleagues and competitors, as well as inspire confidence in a business environment. They are found in science and technology companies in a wide variety of roles, from R&D (Research & Development) or marketing, and to the C-suite (chief executives of various functions) itself.

2. The Communicator Scientist combines their science and technological know-how with an ability to communicate. They enthuse, inform and get their message across through empathy and understanding of the needs of the audience, expertise in how media and other communication channels work and, of course, a deep knowledge of the science involved. Science communicators are found across TV and radio, advertising and promotion, regulation and public affairs as well as social media. They may also have a full-time job as another type of scientist.

3. The Developer, or translational, Scientist uses the knowledge generated by others and transforms it into something that society can use. They might be developing products or services, ideas that change behavior, improvements in health care and medicines, or the application of existing technology in new settings. They are found in research environments and working with Entrepreneur and Business scientists may help bring their ideas to market.

4. The Entrepreneur Scientist makes innovation happen. Their scientific knowledge and connections are deep enough to discern opportunities for innovation – not just in business, but also in the public sector and other sectors of society. They blend their science knowledge and credibility with people management skills, entrepreneurial flair, and a strong understanding of business and finance, to start their own businesses or help grow existing companies.

5. The Explorer Scientist is someone who, like the crew of the Enterprise, is on a journey of discovery “to boldly go where no one has gone before.” They rarely focus on a specific outcome or impact, rather they want to know the next piece of the jigsaw puzzle of scientific understanding and knowledge. They are likely to be found in a university or research center, or in Research & Development at an organization and are likely to be working alone.

6. The Investigator Scientist digs into the unknown observing, mapping, understanding and piecing together in-depth knowledge and data, setting out the landscape for others to translate and develop. They are likely to be found in a university or research center, or in Research & Development at an organization, working in a team and likely in a multi-disciplinary environment.

7. The Policy Scientist uses their science and technical knowledge, as well as their understanding of government and policymaking, to ensure that legislation and policy have a sound evidence base. Some policy scientists describe themselves as 75% scientists and 25% politicians. This type of scientist is employed

and involved at many levels and in many environments including government and Parliament, NGOs, campaigning groups, and charities.

8. The Regulator Scientist is there to reassure the public that systems and technology are reliable and safe, through monitoring and regulation. They will have a mix of skills, and, while they may not get involved in things like lab work, they will have a thorough understanding of the science and the processes involved in monitoring its use or application. They are found in regulatory bodies, such as the Food Standards Agency, and in a wide range of testing and measurement services.

9. The Teacher Scientist is trained in science, sharing their knowledge and understanding to train the next generation of scientists. Their application of science is combined with pedagogic skills and passion for teaching others. This type of scientist works in schools, colleges, universities, and other educational organizations, developing their tools and experience for teaching and learning.

10. The Technician Scientist provides operational scientific services in a wide range of ways. These are the scientists we have come to depend on within the health service, forensic science, food science, health and safety, materials analysis and testing, education, and many other areas. Rarely visible, this type of scientist is found in laboratories and other support service environments across a wide variety of sectors.

These ten types of scientists, developed by the Science Council, are very important in identifying the various fields that are occupied by those who received professional training in one or more fields of a tertiary institution and particularly, those who have undergone postgraduate studies and have scholarly credentials (like a Ph.D.). At the same time, it is obvious that this classification is more of the various career opportunities for people with tertiary education in technical (or social) spheres than the types of scientists that we are talking about in this book. In my (and popular) understanding, not everyone, who has a deep knowledge of any of the scientific fields, is a scholar. A scholar, in the true meaning of this term for our discussion, is a person who is not only an expert in a field but most importantly, *creates new knowledge*.

It is probably a good time to clear the possible confusion between the use of the terms “scholar” and “scientist.” Like many other basic terms that are currently in use in various fields of scholarship, “scientist” and “scholar” have no clear and equivocal definitions, and, as a result, it is impossible to find definite borders to separate one from the other. The term “scholar” is generally much

older than “scientist,” which was coined only in 1834 (while Darwin was aboard of the *Beagle*) by English polymath William Whewell. In our book, these terms are synonymously, and I prefer to use the earlier term “scholar” with the meaning of a person, not only with a deep knowledge of a discipline, but also the one who creates new knowledge.

Out of these ten types of scientists suggested by the Science Council, this chapter is concerned only with one category, “The Explorer Scientist.” This is someone, according to the Science Council, who “is on a journey of discovery ‘to boldly go where no one has gone before.’” What we are going to do is a *further classification* of the category of “explorer scientist.”

Let us now move closer to the notion of “explorer scientists,” or true scholars, those who move forward our understanding of the world around us. As mentioned, there are vast differences between them in their cultural, educational, religious, financial, family backgrounds, personal characteristics, beliefs, and aspirations. Is it possible to classify the existing vast diversity of scholars? Let us try but first divide all scholars into two big categories: scholars and experts. Do not be too critical, or too accepting of my classification, and view this chapter as an invitation to think on the subject.

Scholars and Experts

As shown by the Science Council, not all scientists are involved in the creation of new knowledge. Out of this small number of scientists, those who teach at the universities and publish articles and books, still not all of them are true scholars. The most important characteristic of a true scholar in this book (and in the public imagination) is that scholar creates new knowledge. Among academics is a substantial number of professionals we could call *specialists* or *experts*, but not *scholars*. They have extensive education and knowledge of the field, they can be very fruitful in publishing articles and books within the existing paradigm, but they never challenge the scholarly status quo, and never come up with new revolutionary ideas.

Einstein noticed the difference between broadly-thinking scholars and the more close-minded scholars and mentioned the members of the latter group as *artisans* and *specialists*:

“So many people today – and even professional scientists – seem to me like someone who has seen thousands of trees but has never seen a forest. A

knowledge of the historic and philosophical background gives that kind of independence from prejudices of his generation from which most scientists are suffering. This independence created by philosophical insight is – in my opinion – the mark of distinction between a mere artisan or specialist and a real seeker after truth.” For Einstein, the core difference between true scholars and specialists, at least from these words, was the presence or absence of philosophical insight. It seems to me that the ability for independent thinking, the reluctance to follow the mainstream ways of thinking, noticing details that others fail to perceive, making connections between the facts of life, are the hallmarks of true scholars. These qualities cannot automatically be acquired with the knowledge of the sphere of philosophy; they are instead the inborn features of more inquisitive minds.

Albert Edward Wiggam, psychologist and author, puts an interesting dividing line between education and intelligence: *“Intelligence appears to be the thing that enables a man to get along without education. Education enables a man to get along without the use of his intelligence.”* A good education is a hallmark of an expert, good intelligence – of a scholar.

Sometimes the difference between the expert and scholar is already apparent from the earlier period of their lives. If we recall the types of talented students from the first chapter, we might remember there are students that were successful in studying every subject, without any favorites, but on the other hand, there were less conventionally successful students who had clear favorites and went into great depths following their passionate interest. Recalling the content of the second chapter, you might guess why I put the words “passionate interest” as the key characteristic of a true scholar.

So, before trying to classify scholars, let us first try to briefly describe the difference between experts and scholars.

The main objective for *experts* is to have all the available information, and they want to be among the first to learn about the new publications and developments. They have a wide knowledge of the problems, are interesting in conversation, and use social gatherings to show their superior knowledge. On a more negative side, they might be too dismissive of those who are not experts or have not heard about the latest publications. They are also overtly critical of new ideas if these ideas are not accepted by the scholarly community. Sometimes they do not have their own point of view, as their view coincides with the mainstream. Experts become enthusiastic about the new idea only when the

new idea becomes at least partly accepted by the mainstream scholarship. If they have a new idea that does not coincide with the prevailing trend, they usually are reluctant to reveal (or publish) it. They are very sensitive to critique.

For the scholars, on the other hand, being among the first to learn about new publications is not the top priority. They are highly interested, even obsessed with one or two problems, so they are more interested in finding new solutions than being aware of the new publications in the sphere. Unlike the experts, who are interested in the *existing ideas*, scholars are in an active and constant search for *new solutions*. They might miss some of the new developments, as they are primarily engaged in creating new knowledge. They are often obsessed with a single problem or a relatively small circle of problems. At social meetings, they want to speak only about the things they are obsessed with. Their aim at the meeting is to let others know about their own interests and fascinating new findings. They often are simply sure that everyone will be fascinated by their ideas, so for some, they might become boring. Apart from this mildly negative feature as a result of their directed interest and focus, they might neglect some other ideas and promising new developments.

As I am writing these words during the 2018 World Cup, let me make an analogy with soccer – scholars who try to introduce new ideas are like attackers, so-called “forwards,” those who try to change the score, and in order to do this, they need to come up with new original ways to defeat the defense of the opposition. Experts, on the other hand, act as the defense line of a team. Their energy is directed toward denying the forwards of the opposing team to change the scoreline and refute their attempts to come up with new original moves. As a soccer team only can be successful if it has both good defenders and creative forwards, so the development of scholarly field needs both scholars who come up with new ideas, and experts who are good in defending the field from the new ideas that have caveats. It is no wonder that during the whole match, with dozens of attacks from both sides, only very few (if any) are successful. And still, after the game, we remember exactly these successful attacks, and as a rule, the list of greatest soccer players is dominated by creative forwards, not defenders.

Of course, this separation of scholarly types into “experts” and “scholars” is quite subjective in the first place. As always, it will be impossible to squeeze all scholars into one or another category, and some scholars happily combine elements from both (or more) categories in their personality and working habits.

And still, if you consider yourself a scholar, think where you stand in this equation, and try to look at yourself from aside: are you happy where you stand and what you are doing? Would you like to introduce some changes in your field of knowledge? And of course, remember, the only thing you can really change is yourself.

Now, after discussing the categories of “experts” and “scholars” let us discuss several suggested types of scholars. To make this classification easier to follow, I will be giving each type of scholar a simple catchy name.

Scholar – Curious Child

This is probably the archetype of scholar. This is a natural continuation of the initial childlike state of mind when humans start their intellectual development by asking thousands of questions every day, and by searching for the answer in order to ask new questions. *“Study and, in general, the pursuit of truth and beauty is a sphere of activity in which we are permitted to remain children all of our lives,”* said Albert Einstein. *“The secret of genius is to carry the spirit of the child into old age, which means never losing your enthusiasm,”* this is Aldous Huxley, an English writer and philosopher. With childlike curiosity naturally comes childlike blissful naivety. *“Every true genius is bound to be naïve,”* said Friedrich Schiller, a German poet and philosopher. I cannot resist remembering a gullible anecdote of Charles Darwin: As he went to the school, one of his classmates told him that if he had a certain hat and moved it in a particular manner, every tradesman would give him articles from the shop for free. And Charles believed him, entered a cake shop, took a few cakes, made with his hat a magic movement, and went straight to the door. A second later he dropped the cakes, and ran for his life, chased by the shop owner, and accompanied by the laughter of his false friend (whose name Charles also remembered for life). It is probably the manner such people to perceive life – everything – at face value, sincerely, without cynicism or humor, and it is not difficult to subject them to simple practical jokes. Although the current mainstream educational strategy contradicts this natural development of childish curiosity (see the first chapter), some robust individuals remain unaffected by these restrictions and stay dedicated to their inner desire to understand the world on their own terms, separate from the existing educational system and dominating paradigms. These types of thinkers do not necessarily become professional scholars,

as their passion for knowledge might be directed to fields far from strictly scholarly areas. But in whatever field they will be working, they continue their creative search for the new possibilities. Even without special scholarly education, job and life interests, they are natural-born scholars who move many spheres of human activity forward.

Let me propose that all children are natural-born scholars, as they have the natural urge for self-acquiring knowledge. Only later, with the life demands coming of survival, from the need of forming social bonds and trying to fit with peers, from fighting against restrictive educational systems at school and university, from various family-related problems, from the need for a job, do we have a gradual transformation of the questioning child-scholar into a serious, emotionally and intellectually restrained adult. But if a child survives the onslaught of these and many other problems, either by the sheer nature of character, or with the help of supportive parents, or a lucky encounter with a mentor, or an extraordinary life event, or a combination of these or other factors, the child might grow as a critical, independent thinker. People in this category may have vastly different ethnic and family backgrounds, religious ideas, or financial situations.

To summarise, this is a grown-up with an unquenchable childlike curiosity for everything. Scholars with many interests will be here, but it is also possible to have one all-consuming passion for a single field to remain during a lifetime.

Scholar - Fantasist

These are scholars who draw a bigger source of creativity from the world of fantasy than from logical arguments. They have strong links to their childlike fascination with the world around them. If you think that this kind of thinker only can come out with original sci-fi stories for teenagers, or other ideas without any serious scholarly worth, you are mistaken. Arguably the greatest scholar of the 20th century, Albert Einstein, belongs exactly to this category. Let us listen to his words: *"When I examine myself and my methods of thought I come to the conclusion that the gift of fantasy has meant more to me than my talent for absorbing positive knowledge."* Max Planck wrote in *Scientific Autobiography* in 1968: *"When the pioneer in science sets forth the groping feelers of his thought, he must have a vivid, intuitive imagination, for new ideas are not generated by deduction, but by an artistically creative imagination."* Einstein often

stressed the importance of intuition in his research: *"A new idea comes suddenly and in a rather intuitive way. But intuition is nothing but the outcome of earlier intellectual experience."* And he was very clear that the development of his thought was not connected to verbal faculty: *"The words or the language, as they are written or spoken, do not seem to play any role in my mechanism of thought."* Although very open to new ideas, these scholars might not be very good with lecturing and supervising duties. In short, this a type of scholar who lives in fantasies with a little connection to the real world, but at the same time, such a scholar might travel the furthest among all other types of scholars, as sometimes fantasy is the best way to understand reality. They might not bother acquiring scholarly credentials and draw the biggest inspiration from the fantasy world.

Scholar - Businessman

These are scholars who have no particular passion for research but have an excellent ability to learn, and, most importantly, have a great ambition to reach the highest possible status within the scholarly community. These scholars do everything that serious scholars are supposed to do. They perform all their studies diligently and try to be in the good books of their professors and lecturers; they never challenge authorities, unless someone from the scholarly community severely burned their aspiring ambition; they go to the best universities, try to be always aware of every new development, and read every popular publication in their field.

The problem is that the most significant part of their intellectual energy goes in achieving a better career, better standing among peers, or a better position at their university, or moving to a higher-ranked university; they try to publish articles in co-authorship with more established scholars in more prestigious journals. Ambition in itself is not a bad quality, but when it is the top priority, it may hamper creative development. The crucial characteristic that is usually missing to make this type of scholar a great scholar is the burning passion for the research, and the desire to fight for their convictions against all the odds. Coming into conflict with the establishment is not in the inner nature of scholar-businessman. Although they are mostly well-positioned and respected in the scholarly community, they might still be unhappy as they believe they

deserve better positions, better publishing opportunities, more professional awards, and more prestige in their field.

In summary, this is a person with excellent analytical skills and deep academic knowledge, but often without a natural passion for research of new perspectives. This scholar uses analytical abilities to make a successful career in science. Without a strong passion and natural love of risk-taking, they have minimal chances of making revolutionary discoveries.

Scholar - Polymath

Scholar-polymath is primarily a thinker who not only has broad interests and encyclopedic knowledge but, most importantly, is active in more than one scholarly field and leaves an academic legacy in several, sometimes unrelated fields. Sometimes the expression “Renaissance Man” is used to describe thinkers with broad interests and research outputs. Leonardo da Vinci is probably the best-known polymath in human history, with an array of interests and an unimaginable number of revolutionary ideas in many fields of arts, science, and technology. Leonardo, who did not receive a full academic education and was mostly self-taught, was neglected as a scholar and thinker by the certified and acclaimed scholars in his time. Because of his neglect from professional scholars, most of the scholarly results of Leonardo’s studies (for example, in medicine) were hidden for centuries. So, although Leonardo was immensely admired as an artist and engineer, his contemporaries still did not have the idea of the full magnitude of his greatness. We know very little about his everyday life, but the little that we know shows us a remarkable man, interested in every aspect of life, noble and generous soul, who refused to eat meat out of his respect of life and had a habit of buying caged birds and releasing them.

We can probably say that the scholar-polymath is the ideal of a scholar, a thinker with an unbounded broad vision of the world, able to grasp the universe in its variety of expressions in images, sounds, forces, materials, and passions.

Scholar – Skeptic

Every scholar would agree that skepticism is a vitally important feature of a scholar's personality. You must have a skeptical and independent mind to discover caveats in the existing paradigm or theory, be able to see the weak points in the newly proposed models, including your ideas. But there is a danger. Skepticism should not become an overriding feature of a scholar's individuality and character, as it might turn a healthy skeptic into a cynic. If being a skeptic has the highest standing in the scholar's hierarchy of values, higher than creativity and curiosity, then skepticism might become a negative force. People who define themselves *primarily* as skeptics are usually serious and ambitious scholars with an excellent education, often skeptical whether there are any new significant discoveries left in their field of study.

Scholars from this category are severely constrained in making discoveries themselves and hate maverick colleagues who have independent ideas that go against the status quo. Funnily enough, skeptics can be the worst critics of their own ideas. They are very reluctant to voice their own views as their inner skepticism wins over their creativity. They are usually terrified of criticism from colleagues, so their self-criticism serves them as a shield built to avoid the exposure of their vulnerability. Such scholars might become very influential as their harsh and sometimes even vitriolic criticism is viewed as a sign of their seriousness, scholarly wisdom, and more in-depth knowledge.

I would add here another sub-category. We can call this category "selective skeptics." These are skeptics who are skeptical only towards a certain category of ideas. Very often they are highly skeptical towards the new ideas, or the ideas of other scholars (or when the idea combines both of these characteristics). They can notice the smallest and sometimes even non-existing caveats in the new ideas of other scholars. On the other hand, they are almost blind believers of some other ideas. Usually, these favored ideas are the established ideas, or their own ideas (or again, when the established idea belongs to the scholar in question). Unfortunately, this kind of skeptic is probably the majority among skeptics.

To conclude, this is an overtly negative character who, by criticizing everything and everyone around them, behaves like a school bully to prove his or her dominance over the peers. They often are treated by their colleagues with respect and are feared at the scholarly discussions for their critical "no-nonsense"

attitude. Tragically, if they have an innovative idea, they often do not voice it to avoid possible criticism from their peers. And finally, as being skeptical is so important for scholars, we will be back to this topic in the sixth chapter.

Scholar - Amateur

A scholar-amateur is a person who, because of an array of reasons (personal, ethnic, financial, psychological, and other), never had a chance (or desire) to receive professional education and become a professional scholar. On the other hand, among this category of scholars are scholars by birth, with a naturally sharp mind, unique vision, and a passion for research. Some of them, primarily because of their creative and inquisitive mind, do not fit the ordinary school's rigid system and never reach the postgraduate professional level of tertiary education. This category of scholars, as you might guess is, as a rule, self-educated, and often has extensive interests in the world around them.

Unlike most other categories, these are very rarely considered scholars, at least, by academia. The reason is apparent – they do not have the required professional education, sometimes even the most basic (for example, not having completed school, let alone tertiary education). The lack of academic training is the chief reason they are only considered scholars if they have spectacular achievements. And some of them indeed have high achievements!

Although we certainly have never heard about most amateur scholars, some are profound thinkers and might be miles ahead of the contemporary development of the variety of scientific fields. Only in rare and exclusive cases and later than earlier, scholar-amateurs are acknowledged by academia, sometimes after years of wider general popularity and success. In some instances, scholar-amateurs might become a symbol of scholarly brilliance; they are widely celebrated in the history of science as great scholars, and probably provide the basis for a widespread belief that amateur scholars make most of the significant scholarly discoveries. Among such success stories are, for example, Alfred Wallace, who did not finish school, and Charles Darwin himself, who was by his education a Bachelor of Arts.

Let us ask a question: would Darwin or Wallace become better scholars if they had a “proper” academic education and reached the highest professional credentials? I am not sure. Vital for the scholar who makes big discoveries is the passionate striving for new knowledge, not for the official achievements and

feeling part of the peer community. Sometimes getting official academic credentials can even hinder reaching the higher heights. Petrarch wrote immortal but often neglected words: *“A meaningless master’s degree has kept many from becoming true masters. Believing others rather than themselves and believing to be what they were cried up to be but really were not, they never became what they could have become.”*

In some cases, natural-born scholar-amateurs are venerated for their other activities, without acknowledging their scholarly brilliance. Jim Corbett, an Indian-born British hunter-turned environmentalist, is probably a good case. Corbett is best known as a successful author of classic books on man-eating tigers and leopards, but his scholarly importance is seldom acknowledged. At the same time, his stories are an excellent example of academic analyses of animal psychology and behavior. His views on why tigers and leopards become man-eaters and his speculative reasoning about an Indian girl raised in the jungle are excellent examples of sound scholarly thinking and logical reasoning. Scholars from this category, for obvious reasons, have no academic positions, and have no students, although they often have followers.

In short, these are born scholars who lacked formal education, but by the power of their inherent curiosity, passion, sincerity and high intelligence searched for the new ways of development of various fields of science. As a rule, they are only acknowledged to be scholars when they have some spectacular achievements. They work passionately, often without any monetary rewards, and have no other reward than the pleasure of researching the sphere they are passionate about. In reference of great scholarly ideas, the peculiarity of this category of thinkers is that they are usually acknowledged as scholars only after demonstrating achievements in one or more scholarly fields.

Scholar – Maverick

This category includes scholars who have the full credentials of academia, often including a Ph.D., publications in peer-reviewed journals, work at universities and possess other elements of successful academic career, but at the same time, they bravely venture outside of accepted spheres of research and go into the tabooed areas or “politically incorrect” ideas, or the spheres that are known as a “fringe science.”

American anthropologist, the author of several books on human evolution, Grover Krantz is possibly a perfect example of this type of scholar. He has always been an independent thinker and was not afraid of expressing his unorthodox ideas. He was known to disagree with his colleagues on some critical accounts (for example, about the link between *Ramapithecus* and humans, or the origin of phonemic speech), and sometimes happened to be the first to point to the right direction.

Apart from his purely academic and very successful work, he had a life-long interest in cryptozoology, considered by mainstream scholarship as fringe science. Initially a skeptic on the issue, he became the most prominent professional authority on human and primate evolution writing for academic journals arguing that *Gigantopithecus* (known popularly as Bigfoot) was still an extant species, while mainstream science believed that the last representatives of the *Gigantopithecus* died out about 100,000 years ago in East Asia. Krantz was very diligent in studying the available plaster casts of the footprints, involving not only his professional expertise of human and primate anatomy and evolution but also inviting criminologists from the FBI and Scotland Yard to check the credibility of the footprints and the possibility of the presence of papillary lines on them.

His research on this topic, hugely unpopular in academia, cost him many academic privileges, including long delay in tenure at the university, as well as scholarly grants. An excellent teacher, loved for his broad interests and open mind, for his democratic disposition towards students, and personal honesty, he was dearly loved by his students despite his notoriously difficult exams. Even in death, he remained a dedicated teacher and independent thinker. Following his will, his body was rendered for his skeleton, which is permanently displayed in the Smithsonian Museum and is used to teach forensics and advanced osteology to George Washington University students.

We can say that the most important defining feature of scholar-mavericks is their personal honesty and inability to follow the mainstream line of thinking when they believe the existing paradigm should be changed. They follow their own thinking passionately, without much care for the real-life difficulties in their private and academic lives. So, although their life is often complicated because of their non-conformist nature, their academic education mixed with independent thinking and passion for the research give them excellent chances to make revolutionary discoveries.

Scholar - Tyrant

It would be natural to expect that this kind of title for a type of scholar will create controversies, and hardly any scholar would want to be considered in this category. Unfortunately, a surprisingly large number of scholars might be in this category since this type of scholar behaves like religious fundamentalists, firm believers of the existing paradigm, and openly hostile towards any new developments in the field. They are very careful in creating their following and do not accept dissent from their students and followers. Such scholars, when successful, have a lasting impact on a field as they often leave a strong loyal array of followers. Instead of encouraging independent critical thinking, they try to surround themselves with slavish followers. *“The surest way to corrupt a youth is to instruct him to hold in higher esteem those who think alike than those who think differently,”* said Friedrich Nietzsche. They push everyone around, from family members to the members of their laboratories and students; they do not take no for an answer, and are blind towards the ideas of other scholars. For them, it is incredible that not everyone can see that their views are the only correct ones that must be followed by everyone. This category certainly has strong connections to the following group – scholar conquistadors. Their students find it very hard to please such teachers, as no amount of work is enough to satisfy their boss. Indeed some students seriously consider killing themselves, and some take their lives. There have even been tragic cases of students without mental disorder killing professors for their perceived tyrannical tendencies. Marie Curie proposed a suitable epithet for scholars with tyrannical tendencies: *“There are sadistic scientists who hurry to hunt down errors instead of establishing the truth.”* To summarise, by disposition this category hardly can include scholar-innovators, as open-mindedness is possibly the first requirement for a revolutionary scholar. At the same time, the scholar-tyrant’s strictness, sheer determination, and high demands to everyone around, often puts them into leading positions of departments and laboratories and create a lasting influence on the field.

Scholar - Conquistador

Frankly, I was not going to have this special category, but after reading Sigmund Freud’s words about himself, I decided to distinguish this unusual category. So let us listen to what Freud had to say about himself:

"I am actually not at all a man of science, not an observer, not an experimenter, not a thinker. I am by temperament nothing but a conquistador – an adventurer, if you want it translated – with all the curiosity, daring, and tenacity characteristic of a man of this sort" (letter to Wilhelm Fliess, Feb. 1, 1900).

These words can probably characterize many determined and successful humans, especially males, perennial hunters for females. Freud, with his overarching interest in human sexuality, might have particularly liked this last comparison. This type of a scholar loves primarily the challenge of conquering, the fight; he is a resourceful strategist, cautious in choosing loyal partners for his projects. Scholar-conquistadors usually have a dictatorial attitude towards their close circle of students and do not accept any dissent. If we recall Freud's frustration and non-acceptance of the innovative ideas coming from his most talented follower, Carl Jung, this will become clear. Jung directly wrote to Freud: *"Your technique of treating your pupils like patients is a blunder. In that way you produce either slavish sons or impudent puppies... I am objective enough to see through your little trick"* (McGuire, 1974). Peter Gay, a German-American historian, also wrote about Freud's aggressive policy of creating school by followers:

"While Darwin was satisfied with revising his work after further reflection and absorbing palpable hits by rational critics, while he trusted the passage of time and the weight of his argumentation, Freud orchestrated his wooing of the public mind through a loyal cadre of adherents, founded periodicals and wrote popularizations that would spread the authorized word, dominated international congresses of analysis until he felt too frail to attend them and after that through surrogates like his daughter Anna" (Gay, 1987: 145). In conclusion, this is an ambitious character with various degrees of talent for research and evident dictatorial tendencies. They might have radical new ideas, although their dictatorial attitude towards others precludes their self-critical appraisal. Such scholars, particularly when they are very successful, might become a negative force against progress.

Scholar - Educator

This is a scholar with mostly a delightful character, an open-minded thinker, inspiring and democratic towards students and their needs. Students love Scholar-educators. Such scholars can belong to other categories scholars and be great scholars themselves. To be characterized primarily as a scholar-educator, a scholar must be above all a passionate educator, who prefers teaching and interaction with students to all other activities. Above all, scholar-educators are great communicators of complex ideas, excellent speakers who can inspire the future generation of students towards different fields of scholarship, including teaching itself. They often serve as a role model for students and sometimes remain their mentors and friends for long after finishing their university years. Plenty of great thinkers and scholars were great teachers as well.

On the other hand, some scholars can inspire generations with their open mind and revolutionary ideas but might not possess qualities of the scholar-educator. One of the greatest thinkers of humanity, Albert Einstein, was not a born educator, and attending his lectures in Bern or Zurich, according to the witnesses was not an inspiring experience.

In summary, the scholar-educator is an open-minded scholar with a particularly strong passion for the teaching of new generations. They might author great discoveries, although in the center of their scholarly life is live interaction with students.

Scholar - Martyr

This is arguably an ultimate type of scholar whose dedication towards their subject of study knows no limits. They treasure their time spent in research to the utmost; in fact, this is the only thing they want to do. They do not really care about money and position, and they sometimes neglect their social life, health, and appearance. Their eating habits might suffer from neglect. Most importantly, they are ready to take the harshest punishment for their ideas from governing political, religious, and scholarly circles. This type of scholar is probably the most iconic for their heroic stance. Such a scholar is relatively rare, although we might not be aware of most of them.

Giordano Bruno, who was burnt alive for his beliefs, is probably the best-known icon of such thinkers. Michael Servetus, Spanish doctor, polymath

scholar, and religious free-thinker, was burnt at the stake before Bruno, and his executioners kept him roasted alive for two hours.

I would put Marie Curie in the same category. Although she did not have to face death for her ideas, her determination and loyalty towards science and humanity had no limits. She was known to go without food and sleep for long stretches of time and to wear the same dress for everything. When colleagues, disturbed seeing Marie in the same dress for many years, decided to buy her a new dress for her and Pierre's wedding, she said: *"I have no dress except the one I wear every day. If you are going to be kind enough to give me one, please let it be practical and dark so that I can put it on afterwards to go to the laboratory."* The dark blue suit that she wore at her wedding, served Marie as a lab outfit for many years to come. Marie was fearless towards life problems. Living between two world wars, the time that turned many thinkers into pessimists, she said: *"Nothing in life is to be feared, it is only to be understood."* It is not accidental that Pierre and Marie denied copyrighting their lucrative discovery of radiation (the term Marie coined), leaving their discovery for everyone to use freely. Einstein, who knew Marie Curie very well, once famously remarked that she was probably the only person not corrupted by fame. Such scholars sometimes have to overcome a very difficult start in order to be accepted as a scholar, so their fight for their place possibly prepares them to be absolutely uncompromising in fighting for the ideas they believe in.

In two words, this is a fanatically dedicated thinker, honest and fearless, who cares very little about the achievements and accolades. For them, sticking to the ideals is the greatest gratitude they might receive. We should not forget either, that such utmost dedication might not be connected to fruitful and positive revolutionary ideas. We should also remember, that apart from dedicated scholars, various thinkers from very different fields, like religious, political and social leaders, demonstrate great sacrifices for their beliefs, including some of the most controversial figures of history (for example, some of the founding fathers of Nazi or Communist ideologies). People with such a religious loyalty for their ideas might bring not only positive but negative impact to the world as well.

Small Conclusion

As is the case with all the attempts of sweeping classifications, this schema is also subjective and far from being precise. It will be impossible to fit many scholars in one of the mentioned “boxes.” Many other possible types of scholars are missing, and to describe most scholars we will most likely need to use a combination of two or more scholarly types described above. And still, I hope, a reader will be able to see the vast differences among the people involved in scholarly activity. They all are scholars, although some of them move science forward, and others, sadly, with their activities mostly put brakes on scientific progress.

The types differ in their ability to be the most successful among their peers on one hand and attain scholarly greatness on the other hand. The full realization of the creative potential often comes after declining (for different reasons) the natural striving towards popularity and success. In very rare happy cases, success and greatness go hand in hand, but most scholars have to make a conscious (or subconscious) choice between successful career and loyalty to the initial romantic passion for science. Of course, if there has never been a passion, or the flames of passion have already disappeared under the pressure of the real-life problems, there is no alternative for the chase of success, positions, grants, and publications.

I suggest that if we are trying to assess scholarly achievements, we need to look at both the tokens of success, and the indications of potentially groundbreaking new ideas: resounding scholarly success, published articles and books, number of citations, and professional awards on one hand, and on the other, the presence of potentially revolutionary ideas that are not accepted by academia.

But here we hit the old brick wall of controversy. Unlike success which is easy to see, it is not so easy to see the true potential of new revolutionary ideas. Is there any way to measure the worth of new ideas that have not received, at least yet, any appreciation from Academia? Or, in other words, how can we distinguish the allegedly “revolutionary ideas” that have absolutely no scholarly value from the potentially important ones? And probably most importantly, who is to judge their worth? We will try to address this difficult issue in the next two sections.

Can the Author of the Idea Be an Objective Judge of the Idea?

Do not be surprised after reading this ostensibly silly title: authors of the ideas themselves always are and should be the first judges of their ideas. This might sound quite crazy to many readers. “Which of the authors would agree that their ideas have no real value for science?” I can hear critical readers asking that simple question. And indeed, it would be hard to find such a thinker, apart from possibly the most self-critical and self-effacing ones. Such self-critical thinkers do not usually end up sending their ideas to journals or other scholars. So should we expect all authors to evaluate their ideas as brilliant?

But wait. My suggestion is not as simple as it might seem; it has conditions. What I propose to the aspiring authors of potentially revolutionary ideas is to check the worthiness of their ideas against several relatively easy and more or less objective criteria.

So, if you are an author of a potentially revolutionary idea, please, read these paragraphs carefully and made a mental note if you qualify.

- First of all, do you have quite a clear understanding of the sphere of science you are proposing to revolutionize? This does not necessarily mean having an academic degree or understanding the professional jargon, but the grasp of existing paradigms. If you do not read the special literature, you may not be aware that your idea might have already been proposed or be based on incorrect premises. In two words, you cannot revolutionize the field if you do not understand.
- Can you explain your idea to a layperson? Do not forget what Einstein said: *“You do not really understand something unless you can explain it to your grandmother.”* These words fully apply to discoveries and revolutionary ideas as well.
- Now let us check, in what shape your idea is at the moment. First, have you written it down, with all the supporting materials and references, clearly highlighting the ingenuity of your approach? If you have not done that, then your idea at the moment exists only in an oral form, and your idea, even the most brilliant, has not made even the first step. Scholarship exists in a written form. So if you are interested in moving your idea forward and hearing what others think of it, make the first move and prepare the first draft of your idea.

- One piece of technical advice: many academics, on receiving a new manuscript from an unknown author, first check the list of references. References are the most strictly organized part of your text, so make sure, they look impeccable and follow the same standard throughout. Good references also indicate your knowledge of the sphere. Do you list publications by the expert to whom you are sending the manuscript in your references? Many manuscripts do not reach further than this initial check. This is a pity, as some good ideas come from individuals who have good brains but lack academic training and writing habits. Behind the wrongly written list of references might be an idea that could revolutionize the field, but very few professional scholars (usually only the broadest thinkers) will look at the text if the references are not up to a good standard.
- Essential requirement: can you demonstrate a critical approach towards your idea in your text? Are you able to state, apart from facts that confirm your idea, those facts that go against your idea as well? If your attitude is entirely positive towards your idea, without any arguments against, your eyes are probably closed to objectivity. Remember, we all love our ideas, very much like parents love their children, but if we claim to be scholars, we should demonstrate a certain degree of objectivity.
- Does your idea produce prediction? Predictions are probably the best indicators of the worthiness of fruitful revolutionary ideas. Predictions raise the possibility to provide proof of the new idea, or on the other hand, to reject the new idea. Remember if your idea cannot be falsified, it is not a scholarly idea. English theoretical physicist Paul Dirac once said: *"The measure of greatness in a scientific idea is the extent to which it stimulates thought and opens up new lines of research."* Scholarly predictions open the most obvious new lines of research.
- The next question comes after writing your idea down in the form of a scholarly argument. Have you ever sent your idea (in the form of an article or a book manuscript) to a journal or a publisher? If such an attempt has not been yet made, then this might indicate that you are not sure of your idea's potential worth—is this correct? If you are ready, you can find plenty of guidelines on the writing of scholarly text on the internet.

- You might be hesitant to send your text to the journal or a publisher for fear of getting a negative result. This is a very human emotion, and you are not the only one. Even Charles Darwin was dead against sending his ideas on evolution to any professional journals. Scholars need not only a good brain to come up with a new revolutionary idea, but a strong character as well. Yes, it is highly possible that when the idea is very new, you will meet a negative response, even a few of them, but if you continue attempts to find a supporter of your ideas, then you can congratulate yourself that you have not only revolutionary scholar's brain, but character as well. Emotions and character, as you might remember, are crucial for a scholar, possibly even more important than brilliance of mind.
- Have you ever sent a paper-proposal to a scholarly conference in the field you are trying to revolutionize? Mind, that apart from strictly academic ones, which usually require some academic credentials from the participants (Ph.D., M.A., or an engagement with a university), there are other scholarly meetings with a more relaxed requirement for participation. Getting your paper accepted for a scholarly meeting is a great indicator of the worthiness of your idea, and apart from this, you might benefit greatly from meeting and sharing ideas with like-minded people, interested in similar problems. Do not expect scholars from the field to express excitement from your paper if you happened to be invited to the professional conference. New ideas take time to find an adequate response.
- Apart from producing original ideas, are you open to new ideas from others? If you believe that it is only your ideas that are worthy of scholarly attention, you most likely need to open your mind to other suggestions. When you are listening to competing ideas, try to see the potential for positive development in them. Authors of the revolutionary ideas, as a rule, are broad thinkers, and broad thinkers are good at noticing the potential of the new suggestions from other thinkers, suggestions that many other, more conservative scholars, might reject out of hand.
- Apart from sending your writings to the journals or publishers, nowadays you can find the contact details (for example, emails) of many scholars from the field that you are interested in. So you can send information about your idea directly to the scholar you hope to be open-

mindful and see your idea's potential. If you decide to send your idea, do not try to convince the scholar of its correctness. Just try to get her/his interest in a couple of paragraphs.

- Have you used any of the blogs related to your spheres of interest by placing there your comment/text clearly expressing your point of view? This is the easiest way to let more people know about your ideas. If you cannot get any positive comments from anyone, think about how to improve your style of communication, to improve your writing. Remember, the only person you can improve is yourself. So do not blame others; try to find better ways to get other people interested.
- In case you do not want to put in effort to promote your idea, but would like others to know about it, at least describe your idea and put it on the internet. Time after time check the site (sites) for possible feedback from other thinkers from the related sphere. You might get lucky in finding some like thinkers and supporters.
- And closer to the end of the list of criteria, if you have already taken many of the steps above and reached some professional circles, a higher-level question: has your revolutionary idea been supported by a couple of the scholars (or at least a single scholar) with academic credentials from the sphere you are interested in? If there is someone with credentials that finds your idea potentially viable, this is a powerful indication of its worthiness. Remember, no revolutionary idea had been (and will be) accepted simultaneously by many certified academics, but the acceptance of your idea by even a single academic is a great victory.
- And finally, and most importantly, remember that we need your ideas. The development of science needs your ideas. Human scientific progress depends on the thousands of ideas that many creative humans come up with around the world. Science is moved forward not only by professional scholars who work at universities and professional laboratories, publish scholarly works, and receive grants. Such professional scholars are often too constrained by their duties and the guidelines of their employers. They might be even jealous of the freedom of those who do the research outside of academia. So please, if you have a passion for research, and an idea that sounds innovative and groundbreaking, make an effort, find the time, courage and energy to let others know about your ideas. Even if you do not achieve a breakthrough,

you will have the great fun of researching things you love to research. And who knows, there is always a chance that your idea will find supporters among the thinkers of the next generations. Remember, most of the great scholars were passionate about research for the sake of research, not the recognition of their results. Remember, if you never make a move, there is a possibility that in a few years you will find out that someone else received credit for the same idea that you had years before.

So, be open to seeing both positive and negative sides of your idea; Be honest in indicating both supportive and contradicting facts for your suggestion; Be self-critical and open to criticism; use critique to improve your idea and your text; and most importantly, be brave enough to bring your idea to the demanding line of professionals. Although we complain about professionals, about their resistance to potentially revolutionary ideas, still, the *final aim of every aspiring scholar is to get a positive reaction from the professional scholars*, if not from this generation, then from the next. So make sure to give your idea the best possible chance to make it.

How to Assess Whether a New Idea Has Potential

Authors should not and cannot be the sole judges of the worthiness of their ideas. They naturally are and should be the first judges of their ideas, and in the previous section, I tried to present simple advice on how to make the process of the self-assessment relatively objective and easy to follow.

At the next level, soon or late, new ideas should be evaluated by other readers. In a letter to Alfred Wallace in 1857, Darwin wrote: “*Whether true or false, others must judge; for the firmest conviction of the truth of a doctrine by its author, seems, alas, not to be the slightest guarantee of truth.*” We mentioned at the end of the previous section, that the final word is still after those who already have some credit in the field, and particularly to professional scholars from academia.

Sure, professional scholars are notoriously reluctant to accept works done outside of academia. Professional scholars often dislike works that were created even within academia, if they challenge the existing paradigm. But there are exceptions. These exceptional scholars are broad thinkers, able and willing to

see the potential positive sparkle of the new suggestion, sometimes even behind a badly written text with incomplete references. Such scholars are, as a rule, constantly in search of new ideas and new approaches in their sphere, whereas many scholars in academia are reluctant to spare a moment for a new idea, particularly if the idea comes from an unfamiliar source that has no authority for them.

In the previous section, I was addressing the authors of new ideas, trying to give some advice on how to improve their chances to be heard. In this section, I address those who are asked to provide an assessment of a new idea. First of all, remember, assessing your own or somebody else's new ideas is a very different task for many subjective and objective reasons.:

- You naturally know what you want to say in your text; after all, the idea was born in your head. Conversely, when you are reading somebody else's research text, particularly if this is a new idea, you have no idea what the author wants to say. In fact, this is one of the problems when writing your own idea for others to read – you should be writing for the reader who has no familiarity with your ideas. It is not so important how well you can understand your own text, the all-important question is how an uninitiated reader will appreciate your work. So you must look at your text from the eyes of the uninformed reader.
- When reading your writing about your idea, all your body and brain is positively geared in agreement: you quickly see all the right points and tend not to overlook or downplay all the doubtful and controversial moments. Conversely when reading somebody else's text about a new solution to the problems in your field, you are intuitively geared to see the flaws in the new approach. There is nothing wrong with such a critical approach; on the contrary, this default critical stance towards new ideas is very healthy and beneficial for scholarship.
- Sometimes new ideas revive old, already discredited paradigms. We know that some fruitful new ideas are in fact old and recently revived ideas, sometimes with a new twist, but still, we tend to believe that the existing scholarly consensus is viable. If you have new facts and theoretical suggestions to restore the old idea, you had plenty of time, sometimes years, to get used to this change. But if you are reading about a suggestion to revive the old and already discredited idea, while trying to

establish the worth of the research text quickly, you are more likely to ignore its little-expected revolutionary potential.

- And finally, when reading or writing your text, you have all the time of the world. You can be writing and refining your text for weeks, months, even years. Conversely, when you receive someone else's research text, unless you have nothing else to do with your time (which is rare, particularly with professional scholars), your subconscious wish is to determine the general worth of the received text (and the credibility of the author) as quickly as possible. It depends on the readers' personality how far they are going to go reading, particularly of a poorly written proposal. And it also depends whether this is a text on which you were asked to provide an official review via peer-review mechanism or an unsolicited text from someone you do not know.

So, if you were asked to assess someone's new research text (either via the peer review mechanism or directly by the unknown author), most likely you are a professional scholar with academic credentials, or at least have some publications with some reputation in the field.

When beholders of new ideas send their writings to you, they hope that you are one of the rare broad thinkers, who do not deny a few precious minutes to a new unknown researcher, and above all, can understand the potential of the original idea. Here is an important question: are you one of the rare broad thinkers open to new suggestions in your field of expertise? Or conversely, are you among those members of academia who believe that all the big discoveries had already been made, and the mainstream paradigm is sound and safe?

It is very likely that you would like to consider yourself in a small group of broad thinkers, a scholar able and willing to appreciate a fresh kernel in a research text sent to you. But are you?

Here are a few questions to check whether you qualify in the category of rare broadly thinking professional scholars. Read the questions and note your answers in your head.

- First of all, if you received a so-called "unsolicited" letter from an unknown person, do you have a positive feeling that the author is most likely respecting you as an expert, and wants to hear your opinion? Do you appreciate this trust? Or you see such letters just as annoying spam?

- Do you agree that not all the brightest minds go to university and work in academia? Do you agree that for some of them the existing system of education is too square to follow, and now they might be searching for broadly thinking scholars to share their solution to the problem?
- What is your line of action on receiving such a letter? Do you delete it right away? Or put the answer on hold and answer when you have time? Or, if you do not have time, answer the person on the other end frankly, that unfortunately, you are too busy to read such letters?
- If you read the received text, when is it more likely for you to decide that you have read enough and are ready to write a negative opinion – as soon as you see some technical mistakes (for example, in the references, or in the use of the non-academic language), or later, after understanding the idea and seeing clearly it has logical problems?
- Do you still read the letter if it argues for a new solution of the problem that you (and your field) believe was successfully solved years ago? Remember, some of the greatest problems in the scientific progress are not the unsolved problems, but the solved one, the ones that we believe are here are true and will stay this way for centuries if not millennia. If you firmly believe that the truth has been already found within the existing paradigm, you are unlikely to read such a letter.
- Although you are an expert in the field in which you are asked to provide assessment, the author might be using data from other fields, thus making understanding the text enough to provide assessment difficult or impossible. Do you acknowledge frankly that you do not understand some of the elements of the author's argument, or you still provide your professional assessment? Better to remember Leonardo da Vinci's words when assessing someone's ideas *"You do ill if you praise, and still worse if you reprove in a matter you do not understand."*
- Do you reply to the author of the letter if you find the idea unworthy of serious discussion? Remember, a negative but polite reply is much better than no reply at all. If you can provide feedback with your negative response (for example, that the author needs to work on references, or needs to know more publications in this sphere, or needs more clarity in expressing the idea) that will be a great help for the aspiring researcher.

And a positive final note – If you are reading this book, with its mixed messages about professionalism in science, this already means that most likely you are quite a broad thinking scholar. Do not feel that with such unsolicited letters someone is just trying to rob you of your precious time. You can and should view your time spent in reading and answering such messages your service to your profession and your field of science. The worthiness of a scholar is not in the worthiness of her or his own ideas only, but in the attitude and atmosphere the scholar creates.

So the final word is up to you. If you have a gut feeling that there might be something positive in the text you received, do not close your eyes on this positive element, and do not be stingy of words of encouragement. Even eminent scholars and the greatest experts in their fields have been known for declining outstanding materials, from the ground-breaking papers of the brilliant Evariste Galois to the musical genius of the Beatles. Future Nobel Prize winners, as a rule, had a long string of rejections before they had a breakthrough – you can provide such a breakthrough, especially if you feel there might be something in the letter you just received. If you read dozens of such messages and provide a breakthrough to only a single worthy idea, you should be happy and proud.

Remember if you are a scholar, you are expected not only to produce new ideas but also to notice new-perspective ideas as well. Be open to new possible solutions to the old problems, and trust the creative power of humanity, from a member of which you just received a letter asking humbly for your respected opinion.

A Warning Instead of Conclusions

We are coming to the end of possibly the hardest chapter of this book. We need to acknowledge that there can be no recipes for the right and timely assessment of scholars and the worthiness of their ideas. Instead of a direct answer to this question (which is impossible) I proposed first the rough classification of scholars' psychological types, and then proposed some relatively simple steps towards a more objective assessment of the new idea from two points of the view, first by the author of the idea, and second by a professional scholar. I tried to propose some simple questions and guidelines to thousands of possible aspiring authors of new ideas and the professional scholars, for the benefit of moving scientific progress forwards, by proposing the common ground of inter-

est, warning them of usual pitfalls and simple mistakes they can avoid, both in assessing their own ideas and understanding somebody else's. I want to propose that the readers of this book to feel free, creative and critical towards all the above-mentioned classifications, questions and suggestions.

So we can say that to measure a scholar's success (but not necessarily greatness), we can use plenty of indicators: positions occupied by the scholar, number of citations, or the number of research grants received, the respect from peers, the number of lectures and talks delivered at various universities of the world, number of professional awards, number of published scholarly articles and books, and the number of translations of her/his articles/books. As we can see, there are plenty of objective metrics of scholarly success. And possibly very attractively, all these are tangible and give their fruits now, not in the ethereal promises for the future.

Greatness, on the other hand, is something very elusive and never guaranteed. Greatness exists only in a latent state, as a precious but rare possibility, like a big win in a lottery. As with a lottery, there is a slim chance to win millions, but for the single ticket that allows you this slim chance, you have to pay with a big part of your life. And if the acknowledgment of the greatness of your idea ever comes, most likely this will happen later, possibly after your lifetime. Does not all this talk about the potential greatness sound like the idea of after-life heaven?

So is there a recipe on how to be successful and have a comfortable, successful career and life? Here is some advice: follow the mainstream of the scholarly thought; if you have innovations, make sure they do not challenge the paradigmatic foundations of the field; do not go against the currently accepted research directions; be part of the peer community; provide positive reviews to your colleagues whose results and views are similar to yours, thus securing positive reviews from them as well; forget about Big Ideas and the repel any impulses to propose paradigmatic changes; predict what your colleagues expect you would say in your publications and say it; fight against those who want to bring big paradigm changes; try to keep your field and your workplace stable.

In this clear road to success, there are two main problems. The first is that there is huge competition in the search for a successful career, as the numbers of university positions and lucrative grants are grossly limited. The second is your conscience, which might be telling you not to give up your romantic passion for science and not to trade your chances of greatness for the cheap (yet

still very hard to get) tokens of success. The choice is easier for those who frankly believe in the infallibility of the current paradigm and the authority of the Big Names. But for those who are torn between their conscience and the realities of scholarly life, the choice is never easy.

Well, at least we can articulate what the possible ways to a successful scholarly career are. Unfortunately, we cannot say so easily how to reach scholarly greatness, as there are no clear ways to determine this elusive phenomenon. The chances that your idea is your ticket to scholarly greatness are slim, but if you are passionate about it, if you can see clearly how it can revolutionize the scholarly field if you do not care about the tokens of scholarly success, if you do not care about the position and financial security, if you are happy to follow your passion and content just from being loyal to your ideas, then you have no other option than to follow the call of your heart. At least it is unlikely that you will be burnt at a stake, tortured, or put in a madhouse for your ideas, like some of your predecessors.

Apart from the conviction of your own greatness, you can consider yourself in good company, as many great scholars were not appreciated during their lifetime. You can for sure remind yourself that great discoveries are usually made by thinkers from other fields, and often amateurs. *"None of the great discoveries was made by a 'specialist' or a 'researcher'"* said Martin H Fischer, German-American physician and author. And what is the reason for this: *"A specialist's mind is a slave to his specialization,"* said South African philosopher and satirist Mokokoma Mokhonoana. And finally, you can definitely cheer yourself with the idea that even if your idea is not correct, the true progress of science always depended and still depends on passionate, dedicated and creative individuals like yourself. Thank you.

Chapter 4

MONEY, OR MONKEY BUSINESS

Doing Science: For Living or for Love?

*To enjoy – to love a thing for its own sake and for no other reason.
- Leonardo da Vinci*

I hope the readers of this book do not expect to find here a comprehensive analysis of the allocations of the scientific research findings in various countries and in different fields, or the critical analysis of the activities of the grant-giving bodies. We have a very different goal here. This chapter is dedicated to the problem of how much the presence of funding, or more precisely, dependence on income from the research affects scholarly freedom and the further development of the scholarly field.

Initially, I had an idea to discuss the issues of “money” and “professionalism” in separate chapters but quickly realized that this was impossible. Not only can the presence or absence of professionalism be checked quite accurately by the presence or absence of payments for the activities, but also professional achievement, as a rule, can be accurately assessed by the amount of money professionals receive for their work.

Humanity had been in the ongoing process of professionalization for the last few thousand years. All spheres of human activity, from the most natural and primary to the most sophisticated and specific, are turned into fields dominated by professionals. A few thousand years ago our direct ancestors were giving birth without midwives, were building their dwellings without architects and builders, were fighting predators and enemies without hunters and soldiers, were eating the food they prepared without restaurants and professional cooks, and were entertaining themselves without paid musicians, professional dancers, or the TV set. Every member of early human society was a carrier of virtually all, or at least most of the knowledge of the community in every sphere.

Today the situation is entirely different. Hardly anyone in the civilized world would consider giving birth without any help (or at least supervision) from trained medical personnel or midwives; or consider building a house just by himself, without builders and architects? What about dealing with dangerous predators, or fighting enemies at the gate? Of course, these dangerous activities are also relegated to professional forest officials and trained soldiers.

The contemporary world is overtaken by professionals, sometimes to an excessive extent. To produce highly technological machinery we need trained pro-

professionals to design and construct it, but surely we could cook our dinner, or do the cleaning of our dinner table or a house, or wash and iron our clothes ourselves. Yet those who can afford it often prefer to eat out for most of their meals, invite professionals to do their cleaning, washing, and ironing. And of course, when it comes to entertainment, for those who have enough money, apart from the most democratic TV and radio, there are an array of professionals ready to entertain them for a fee, from the opera and rock stars or the authors of the musicals and dance productions, to the travel agents, sporting events, or the professionals of the sex industry.

Professionalism has been a mixed blessing for our contemporary world. On the one hand, it allows our society to have all the necessary duties done probably in the optimal way. When we go out in the streets early on Monday morning, we have public transport driven by professional drivers, streets secured by professional police forces, roads maintained by professional road workers, and the lightning and traffic lights provided by licensed electricians. All is fine, and all is running, what else could we want?

On the other hand, we need to admit that many of our fellow citizens are suffering debilitating depression primarily because of the monotonous life they are leading at their professions. If you imagine someone standing behind a counter for five days a week, or someone driving a taxi for many hours every day, or someone preparing the basis for pizzas for five days a week, you can understand why, as it is mentioned in a popular song, “everybody’s working for the weekend.”

And you are mistaken if you think that only low-paid tedious manual work is tiresome for unskilled workers. Highly paid and highly educated professionals, like surgeons, lawyers, university professors, commercial pilots, and even the proverbial rock-stars get depressed by the routine of their professional lives. Escape from this routine is not easy. Sure, if you have money you can enjoy a variety of entertainments on the weekend, or travel to faraway countries to experience a change of climate, environment, and life. But when you are back to the routine, you quickly realize that to maintain interest in life, you have your eyes fixed on the next weekend or holiday. Nassim Nicholas Taleb, a Lebanese American essayist and scholar, said: *“Those who do not think that employment is systemic slavery are either blind or employed.”*

Apart from doing their work, or something that we all “do for a living,” many humans also have hobbies. I am not speaking here about such hobbies as

collecting stamps or beer cans or engaging in dangerous sports to revitalize life. I am talking about creative hobbies, like composing songs, writing poetry and novels, or doing scholarly research. In all these creative spheres there are people out there who are doing the same thing for a living. This chapter is to discuss the intricacies of doing scholarly activities for a living on the one hand, or, on the other side, doing the same thing for the fun of it, without remuneration.

Here a reader might ask me a very reasonable question, “Why should we separate so deeply these two incentives for human activities? Can’t we have a situation in which people are doing for living whatever they love doing? Is anything wrong if humans receive money for doing the things they love to do?”

This is a proverbial million-dollar question, the very heart of our discussion in this chapter. You are of course blessed if you are paid to do what you wanted all your life to do. And still, this seemingly happy balance is not that simple. I will argue that as soon as humans who love doing something, start receiving money for it, a subtle change takes place in the brain.

To better understand the problem, let me bring in this discussion a funny, romantic example. Imagine, the story of Romeo and Juliette just had a Hollywood Happy Ending. So they miraculously escaped grim Shakespearean death and are happily married and live in our society. And even more, they are told, “Hey guys, here is the suggestion that will make you forever happy: you do not need to work any boring 9-to-5 job! Instead, every time you make love, a thousand dollars will be deposited to your bank account!” Imagine the joy of the legendary lovers! What can be better? As they start rolling in money, after some time they might feel that the rot is setting in.

The reason for this rot is that they started looking at the most natural expression of their affection as the source of income, the source of their standard of living, their home or homes, their luxury cars, their holidays in foreign countries. With this subtle change, their priorities gradually change. And if we take into account that in a couple of years the sexual life naturally goes from frantic to moderate, they might start feeling pressure to have more sex than they would usually want. This feeling of obligation will gradually drive their intimate and family life toward discontent. To remain a happy couple, probably the best advice would be for them to start doing some other, usual jobs so that they do not look at their love life as a source of income. Making love just for love does not only sound better, but it also feels better.

"It's probably hard to feel any sort of Romantic spiritual connection to nature when you have to make your living from it," said brilliant American writer and professor David Foster Wallace. As with the example of Romeo and Juliette, imagine paying a mother every time she kisses her child, or paying a cat-loving person for each time she or he pats a cat, even paying a food addict every time he eats, etc. They might be very happy about such an agreement, but it is a dangerous path. After some time, you will see the activity that you loved so much to do, as something that brings you income, and gradually you will feel obliged to do it, to have more income. And as soon as you feel compelled to do something, it is easy to lose the loving feeling towards the activity what you formerly enjoyed. If you like something very much, do it for free; do not accept payment for it.

The same way, if we compare scholars who research for a living with those who do it as a hobby, just for love, we will see some interesting differences.

For professional scholars, science is the source of existence; this is what they do for the living. The sphere that was their early romantic attraction gradually becomes a permanent war with grant-giving bodies on the one hand and with the competing colleagues on the other. They gradually become more concerned with getting the tenure position or a long-running grant funding, than with the development of the sphere they are serving. Some scholars have a very robust personality, and they manage to maintain their initial romantic love towards their field for life, but they are in a significant minority. Probably the most harmful element that kills the primary passion for the research is the general conservative atmosphere among professional scholars, dominated by established big names, names ready to fight any threats to the dominating paradigm. It is this atmosphere of paradigm stagnation that renders miserable and constrained the life of scholars who try to bring about big changes. Professional scholars continuously feel peer pressure; for them, science is a collective endeavor, and they are not free to develop their ideas, but are usually dictated what to research.

Indeed, some research projects require a substantial collaboration and financing, such as the establishment of DNA sequencing. Such collaboration is required when the amount of work is unusually large and complicated, and expensive technical equipment is needed.

Other scholarly research, particularly the projects that bring paradigmatic changes in a sphere, as a rule, is done by single scholars. This was true of identifying the structure of DNA, or the principles of natural selections.

On the other hand, for “free scholars,” who are not doing research for a living, science is a sphere of their passion and remains so as they are not pushed by livelihood necessity to keep doing it. This is what they do for love, for fun, not for a living. Many of them will continue doing this work even if you forbid them. For them, research is the best form of relaxation, and they use most of their free time for research, without noticing how time passes. As they do not need to do research for a living, nor chase elusive research grants, they are free in their choice of research goals, directions, ideas, and methods. In short, they are doing what they please, or, if we remember the small wise quote from Leonardo da Vinci, they enjoy the process of research, as *“To enjoy is to love a thing for its own sake and for no other reason.”* On the other hand, their obsession with the research might also become a problem for their families, as during the weekends it might be almost impossible to drag them away from their hobbies for other activities. For me, these perennial romantic Romeos of the research are the true scholars. Not only for their attitude towards the process of the study, but also (remember chapter two) for their constant obsessive thinking about the subject of their interest. Great scholarly discoveries are only born in such obsessed minds. Many romantic scholars would not mind having money, but they probably know intuitively that money brings a new unwelcome interest, new temptation, the element that might destroy the pure enjoyment of activity for the sake of this activity.

Marie Curie once said:

“Humanity needs practical men, who get the most out of their work, and, without forgetting the general good, safeguard their interests. But humanity also needs dreamers, for whom the disinterested development of an enterprise is so captivating that it becomes impossible for them to devote their care to their material profit. Without a doubt, these dreamers do not deserve wealth, because they do not desire it. Even so, a well-organized society should assure to such workers the efficient means of accomplishing their task, in a life freed from material care and freely consecrated to research.”

Simply brilliant!

New Baby in the Family, or the Birth of a Profession

*Academies that are founded at public expense
are instituted not so much to cultivate men's
natural abilities as to restrain them.*
- Spinoza

Unlike the birth of a new baby, the birth of a new profession in a family of established professions is often a hard-to-notice event. Very often scholars need to search back to the beginning of the new profession, and there are sometimes conflicting views about which of the occasions, and which of the “fathers” of the profession should be considered the definitive pioneer of the new profession.

However, as soon as a new profession is born and gradually established in a society, a new layer of community comes to life. Like a newly born living organism, it requires care and attention, and as it grows, self-survival and self-perpetuation become the central function of all those who are the members of this layer. As a result, we can be sure that they will fight with all means for *maintaining* and the *increase* of the need for their profession. Every profession, as a group of people making a living from a specific activity, naturally tries to increase financial gains for this profession.

The situation is complicated by the fact that members of the same profession usually are not very friendly towards each other. This is easy to understand, as they all are generally in direct competition for limited resources. But on a higher level of the perennial competition, where this profession competes with other professions, individually competitive professionals as a rule, at least for a brief moment, unite, to achieve a common gain. This is very much like in a state during wartime when the state opposition and position combine their efforts to defeat the common enemy. At this moment, all internal problems are forgotten, and all the resources are directed towards the common goal or against the external enemy. Cooperation, as a rule, is an indicator that competition is moving to a higher, group level.

Sometimes, usually in the earlier stages of the development of the profession, this socio-economic fight for status and financial gain happens chaotically. Gradually this struggle occurs in a more organized way, through unions, strikes, and other forms of defense (and offense). The pressure is always directed towards the society, whom all these professions are ostensibly serving. Members

of professions try to increase the need for their business and sell their services for a better (read “higher”) price. Society, on the contrary, tries to get the service for a reasonable price, and if possible, for free. Hence the internal conflict of professionals with the society they are serving.

In a science fiction story, “Good night, Mr. James,” Clifford D. Simak describes a situation when a scholar, Mr. James, with the help of a bootleg clone maker, creates his own clone to accomplish a highly dangerous mission to kill an alien predator he smuggled to the unsuspecting earth. The beast is extremely intelligent and dangerous and escaped from the high-security cell at the moment when it was ready to give birth to the new generation of the ultimate predators. If this happens, humanity and even the entire Earth are doomed. The mission is perilous, and that’s why the clone was created. The clone has all the knowledge the original Mr. James needed to track and kill the predator, but is not aware that it is not a real person. At the moment of accomplishing the mission, the dying predator informs the clone that it is, in fact, a clone of the real Mr. James.

Having all Mr. James’s knowledge, the clone realizes it was created for this mission and with its accomplishment, it must be destroyed. Its first and the most natural reaction is to want to live. It decides before it becomes known that it has killed the predator, to find the real Mr. James and convince him to let it live. It manages to enter unnoticed its “own” house and finds the real Mr. James is not there. After some time, he receives an internal telephone call from Mr. James’s gardener and personal assistant, who informs it that the clone has just arrived at the gate claiming to be the real Mr. James. The gardener was calling was to check whether the real Mr. James was in his office. The clone, sitting in the office of the real Mr. James, directs the gardener to kill the clone as they discussed before. A muffled shot is heard. It’s over. The clone is given a chance to live at the expense of the life of the real Mr. James.

But this is not the end of the story. In the chilling closing scene, the clone receives the call from the bootleg clone maker, saying that in order to avoid clones trying to stay alive after completing their mission (which apparently has already happened a few times), he started putting a slow but deadly poison into clones. The poison has no antidote. The bootleg clone maker’s last words, “Good night, Mr. James” end the story.

Sadly, when it was filmed as a part of the series “Outer Limits,” the story underwent significant changes. Instead of the sinister plot and chilling ending, it

obtained a Hollywood Happy Ending with noble characters of Mr. James and his clone. In the process of hunting the predator, the clone and the real James became friends. The real James decides that it would be better if the clone lives on, so the real James goes on a dangerous hunting mission and kills the predator. But before dying, the predator attacks and destroys the cloned James, who, in addition to the death from the predator, apparently had a poison inserted into his body.

Even if you create a new life for the moment of the need, and you feel the time has come to destroy this new creation, the creation will cling to life with all the means available. Any new profession, like a new life, clings to its existence with the same tenacity.

When a society or a wealthy patron gives a salary to someone for doing something that was never a paid job before, a new potential job is born. It is the act of gaining income that signifies the start of a new profession.

Many professional scholars who receive salary convince themselves they are free. Sadly you cannot be free if you are paid. Doing things for a living and feeling free is an illusion, as you have to follow the demands of those who pay you. Sure, you can argue whether the funds given you are adequate, and you can surely argue that you need to be paid more (that's what all professions do); you can even do some tricks to overblow your significance and the uniqueness of your contribution, and sometimes you can receive a promotion or a better salary. But imagining that you are free is an illusion. And by the way, any hard-earned promotion and better pay, as a rule, comes with more responsibilities, more workload and with more strings attached.

At the same time, we can probably all agree that scholarly freedom is possibly the most critical requirement for the creative development of an academic field. Hungarian polymath Michael Polanyi was right when he argued that freedom is essential for the advancement of science (1958). There are different threats to scholarly freedom. Polanyi was talking about freedom from state control. Obviously, state control can be truly devastating for the development of science.

Examples of Communist and Nazi control of science come to my mind. Here is a crude example from my past in a non-democratic Communist country. In the Soviet Union scholars were forbidden to work on particular topics. For example, they could not work on a subject "American Literature of the 20th Century" since Americans were the ideological enemies for the Soviets. But they

could approach the topic with a small twist in the subject (and title) of study: “Critique of American Literature of the 20th century.” This was a workable topic. Therefore, literature experts who loved American writers of the 20th century, who wanted to be published, employed, or just be in the “good books” of the authorities, were confined to a very narrow line of thinking – seeing only the negative side of the vast output and praising only the works that were self-critical of American life. The general outcome of their research and publications was pre-conceived.

In Western countries with freedom of expression, you can undoubtedly criticize any political decision of any (including your own) government or any scholarly idea. But funnily enough, it is virtually impossible to publish in a peer-reviewed journal a new idea conflicting with the existing paradigm. Indeed, in democratic countries, political leaders do not dictate what to like and what not to like in a narrow scholarly field (well, mostly). But at the same time, it is impossible not to notice that the enormous vested financial interest in maintaining the existing paradigm works no less effectively than the political censorship of non-democratic countries.

Instead of authoritarian political ideology, life in free-market countries is ruled by financial needs. Because of the rule of the economic interests of the ruling scholarly elite, the democratic aspirations of most of the scholars go out the window.

Changing Priorities

The struggle for income and grants for professional scholars is as vital and natural as the struggle for votes and winning the elections for political leaders. And just as politicians use deception, mud-slinging methods of searching out dirt in their political “enemies” family histories, accusing opponents in hard-to-prove issues, and trying to conceal their own weaknesses and mistakes, established scholars use their authority of peer-review to push away new ideas and maintain the status quo. And do not forget, peers have a huge advantage: they can always mob the freethinker since there are always many more conservatives than freethinkers.

This is not a calculatedly malicious process, so I am not accusing scholars of deliberate corruption. The power struggle between the “good for science” and “good for peer community” goes on almost entirely at a subconscious level. As

soon as your financial well-being is connected to the maintaining status quo, your brain will automatically find ways to convince you that those who want to destabilize the status quo are the enemies of science. And most importantly, of course, they are totally wrong in all their new ideas. Even if you (and others from the peer community) cannot point out the inconsistencies in the new threatening idea, no need to be afraid: a sharply-worded, critical letter signed by a big number of professional scholars is always an imposing weapon.

It is sad, that jobs in a scientific field, like any other professional job, are treated by most scholars primarily as a feeding place (or possibly as a wrestling place for funding), not as a sphere that opens more possibilities to further development of science. We all know that scientists should serve science, but in reality, in most cases the opposite is true: it is science that serves scientists.

It is not a secret that wars make the military wealthy. Similarly, the biggest medical threat, pandemic, makes doctors wealthy. If you find this hard to believe, read this: “Many businesses, especially those in the service and entertainment industries, suffered double-digit losses in revenue. Other businesses that specialized in health care products experienced an increase in revenues.” (Garrett, 2007).

Please, remember again, I am not talking only about the corrupt, immoral military who sell arms to their enemies or doctors who subvert clinical data for material gain! The dependence on income makes most of the professional military and healthcare providers consider income their first priority. A military that is truly trying to eliminate conflicts and a doctor thinking more about human health than income are heroes, often not appreciated. They are not only unappreciated but are sometimes viewed as an enemy by the peer community. Let me ask: how many generals would introduce a reform that could lead to a decrease in military conflicts if such reforms will lead to a gradual decrease in the need for military services? How many doctors will support a simple free method that can help many sufferers if such a method will decreasing funding for professional medics?

Sadly, from a more distant view, we can see that the military does not serve peace, doctors do not serve public health, and scholars do not serve the development of their fields as their first priority. Sorry, of course, they do, but I want to repeat: this is not their first priority. All of them are primarily serving the interests of their paying client, their corporate interest, professional peers, their own wellbeing, income, and status. Individuals with exceptional integrity who

do not fall into this category of military, doctors, scholars are always very few, and they often are mobbed by the majority of peers.

Struggle for economic benefits can take various forms. For example, on the one hand, no one would argue about the merits of education. “If you think education is expensive – try ignorance,” says one of the most contested quotes. On the other hand, there is an important question to ask: who is the target of this saying, a parent, a government, or both? In any case, this saying can be also viewed as a usual professional ultimatum and blackmail from education professionals. People of other professions can easily modify these words into sister-sayings: “If you think paying air traffic controllers is expensive – try flying without them”, or “If you think rubbish removal is expensive – try not removing it,” or “If you think keeping defense forces is expensive – try being defenseless!” What a fertile background for professional blackmail and strikes in a perennial competition for salary raises!

Very seldom do you hear professional scholars discussing some burning issues of their field even during academic conference meetings after the boring sessions where they must adhere to their professional topics. As a rule, in their private conversations, they are discussing job and publication opportunities, the possibility of new Ph.D. students, or more importantly, new funding possibilities. This does not mean they are not dedicated scientists because they do not try to talk about their passion for science every free moment like obsessed lovers. This only means they are preoccupied with the fleeting character of their grants, by the uncertainties of their field of scholarship, where the change of paradigm might threaten their job. Our society, our governmental policies create such a stereotypical type of scholar, the one who must think constantly about making a living. As scholars try to make a livelihood with their research, this perennial effort becomes the first priority, obscuring their initial romantic desire to serve the progress of science.

If you are a paid member of a scholarly (or military, or medical, etc.) establishment, be aware of this hidden danger. Remember, that the “establishment” naturally wants to maintain what is already *established*. What the establishment wants is often not what the majority of citizens want and expect from them. There is always a conflict of interest between the public and the professionals. Mentioning the word “conspiracy” in Adam Smith’s widely known words describes this clash of interests quite well.

True establishment members cannot be revolutionaries. Renegade establishment members or total newcomers make the best-known revolutionaries who really try to bring about the new radical ideas. There are rare cases of professional experts who do not lose the initial passionate love for their fields, and do not substitute their scholarly interests and aims for the interests and aims of their own career and comfortable life.

This is a problem for not only scholars. Most rock artists and groups, as soon as they receive lucrative contracts for their music, are “tamed” and become money-making machines instead of continuing to express their revolutionary ideas about changing the world through their music. Elvis Presley was a good example of this. After becoming a symbol of a new revolutionary style singer, he was tamed by industry professionals, who were experts in making more money from his second-rate films than from his recordings. This is the price of professionalism. Professionals first of all serve their own interests. They do things for a living.

So my idea is simple: as soon as you receive money for your activity, there is a dangerously steep, tempting possibility of gradual corruption of your attitude towards your beloved activity. The best things in life are free, including scholarly ideas.

Here is a dangerous (but potentially effective) piece of advice if you are a part of the establishment and are ever annoyed by someone’s revolutionary attitudes: give the revolutionary thinker a good salary and position for their annoying activities. Most rebels can be tamed this way. Very few can still remain romantics and revolutionaries after reaching fame and riches. The reason for this transformation is in human nature. When people express revolutionary ideas, their first desire is to get noticed, then to get recognition of their correctness and importance. As soon as their importance is acknowledged by their higher status and position, and their life quality is assured, they become a part of the establishment, reluctant to see new revolutionary ideas from others, as most of their revolutionary energy drops drastically.

Money and power and the requirements of true scientific progress often are irreconcilable enemies.

Do You Get What You Pay for or Are the Best Things Free?

It is not the man who has too little, but the man who craves more, that is poor.
- Seneca

Money is a terrible master but an excellent servant.
- Phineas Taylor Barnum

Freedom from financial need is very important for the advancement of science, no less than freedom from state control. Unfortunately, freedom from financial need is much more difficult to achieve. A state is an external enemy for scholars, much more powerful than they are, but still external. Financial conflict is internal to the world of professional scholars. It is based on the division of scholars into different camps, with the established scholars acting like the conservative force, and on a higher level, all of them depending on the grant and position distributing authorities. Such a conflict of financial interests of various groups, when one group is in charge of distributing most existing resources, always brings corruption. Corruption has many faces, not just the most basic and obvious forms of taking bribes or altering documents. Corruption can be very subtle and even subconscious. When there are apparent financial gains and losses, a certain level of corruption is unfortunately unavoidable.

Think of this internal conflict in the world of professionalism: what is suitable for a professional might not be suitable for another member of the same profession, and what is good for the members of a specific profession, might not be good for the members of another profession, or the community at large. We have already mentioned that the periods that are bad or even disastrous for a greater society might be the most lucrative for certain professions. The state budget for the military during the wars or the budget for medicine during significant epidemics is understandably high. Similarly a major volcanic eruption is a disaster for the community or even a country, but for vulcanologists, the explosion might be a goldmine.

We know too well from industrial history how workers have destroyed the machines that were denying them a livelihood, although the same machinery was a sign of progress reducing heavy physical work. A conflict between the needs of a viable economy and the needs of workers to keep their jobs led British coal miners to massive strikes with plenty of unfortunate violence involved. Military powers need to have enemies of the state to justify expanding their budgets. As I am writing these words, a couple of countries, like North Korea

and Russia, are behaving aggressively, threatening stability and peace in Europe and world, and as a result, we can be sure that the military budget of the USA and NATO will experience a surge.

We know about a universal hatred towards new migrants from a number of professions as migrants are taking over “their” workplaces, although the same migrants are often welcome to the broader community who enjoy their services and affordability.

We know that many newspaper editors hate the internet news that has limited the number of their readers, although the greater community enjoys the free and available source of information on the internet.

We know that publishers of traditional encyclopedic editions generally loathe the free online Wikipedia that reduced their readers and the need for academic sourcing and expensive production, although Wikipedia often became the only source of readily available and free (and not necessarily worse than the best possible academic encyclopedias) source of information for billions of people. We will discuss the case with Nupedia and Wikipedia soon, but let us make some conclusions.

The general conclusion of all these examples from history is not very encouraging: every member of the professional group is primarily acting in the best interests of the well-being of their profession, not for the general good of the greater society. In a way, professions act as selfish units with their agendas, outside of common agendas of the community. Continual fighting for higher material gain from virtually every professional group is the central force that drives the well-known process of annual inflation in the world’s free market economy.

Wikipedia, or the Revenge of Altruistic Romantics

If you don’t value your time, neither will others.

Stop giving away your time and talents.

Value what you know and start charging for it.

- Kim Garst

Money is essential for professionals, no question about that. It is fair, of course, that when a person, who is considered to be an expert in the field and who most likely spent years and finances to become an expert, should be rewarded financially. After all, if you are making a living from a sphere of your expertise,

you cannot go around giving your time and knowledge for free. It's simply not fair.

The life of professionals is not as simple and straightforward as it might seem to non-professionals. To start with, there is an intense competition among professionals, all boasting having their education from the best universities, trying to lure clients with their promises, stories of their success, expensive ads, and sometimes even with lower fees for services. Lower prices are not encouraged by the professional bodies and institutions that are in a perennial fight with a wider community to push the fees for professional services higher. Self-respecting full professionals look down on colleagues who try to get more clients with prices lower than the standard professional fees. But the worst nightmare is that apart from competing professionals, in some spheres there are other humans, often amateurs, who are providing the same services for free.

Apart from pure altruistic feelings, this free sharing of time and expertise often comes from the fact that those who give their time and knowledge for free, are making a living from some other sphere. Do not make mistakes; not everyone who is making a living somewhere else is so altruistic as it might seem. Some amateurs try to sell their expertise and inventions as well, and on rare occasions, they are incredibly successful (think of Leonardo da Vinci or Thomas Edison). This is fair by all accounts. But a goodly proportion of expert-amateurs are happy to share their time and expertise for free, mostly for the comforting feeling that their knowledge and expertise is needed and acknowledged by the community. For sure, at least some of them would not mind if there was money for their activities, but even without money, they are happy and content to share their time and skills.

Such expert-amateurs who make the world a better place for the broader community are naturally seen as competitors by the paid professionals. The birth and success of Wikipedia is an excellent example of this kind of conflict.

The original idea behind the online encyclopedia, as readers might remember, was very different from Wikipedia as we know it today: Jimmy Wales and Larry Sanger wanted to create an online encyclopedia, free for all users, written by formally educated scholars of the appropriate field (preferably with Ph.D.s), and checked by other formally educated scholars through a full peer-reviewing process. The name of the online encyclopedia was Nupedia. The crucial idea behind this project was the belief that professional scholars, with full creden-

tials and formal education in their field, would be willing to provide their expertise and time free for the good of humanity.

The central problem that destroyed the noble idea of Wales and Sanger was the simple fact that most professionals, to put it mildly, are not very enthusiastic about providing their time and expertise free of charge. Another, lesser problem was the feared peer-reviewed mechanism that was slowing down approvals. The overall result was quite disheartening: within a year after the announcement of the idea and invitation of scholars, Nupedia produced only 21 approved articles. After the first year, Nupedia slowed down even more, and by the time it was decided to close the project (in September 2003, four years later), only 25 articles were approved, and 74 more were in the process of approval. Even if we count all the unfinished ones (about 100 in four years), with this speed to reach the current volume of Wikipedia (5,000,000 articles) Nupedia would have taken about 200 000 years.

Wikipedia was a side-project of the more serious and ambitious Nupedia. Only after Nupedia's agonizingly slow start was more thought given to the idea of Wikipedia, and its success surpassed all expectations. In the first year, 18,000 articles were produced, and then the speed increased. In three years, the number of articles was in hundreds of thousands, and more than 160 different language editions of Wikipedia were in progress. Jimmy Wales and Larry Sanger, arguably the two most prominent figures of the Wikipedia project, found themselves in different ideological camps, Wales full-heartedly supporting the all-inviting Wikipedia approach, and Sanger opting for a more conservative, academically written, and peer-reviewed approach.

Today Nupedia is so obsolete that even Microsoft Word does not recognize the spelling of this word. On the contrary, Wikipedia is the fifth most visited website in the world. Let me predict that be any attempts to make Wikipedia a peer-reviewed and closed (even partially), it will die. At the moment, those who edit Wikipedia mostly do so for personal interest and love of the subjects they put their time and energy. Professionals do similar things (writing, editing) for money, not for love.

There is a famous joke about Wikipedia: *"The problem with Wikipedia is that it can only work in practice. In theory it can never work."* The funny thing about this saying is that this view of Wikipedia as a cheap, impossible-to-trust source comes from the popular view that the best knowledge can be found only among highly paid professionals, who do this for living. From the popular

point of view, amateurs can never be as good as professionals. Well, those who stick with this view should not forget such amateurs as Charles Darwin, Alfred Wallace and Gregor Mendel, who were not worse than the certified scholars of their day.

With its “hippie” philosophy, accessible and cheap for everyone (free internet most likely will be the future), making the exchange of new ideas easy, the internet heralded the slow death of closed professional circles where insiders tried to conceal their professional secrets from the general public. Wikipedia is gradually becoming a symbol of the fight against the scholarly establishment. Professionals will have to accept that not all brilliant minds come from within the limited circle of academics with Ph.Ds.

Few topics have received so much heated discussions in mass media and professional journals as Wikipedia. Many commentators noticed an undeniable fact that Wikipedia represents an economic threat to publishers of traditional encyclopedias: will any other general encyclopedia be published in 50 years? Prominent American writer, finalist of the 2011 Pulitzer Prize for non-fiction, Nicholas Carr wrote in his widely known 2005 essay, "The amorality of Web 2.0":

“Wikipedia might be a pale shadow of the Britannica, but because it’s created by amateurs rather than professionals, it’s free. And free trumps quality all the time. So what happens to those poor saps who write encyclopedias for a living? They wither and die. The same thing happens when blogs and other free on-line content go up against old-fashioned newspapers and magazines. Of course the mainstream media sees the blogosphere as a competitor. It is a competitor. And, given the economics of the competition, it may well turn out to be a superior competitor.”

The issue of quality became a point of much discussion. There had been special studies of the relative quality check of Wikipedia, compared to arguably the best professional encyclopedia available, the *Encyclopedia Britannica*. One of the most prestigious professional journals *Nature* concluded that the accuracy of information was very close between them. The *Nature* article then was criticized by supporters of *Encyclopedia Britannica* and was subsequently given a rebuttal by *Nature*. The most eligible criticism of Wikipedia was (and still is) that the articles are not written in the best possible style. It is hard to imagine having this criterion fulfilled by the Wikipedia articles as many articles are con-

tinuously edited and new bits of information are added by separate editors to the existing text.

Let me add my personal experience of the *Encyclopedia Britannica* and Wikipedia. I was born in the former USSR Republic of Georgia and came to a Western country (Australia) in 1995 when I was 41 years old. I was thrilled and overwhelmed by the abundance and freedom of the available information. I remember when for the first time I went to a local library and saw the famous *Encyclopedia Britannica*, I immediately tried to indulge in reading an article about my lifelong role model, brilliant writer (his book was published among Oxford World Classics edition), pioneer tiger conservationist (whose name was given to the first national park in India, and to a tiger subspecies), legendary Jim Corbett. I had a lifelong fascination for him, read his books while still in the Soviet Union (in Georgian and Russian translations), and was excited to learn about him in the best Western encyclopedia.

I had one of my biggest disappointments in the library. There was no article about Jim Corbett in the *Encyclopedia Britannica*! I was so disappointed and even angry that I wrote a critical letter to the publishers of the *Encyclopedia Britannica*.

In Georgia, I had some firsthand experience in the creation of a professional multi-volume encyclopedia as the Head of the Board Experts of Georgian Traditional Music of the Georgian Soviet Encyclopedia. I remember very well how we had to work out which traditional performers or which traditional songs were to be included in the encyclopedia, and which excluded, and of course the size of each article was strictly limited. And although I agree that the *Encyclopedia Britannica* is rightfully considered one of the best produced in history, every time I hear its name, the painful experience of not finding there an article about Jim Corbett in 1995 comes to my mind. By the way, the article about Jim Corbett is missing in the most recent 2010 edition and in the current online version as well. The first Indian national park, named after Jim Corbett, is there, the boxer Jim (James) Corbett is there, but the world-famous bestselling author, pioneer conservationist and humanitarian Jim Corbett is still missing.

To my delight, and that of many thousands of Corbett fans all over the world, Jim Corbett appears in Wikipedia. And more, there are separate articles about the house where Corbett lived, his most prominent book, a Hollywood movie based on his story, and even several articles dedicated to the best known man-eating big cats hunted by the legendary hunter and conservationist. This is

another significant difference between the *Encyclopedia Britannica* and Wikipedia: the volume. The newest edition of the *Encyclopedia Britannica* has impressive 120,000 articles, but still very far from Wikipedia, which has over 5 million articles and growing.

So if the quality of the most complex science articles *Encyclopedia Britannica* and Wikipedia are at least comparable, there is no comparison whatsoever of the volume of the subjects covered, much less the availability of Wikipedia, free of charge for anyone with the internet. This reveals a fuller picture of why even those who loathe Wikipedia use it in everyday life more than professional encyclopedias.

Now let me add another comment responding to the words that Wikipedia might be “a pale shadow of *Britannica*.” As mentioned, I know many aspects of how professional encyclopedias are organized and written, as, besides my professional involvement in the *Georgian Soviet Encyclopedia*, I have written a number of articles for the most prestigious Western academic musical encyclopedias, including *The New Grove Dictionary of Music and Musicians*, and *Garland Encyclopedia of World Music*. So, a few years ago I had a look at the Wikipedia article on the Georgian song *Suliko*, an urban song from the 19th century, one of the best-known Georgian songs. The fact that astounded me was that the Wikipedia article contained information unknown to me. How was this possible?

The answer is simple. If the article in a Nupedia or another professional encyclopedia had been written by a guy like myself (an expert in the field with a Ph.D.), in Wikipedia the article was written *collectively by combining forces of several volunteers*, most of them probably amateurs. The feature uniting all the contributors for this article is that they are fascinated by this song and are unsung world experts of this particular song. This is the strength of Wikipedia.

When you consult a Wikipedia article, you are receiving the combined answer from the most dedicated fans of this subject from all over the world. Of course, sometimes you can feel that not everyone agrees on the statements there, as various enthusiasts have different ideas about the object of their passion, but this is the nature of collective human knowledge – it gradually grows, obtains new facts, struggles between conflicting opinions, and evolves over time.

Let me propose that the collective knowledge is always superior to the knowledge of a single person, at least in terms of knowledge of various facts

about the phenomenon. I would suggest consulting Wikipedia articles not only for quick and superficial reference but also as a way to widen the point of view of the existing facts and various ideas on this phenomenon. I am sure that if Charles Darwin and Leonardo da Vinci lived today, they would be Wikipedia enthusiasts and contributors.

As the years pass, it will be noticed that we will learn about more new exciting and promising ideas from open Wikipedia than from closed and somehow mysterious peer-review-based conservative journals with their subconscious nepotism-fuelled competition between vested interests. Inherently, professionalism is about competition, but gaining knowledge is more effective when it is shared. Full egalitarian access to the facts of knowledge should be amongst the most democratic things life can provide. We are stronger when we are ready to freely share our energy and knowledge, than worry about the means of living out of our sphere of activity. The lesson with the two very different encyclopedias, Nupedia and Wikipedia, is a telling example.

We know from history that when free and diversely-thinking researchers become involved in “serious” things, with higher prestige, more responsibilities and a better income, their research activity often suffers gravely.

A couple of years after the publication of his ground-breaking research on genetics in 1869, Gregor Mendel was elevated as abbot. So what happened? His scientific work largely ended, as Mendel became consumed with his increased administrative responsibilities, especially a dispute with the civil government over their attempt to impose special taxes on religious institutions. It was good luck for the history of science that Mendel was not appointed to the high position a few years earlier.

One of the founders of the contemporary Georgian music composition school, and Georgian ethnomusicology, Dimitri Araqishvili is another example. After becoming a rector of Tbilisi State Conservatory, his research activity suffered greatly.

Russian physical anthropologist, Valeri Pavlovich Alekseyev is another example. When he was made the Director of the Institute of Archaeology in Moscow, his research also suffered. He was an exceptional human and scholar, halting his career by refusing to become a member of the Communist Party, and refusing to become the director of the Institute of Archeology. It was difficult for others to assume that his research suffered, but during the last years of his life, he complained to me about the lack of free time to follow his passion for

the research. It is not a mystery that many more examples of such sad cases of high positions bringing decline of research activity can be found in the history of science.

So if you are a scholar and enjoy your intellectual freedom, try to keep away from high ranking and often lucrative administrative positions; be content and happy with the freedom you have. This is usually a difficult choice, of course, but you will feel internally unsatisfied if you chose money and position over intellectual freedom. As soon as you accepted a lucrative and high-ranking position, as a rule, you lose your intellectual freedom. Remember, paid professionals are never entirely free in their choices.

As quoted at the very beginning of this chapter, *“If you don’t value your time, neither will others. Stop giving away your time and talents. Value what you know and start charging for it.”* Professional scholars invited to create Nupedia followed this very wise and practical advice intuitively, even if they were not aware of Kim Garst’s quote. On the other hand, not contradicting, but still somewhat different advice came from Winston Churchill: *“We make a living by what we get, but we make a life by what we give.”*

Why Do We Love Professionals?

If we had a chance to complete a character check of the political prisoners around the world, it would be logical to expect to find the level of sincerity among the prison population to be much higher than in the general population. It is ironic how the level of honesty, authenticity and inner freedom correlates with real-life troubles, including imprisonment. Of course, the punishment society puts on sincere citizens does not always have to be as drastic as imprisonment or execution. In the case of contemporary scholars, for example, this often translates into much less radical ways of punishment. These ways can be a much more peaceful and civilized as polite rejection letter from the peer-reviewed journals, or rejection of the tenure positions at universities and grant-giving bodies, or just neglect for the new potentially ground-breaking ideas.

Is it worth asking who is in the all-powerful grant-awarding committees? It is not difficult to notice that out of ten categories of scholars described by the Science Council in the previous chapter, the fate of competing ideas is *not* decided by the scientists who are moving the science forward, but by other categories of scientists, like “business scientists,” and “policy scientists.”

Free creativity does not go along very well with strict money-oriented business needs and policy requirements.

On the other hand, it is fascinating to see how the emotional commitment and true sincerity win the hearts of viewers in the arts. About a year ago, during my search for the various aspects of the world of professionalism, I happened to check the movies with the title “professional” and was thrilled to notice an interesting tendency, which revealed an unexpected response to the question of why we love professionals.

There are quite a few films with the title “professional,” which show the widespread fascination with the mastery of professionals. Movies about professional killers and gunmen are naturally among the first to come to attention. They are invincible, those professional gunmen. They can accomplish unbelievable things, can fight an overwhelming number of opponents, and we are naturally set to believe everything, as they are professionals, they do this for a living. And still, despite a popular fascination with professionals who do the job for a living, they are particularly loved, and movies are made about them when they abandon their professional duties and strict rules of the deadly game and put human emotions above their professional responsibilities.

One of the best-loved films on this topic is the 1994 film “Professional” by Luc Besson, sometimes known as “Leon the Professional.” We start truly sympathizing with the professional killer when he begins going against his professional principles and putting his feeling for another person ahead of the strict professional rules of the game. When in the middle of the night Leon cocks his pistol and puts it to the head of the unsuspecting sleeping teenage girl, he behaves like a true professional killer, who should not have feelings for anyone and should not be associated with anyone who might jeopardize his safety or professional integrity. When, after a few very tense seconds (or as my favorite writer Jim Corbett once put it, “during a few heartbeats”), he takes the gun away from the girl’s head, we know his professionalism is defeated by simple human empathy and a feeling of care. It is this strength of his human side that makes the rest of his life worth living, and that gets him killed in the end. But he won the hearts of millions, and his life finally had a worthy goal.

In another movie with a similar name, 1966 American western by Richard Brooks, “The Professionals” with Burt Lancaster and Lee Marvin, has a similar element of conflict of human emotions and contractual professional obligations. Hired professional warriors neglected their contractual obligation when

they found out the dirty motives of their paying client. So, they ended up helping the enemy that they were fighting against the whole movie. Again, professionals discarded their professional duties and became closer to us.

There is also a French version of the professional warrior, 1981 Georges Lautner film “Le Professionnel,” starring Jean-Paul Belmondo. In this film, when the goal of the mission changes, the hired gunman, instead of understanding the rules of the political game, goes against the new political rule and against everyone. So, he follows his conscience, still kills the dictator, along with many of his former colleagues whose professionalism is difficult to reject. Here also, the human element is above the professional understanding and cold execution of the mission and political realities. And like Leon, the hero of Belmondo also dies at the end of the film, after abandoning his professional duties.

There is also a beautiful Serbian drama-comedy, again titled as “Professional,” in which a professional state security agent, who was following a political opponent, suddenly shows his human side, saves his life, and become a friend of his political enemy.

Some famous detectives also fall under the spell of intense emotions and behave against their professional duties. Sherlock Holmes, my favorite literary hero, let the murderer go free in one of the best short stories by Conan Doyle – “The Adventure of the Abbey Grange.” Another legendary detective, Hercule Poirot also lets the murderer, more precisely, a group of murderers, go free in the story “Murder on the Orient Express.” Readers, very much like myself, love such unprofessional deeds from professionals!

Yes, we are fascinated by professionals, by their mastery of the trade, and their neglect for the difficulties and dangers of the business. But we still want to see them over everything as humans with emotions, not cold-blooded professionals. We want them to neglect their contractual obligations for the sake of their feelings towards another living being. Love and compassion are still the higher authority in our hierarchy of sympathies, higher than our fascination for professionals.

Scholars are the same. We like scholars when we are fascinated by their personality. We want them to be noble and generous spirits. Darwin again is the best example of this kind of scholar. He is tremendously loved not only for his theories but for his amazingly warm and gentle personality that had true passionate sympathy for disadvantaged, like slaves and animals. In a 1857 letter

to Huxley, he wrote with sincere disgust: *"Alas! A scientific man ought to have no wishes, no affections – a mere heart of stone."*

Here is what American philosopher and animal activist, James Rachels, wrote about him:

"A few years ago I set out to canvass the literature on Charles Darwin. I thought it would be a manageable task, but I soon realized what a naïve idea this was. I do not know how many books have been written about him, but there seem to be thousands, and each year more appear. Why are there so many? Part of the answer is, of course, that he was a tremendously important figure in the history of human thought. But as I read the books - or, at least, as many of them as I could - it gradually dawned on me that all this attention is also due to Darwin's personal qualities. He was an immensely likeable man, modest and humane, with a personality that continues to draw people to him even today. ... Darwin's strong feelings about slavery are expressed in many of his writings ... His comments there are among the most moving in abolitionist literature. But it was his feelings about animals that impressed his contemporaries most vividly. Numerous anecdotes show him remonstrating with cabdrivers who whipped their horses too smartly, solicitously caring for his own animals and forbidding the discussion of vivisection in his home. At the height of his fame he wrote an article for a popular magazine condemning the infamous leg-hold trap in terms that would not seem out of place in an animal-rights magazine today" (1993:152).

Alfred Russel Wallace, the closest spirit to Charles Darwin, and the co-author of the theory of Natural Selection, rivalled Darwin in his generosity and selfless disposition.

We also love Linus Pauling for his passionate involvement in social matters, from maintaining peace in the world to helping humans to overcome the common cold or other diseases. Very much like the professional killers who abandon their contractual obligations or professional detectives who let the killers go free, we love scholars who follow their emotions throughout their lives, sometimes at the expense of the advancement of their career and neglect the rules of conduct of their professions. It is also easy to see that it is the expression of empathy and love by those on the screen of the cinema or TV set that wins the viewer's hearts. In every professional artist, musician, sportsman,

scholar, politician, we value first of all their human qualities. For example, the music of Johannes Brahms is rightfully considered among the best that classical tradition left to humanity, but every time I hear his music, I cannot help remembering how insensitive and rude he was to his fellow humans and other musicians, or how he hated cats.

Fearless maverick scholars who are ready to follow their inner convictions, to challenge the status quo, and to work on tabooed topics, also have a chance to win wider popularity. I am talking about some taboo topics that serious scholars are not supposed even to discuss, let alone put advocate. Which professional scholars would, for example, discuss seriously the possibility of the existence of the mythical Bigfoot? In the contemporary academic world, the issue of Bigfoot is almost on the same level of probability, as the story of Santa Claus—zero. And still, at least a few scholars have the courage to voice their beliefs that not all the evidence of the presence of Bigfoot is easy to dismiss.

Grover Krantz, a Serious Scholar who Studied Bigfoot

Probably the scholar who contributed the most to recognizing this topic as a possible issue for serious study was Grover Krantz, a professional anthropologist and primate expert of the highest international standards. His undergraduate studies began at the University of Utah in 1949 but were postponed in 1951 by 18 months of service in the United States Air Force. After being honorably discharged, Krantz attended the University of California, Berkeley and earned his bachelor's and master's degrees in Anthropology. In 1970, he received his doctorate in physical anthropology from the University of Minnesota. Krantz was considered a leading authority in hominoid evolution and an expert on primate bone structure. Between 1968 and 1998, he served as a professor of physical anthropology at Washington State University in Pullman, Washington. Among his publications are the books *Climatic Races and Descent Groups*, *The Process of Human Evolution*, and *Geographical Development of European Languages*.

His broad research interests included the origin of language and speech, sex identification of skeletons, and early human immigration into America. He brought his academic rigor to many other topics, from a unified field theory in physics to how World War II should have been fought, or how English spelling should change to a phonetical one. His associates and friends remarked that he

was a genuinely kind and sometimes too honest man who wrote a novel called *Only a Dog*, about his life with his first of three beloved Irish wolfhounds, Clyde. Revered among his academic peers loved by his students, Krantz was publicly wider known for his interest in cryptozoology (a so-called pseudo-scholarly sphere that studies animal species not yet known to science), as he was one of the first established researchers to pursue the question of Bigfoot, or Sasquatch, from a serious scientific approach.

When he first arrived to teach anthropology at WSU in 1968, he was asked to look at some huge footprints found near Colville. Krantz made casts and studied them, expecting them to be a hoax. Very unexpectedly for the expert on the bone structure of primates, he found important evidence in the footprint of compensation for broken bones. Krantz didn't think anyone attempting a hoax could have constructed such elaborate detail. Later, looking at similar prints in The Blue Mountains near Walla Walla, he found "dermal ridges"—the lines in the skin that also create fingerprints—on footprint casts. He verified his doubts with the expert-criminologists. He believed the evidence couldn't have been faked and started writing rigorous scholarly articles for peer-reviewed journals. Despite his high academic status, none of his articles were accepted, as no established academic wanted to discuss or sometimes even to have a look at the writings on such a topic.

This was not the first time Krantz went against mainstream scholarly beliefs. For example, many in the scientific community used to believe a fossil primate from about 14 million years ago known as *Ramapithecus* was the first branch of the ape family to diverge and eventually evolve into humans. Krantz was one of the first to argue against it and helped prove it false. He was also the first who proposed that the final element that created modern human facial anatomy was the emergence of speech. But of course, the topic of Bigfoot was very different. It was a "fringe science", "bad science", a "pseudo-science", you name it. To maintain his scholarly freedom, Krantz did not associate himself with any of the mainstream academic groups and did not apply for grants.

Jeff Meldrum, a professor of anthropology and primate anatomy expert at Idaho State University in Pocatello, thinks the scientific community lost something in its rejection of Krantz' work on Bigfoot – objectivity and an open mind. Though it indeed remains unproven that a creature like Bigfoot does exist, Meldrum said, it is the obligation of scientists to consider all the evidence. Krantz tried to do exactly this. Skeptical at the beginning, he became a vocal

supporter of the existence of the Gigantopithecus, an unusually large primate species believed to have become extinct about 100 thousand years ago. Despite widespread criticism and damage to his professional reputation, Grover stood by the scientific evidence he gathered and the methods he used to support the existence of Bigfoot.

Luckily for Krantz, as it is well-known to scholars, not finding the evidence does not prove the absence of the artifact. So the search continues, and although most of us do not believe in the existence of Bigfoot, as scholars, we probably all can agree that we should keep an open mind, check all the available evidence, and consider all possibilities. Let me repeat myself: we make our biggest mistakes not when we are hesitating, but when we are absolutely sure.

Garrincha: Sporting Star who did not Care for Money

I want to give one more example of the highest-ranking professional, this time sportsman from the world's most popular game, who did not care for lucrative contracts.

If you are a football (soccer) fan and happen to go to Brazil, the country of "Futebol," you might have a few conversations about soccer, and the name of Garrincha (or Mane Garrincha) might be mentioned in the context of the glory of Brazilian soccer. Garrincha was one of the best players soccer has ever seen. In the 1999 FIFA Grand Jury Vote for the Player of the Century, he came in 7th. On top of this list was another, more famous Brazilian, Pele. But do not be surprised if a Brazilian soccer fan you might happen to talk to (most of the 200+ million nation are knowledgeable soccer fans) expresses the opinion that Garrincha was better than Pele. Garrincha was the key player together with Pele in the 1958 World Cup, and he clearly was the best player of 1962 World Cup, which he won for Brazil virtually singlehandedly.

Most importantly for our discussion of the remuneration that professionals receive, Garrincha was unique. It is probably impossible to find another professional sportsman who would equal Garrincha in his disdain for money. He was known to sign blank contract papers without even asking how much he would be paid. And unfortunately, his behavior was heavily taken advantage of until his second wife, star-singer Elsa Soares, started to pay attention to the abuse of the club managers towards their star player. "Garrincha deal" is now a saying in Brazil for a very unfair contract. Apart from his unusual disdain for money, Gar-

rincha had a congenital physical condition very unusual for a soccer player – deformed legs, in addition to one leg being shorter than the other. Although immensely talented, good looking, and popular with women, he was not actually interested in playing soccer professionally, and it took several invitations and tries to bring him to the Brazilian club Botafogo.

Garrincha also did not bother about winning. Very often he did not bother even to know which team he was playing against or the importance of a particular game, even when he was playing for the National team. For example, after his first appearance in World Cup in 1958, against the USSR, the deciding game for Brazil to continue the tournament or to go home defeated, Garrincha was surprised to learn that the defeated team of Soviets was out of the tournament. Even more, according to some sources (World Cup 2006 Guide. *The Guardian*, June 5, 2006. p. 100), Garrincha was surprised to hear that after their 5:2 win against the Swedes that gave Brazil their first World Cup, the tournament was over and that they were crowned Champions of the World. He thought there would be a second leg of the games. He enjoyed the game without the fuss about the result.

Despite his being one of the greatest players soccer ever saw, Garrincha was not by personality a “professional.” Garrincha played the game for sheer enjoyment, as a social entertainment, and was totally irresponsible towards the material needs of the team, like winning or scoring a goal. During the game, irrespective of its importance and the score, he was constantly improvising with the ball, changing angles of attack, dazzling defenders, and often causing laughter among the spectators. It was impossible to predict what he would do next. And we need to add to this mixture his phenomenal ability to pass any defender. As a result, Garrincha was a delight to watch. Even the spectators of opposing teams often loved him and his game. It is not accidental that Brazilians gave him the name “joy of people.”

Garrincha suffered for his carefree attitude. First, he started professional soccer later than most of the other professional sportsmen – at the age of 20. Frankly, he was not interested in playing professionally, and was happy to play in his town club side in Pau Grande, 60 Km from Rio, without payment, and go to the pub with his friends after the game. He appeared in the Brazilian national team very late, at the age of 24, although he had been dazzling fans for a few years. He was considered too irresponsible for a serious game, the game which

is, as Bill Shankly famously said, not a matter of life or death, but something much more important.

Les Murray, a brilliant Australian soccer commentator of Hungarian descent, made a pilgrimage to Pau Grande, where Garrincha was born, and called Garrincha “the soul of soccer.” Garrincha did not care much for the official training sessions of his club, which he would skip in order to play in his hometown with his friends.

Because of his relaxed attitude towards winning and for the team’s material needs, Garrincha was the perfect player to rely on in difficult moments when the Brazilian National team was losing and was feeling distressed. Brazilians famously dislike coming up from behind, as they become touchy and uncoordinated. Garrincha, on the contrary, with his disdain for the result of the game, was still game to go through the defense of the opposition and create scoring chances. In the historic day of Brazilian football, 29 June 1958, during the World Cup Final game, after the Brazilians disastrously conceived the first goal from the hosts, Sweden (a few Brazilian fans died that dark moment), Garrincha changed the rhythm of the game. Starting from the center of the field, Didi, the best player of 1958 World Cup, and the master-conductor of the great Brazilian team, gave the ball to Garrincha, he went straight into the daring attack, and a couple of minutes later, Brazil equalized after his dangerous cross, and generally, it was from his surgical crosses that Brazil scored two goals and believed they could finally become the champions of the World.

Garrincha’s relaxed attitude towards the result of the match was not always valued. On the contrary, he was believed to be an irresponsible player who cared more about playing than winning. It was because of his attitude that Garrincha, although already a legend of Brazilian football, was left out of the 1954 World Cup. He was even expected to miss the 1958 world cup as well, again because of his very public irresponsible behavior. What did he do?

Just nine days before the opening of the 1958 World Cup, Brazil played a friendly game against one of the leading Italian teams, Fiorentina. By the 75th minute Brazil was leading 3:0. The fourth goal came from Garrincha. He passed three defenders, all members of the National Team: Enzo Robotti, Sergio Servati, and Ardico Magnini, then he beat one of the best Italian goalkeepers Giuliano Sarti and found himself in front of the empty goal. Instead of scoring, he waited for the Enzo Robotti to attack him again, tricked him and sent him clinging to the goalpost, and then slowly walked with the ball into the net. According

to Ruy Castro, the goal had such a stunning effect, that terraces fell silent. Brazilian players, Garrincha's teammates, on the other hand, were mad at him for his irresponsibility, afraid that he could do something like the same during the tournament. We need to remember that in 1958, Feola was trying hard to teach Brazilian players European practicality and effectiveness in scoring goals.

Garrincha was the opposite of what Feola was trying to do, and for that reason Garrincha was allowed to play only when drastic measures were needed against the much-feared Soviet team. It was in this game, on June 15th, that two of the greatest stars of Brazilian soccer ever – Pele and Garrincha – first appeared in the national team. Tellingly, Pele was only 17, but Garrincha was 24. If Pele was kept out of the game because of his tender age, Garrincha was kept out because of his irresponsibility and independence. Independence of character is dangerous for a successful career not only in science but in sports as well. On the other hand, as with professional gunmen, in soccer too, the public adored the talented player who did not care for money and winning, but was playing primarily for the sheer joy of the game and the entertainment of the public.

Brilliant Brazilian player, Amarildo, Garrincha's teammate in National Team, summed up Brazillian's attitude towards Garrincha:

"He is the only player who is loved by every single fan from every single club in Brazil. Garrincha does not belong to any one club. Every club in Brazil supports Garrincha. He was "the joy of the people" as they used to say, because when Garrincha played, he'd even entertained the opposition. He was incredible. I don't think you could ever get another player like Garrincha."

Characteristically, Garrincha was the founder of two traditions widely accepted today in soccer. On March 27, 1960, when his team Botafogo was playing against Fluminense, Fluminense international Pinheiro pulled a muscle and went down in great pain, losing the ball. The ball went to Garrincha. Instead of taking advantage of the moment for an attack, Garrincha kicked the ball off the field, allowing a doctor to attend the opposition player. The Fluminense international player Altair responded to Garrincha's generosity by giving the ball back to the Botafogo team. Legendary Brazilian commentator Mario Filho, for whom the Maracana stadium was named after his death in 1966, was so im-

pressed, that he called Garrincha the “Gandhi of futbol.” This episode started one of the well-known unwritten rules of kindness we often see during the game today.

Another tradition came from fans cheering for Garrincha. The supportive joyful chant “ole” that accompanies well-coordinated passes to each other was heard for the first time on February 20, 1958, in Mexico, during a game between Botafogo and Argentinian club River Plate. The chant started accompanying Garrincha’s moves when he was repeatedly passing his marker, Argentinian National Team player Vairo. Vairo was substituted after the first half. Defenders were terrified to play against Garrincha, and knowing his kind heart, there were cases when they asked Garrincha before the game not to destroy their reputation by toying with them during the game.

“Pele is revered. Garrincha is adored. Garrincha argued with the establishment. Pele became the establishment” summed up Alex Bellos Brazilians’ attitude towards their two biggest soccer stars (2002). Pele and Garrincha played together for the national team in 1966 for the last time in the opening game of the disastrous for them World Cup in England. By that time Garrincha was severely out of shape and suffering from long-running trauma and a drinking problem. As a beautiful farewell gesture, for the first and last time in their shared long international career, both Pele and Garrincha scored in the same game from magnificent free-kicks. Before this, although they were both outstanding players of two world successful cups in 1958 and 1962, when they were together Garrincha did not score, as he was happy to provide chances for other players to score. Pele and Vava heavily depended on Garrincha for their success in 1958. On the other hand, in 1962, with Pele injured, Garrincha started scoring himself, becoming one of the leading goalscorers of the World Cup, and undoubtedly the best player of the tournament.

I very well remember the legendary status that Garrincha had in my native Georgia. For my father and his many friends, Garrincha represented the true player with a godsent talent for the game, who played for enjoyment more than the result. And it was natural that when I went to Brazil in 2013 many years later, I visited Garrincha’s hometown to see his house and museum. Garrincha’s granddaughter, Alexsandra who still lives in Garrincha’s house, has the same friendly and informal attitude towards the guests of the museum as her famous grandfather. Disdain for the money seems to be hereditary in this family – I never saw Alexsandra asking museum visitors to pay the entrance fees,

although the information about the fees is clearly displayed at the entrance. When I inquired if there was a hotel nearby where I could stay for a couple of days, she told me “Why do you need a hotel? You can stay here, at our house!”

Staying in Garrincha’s house with his granddaughter and her three kids was beyond my dreams. I know my father would have been very happy to hear his son stayed in the house of Brazilian football genius that he loved so dearly. Our friendship continues. In 2014, when my son and I visited Brazil during the World Cup, we stayed at Garrincha’s house for several days, and watched the opening game of the World Cup in Garrincha’s house, or, more precisely, *at Garrincha’s house*, as Garrincha’s family put the big TV screen outside of their house and a big crowd of friends and neighbors from Pau Grande watched the first game against Croatia together with barbeque, drinks, and predictions going around.

Yes, we like professional gunmen when they follow their emotions and go against their contractual obligations, we like detectives who follow their conscience more than the word of the books, we like scholars who put on line their career and follow their convictions, and we like sportsmen who care more about the joy of game than winning and getting lucrative contracts. Basically, we like professionals when they follow their emotions at the expense of their professional duties.

Conclusion, or a Monkey Lesson

*...science is almost wholly the outgrowth of
pleasurable intellectual curiosity.
- Alfred North Whitehead*

Richard Feynman finished his address to Caltech students in 1974 with symbolic words: *“So good luck to be somewhere where you are free to maintain the kind of integrity I have described, and where you do not feel forced by a need to maintain your position in the organization, or financial support, or so on, to lose your integrity. May you have that freedom.”* It is a pity we cannot check how many of Caltech graduates who heard Feynman’s words were able to follow this difficult advice.

So what is my suggestion in this complex situation with financial incentives in the scholarly world? What is the alternative? Should “scholar” cease to be a profession? Or does society need to stop giving research grants to scholars for

them to retain their intellectual freedom and pure romantic striving for progress? Marie Curie once proposed creating some minimum facilities for romantic dreamer-researchers to free them from the search for means for living. Not a bad idea, but my aim is simpler: to bring awareness of the dangers of paid positions for those scholars who sincerely dream to serve the progress of the science. A scholar should be aware of the differences of their initial romantic attitude towards their sphere, and more pragmatic appreciation of the possibilities that the position and grants represent that comes later.

You do not have to receive a salary and position to be a scholar. Martin H. Fischer, German-American physician and author said: *“Research has been called good business, a necessity, a gamble, a game. It is none of these – it’s a state of mind.”*

You might be a president of a country, lawyer, rock-star, or astronaut, or scholar, or sporting star in a seemingly commanding position, but as soon as you accept payment for your work, you cannot be fully free. Nassim Nicholas Taleb said: *“The three most harmful addictions are heroin, carbohydrates, and a monthly salary.”* So is there any escape from this financial trap? Here is my suggestion (not an original one, sorry): if you really want to maintain your freedom in any kind of activity you love with all your heart, try to organize your life so that you have another source of income so that you can do the beloved activity without any payment for its own sake. The popular dream to be able to do for living what you love doing most is misleading. The best things in life are free and should stay free.

Basically, it is difficult to believe in the full neutrality of scholars who are financially dependent on their secure positions and lucrative grants, as they mostly try to maintain the status quo. I am sure some scholars still manage to do this, but such scholars, true heroes, are in a big minority.

Money is certainly a useful commodity of freeing a scholar from everyday hassles, but if a scholar is directly and constantly dependent on positive feedback from bosses and grant-giving bodies to be paid, money turns from servant to a master.

And now, at the end of this chapter, instead of formal conclusions, let us have a quick look at what our evolutionary cousins, the monkeys, can teach us.

Back in 1949, Harry Harlow, professor of psychology at the University of Wisconsin, along with two of his colleagues, organized a highly original experiment. The researchers devised a simple mechanical puzzle whose solution re-

quired three steps: pull out the vertical pin, undo the hook, and lift the hinged cover, quite an intellectual challenge for a rhesus monkey. The researchers placed the new object in the monkeys' cages to get them used to it and to prepare them for later tests of their problem-solving abilities. Researchers were surprised to see that the monkeys immediately began playing with the puzzles and pretty quickly, they began figuring out how the contraptions worked. In a couple of weeks, they became experts in puzzle solving. By the time Harlow tested monkeys in about two weeks, the primates had become quite adept. They solved the puzzles frequently and quickly; two-thirds of the time they cracked the code in less than a minute, although nobody had taught the monkeys how to remove the pin, slide the hook, and open the cover, and possibly even more importantly, nobody had given them any form of reward. They just enjoyed the challenge.

Monkeys solving a puzzle became quite a puzzle in itself for scholars. The observed behavior had nothing to do with biological need for the monkeys, and their efforts were not rewarded. These two factors (*biological* motivation and *external* motivation) totally dominated explanations of motivation at the time (see, for example, Skinner, 1953). What else could be at work? Being an open-minded scholar, Harlow proposed a revolutionary idea of *intrinsic motivation*: "*The performance of the task provided intrinsic reward.*" In other words, the monkeys solved the puzzles simply because they *enjoyed doing it*.

Then came an even more unexpected part of the experiment: Harlow started giving monkeys highly desired rewards (raisins) for solving the puzzle they already loved doing. The expected outcome was that puzzle-solving would become even more efficient and quick with the coveted reward. Well, what happened was quite opposite: with the introduction of the reward (we can call this reward for scholars "grant") the efficiency of the puzzle-solving among monkeys *dropped drastically*! The monkeys were making more errors and solved the puzzles less frequently. Harlow concluded: "*Introduction of food in the present experiment, served to disrupt performance, a phenomenon not reported in the literature*" (Harlow, 1950:293). In simple words, the pure enjoyment was lost, and as a part of the monkey brain was now occupied by their wish to get a desired "grant," their concentration for a beloved activity was lost; they needed more time for the puzzle, were more distracted, and were making more mistakes than when they did the same thing without the reward.

This was truly a revolutionary observation and idea, and like many revolutionary ideas that challenge prevailing beliefs, it was mostly neglected. Even today, after scores of journal articles and books on the subject (see, for example, Di Domenico and Ryan, 2017; Pink, 2015) confirming the initial idea expressed by Harlow in 1950, after the success of the most innovative companies giving their employees free time and freedom of thinking, this idea still lacks due recognition. For example, even the all-inclusive Wikipedia article on Harlow fails to mention his brilliant idea of “intrinsic motivation”. Wikipedia even lacks an article on “intrinsic motivation” nor does the small section on intrinsic motivation, embedded in the article “Motivation,” mention Harlow’s name and his research, instead claiming that the phenomenon was studied from the 1970s.

This is a pity. We know from scholarly experiments and publications that too much external motivation takes a negative toll on thinking. For example, surgeons are often discouraged to operate on close relatives and friends because the extra desire to do the best might lead to unwanted and unconventional behaviours and unexpected consequences (see, for example, Knuth et al., 2017).

Most importantly, there are differences between the reaction to reward in various activities. Some activities are best performed under intrinsic motivation, and other activities are more efficient under external motivation. Activities requiring simple motor skills (for example, “if you run faster, you will be rewarded!”) are better suited to external motivation, but activities requiring innovative thinking fare much better with intrinsic motivation only.

It is clear that the creative work that scholars are supposed to do suits perfectly intrinsic motivation. The pleasure of coming up with a new original idea is the greatest reward any scholar could receive in life. Paying scholars for their research activities and giving them grants might make them more competitive, but at the same time, the prospect of reward might impede their free creativity, crucial for scientific progress. Although this idea makes perfect sense, this 70-year-old advice still falls on deaf ears.

So what is the final conclusion of the “financial chapter”? Here it is, very short and sad:

Monkeys seem to be good teachers in this case, but unfortunately, humans do not seem to be very attentive and smart students.

Chapter 5

PARADIGM SHIFT

Paradigm Shift as Environmental Catastrophe

*Normal science does not aim at novelties
of fact or theory and, when successful, finds none.*

- Thomas Kuhn

Humans are naturally terrified by the possibility that our planet Earth might be hit by a wandering, sizeable asteroid. During the few billion years of its existence, our planet had been hit a few times by cosmic bodies of various sizes, sometimes with catastrophic consequences. No wonder this rare possibility is one of the favorite themes of catastrophe films.

The most vulnerable population of our planet in the case of such a catastrophic event is the megafauna. It is not their bigger bodies that make megafauna more vulnerable, it is the length of their reproductive cycle that is lethal in the case of such catastrophe. Why? Imagine a hit like the one that rocked our planet some 65 million years ago, most likely leading to dinosaur extinction.

Apart from the site of the catastrophe, where the hit would be felt like a monstrous nuclear weapon (with the energy of 10 billion times size of the Hiroshima bomb), the rest of the living population would have problems because of the countless cubic kilometers of earth going into the atmosphere, obscuring the sunlight probably for months and even years and drastically reducing the Earth's temperature. The lack of sunlight and resulting glaciation is probably the most damaging factor of such a catastrophe. Monstrous tsunami would wipe out mostly the shorelines of the continents but not reach the interior territories.

In a drastically changing environment, where the temperature drops and the atmosphere changes for several years, those species with shorter lifespans, have a great advantage as they adapt faster to the new environment. For example, species that live about a year or two, like house mice, start reproducing in six weeks, so they can have eight generations within a single year, 80 generations within a decade. More generations mean better chances of adjusting to the new harsh environment via random genetic drift. Many insect species live much shorter than a year, sometimes only days, and they start the reproduction cycle sometimes within hours. This means thousands of generations within a year. Such species have vastly better chances to adjust to the changing environment than large mammals that need years to reproduce. No wonder the number of insect species vastly outnumbers all other categories of living organ-

isms. Actually, the number of insects is growing faster than science can classify them. According to some estimates, less than 20% of insects are currently identified and described. No wonder insects would be able to survive the greatest catastrophes that would drive large mammals towards extinction. A short lifespan might seem a disadvantage for the living organisms, but from the evolutionary point of view, a short lifespan and shorter reproduction cycle is a great advantage in a changing environment. Such is an evolutionary logic – what is good for an individual (for example, living a long life or a predator-free environment), is not good for the species in the long run (Jordania, 2014:322).

It is probably time to ask why all this discussion of the consequences of an asteroid-induced catastrophe in a book dedicated to scholarly progress?

The reason is simple: I propose a similar environmental catastrophe event takes place in a scholarly community when a field is rocked by a powerful force known as paradigm shift.

Let us try to understand the impact of the paradigm shift for a scholarly field in order to understand the forces and emotions involved in the event.

Suddenly all that we knew changes drastically. What was believed to be a solid and stable ground becomes a wobbly and shaky mass. The big books believed to be the Truth Tellers are suddenly revealed to be incorrect. Iconic names viewed as founding figures of our contemporary understanding are suddenly proven to be wrong. The balance of power shifts drastically, universities and grant-awarding bodies try to adjust their policies to the new understanding of the scholarly field. New names start to dominate the elite of the scholarly establishment.

And exactly as it was during the asteroid-induced catastrophe, the mega-fauna of the scholarly establishment are the prime victims of the paradigmatic catastrophe. Bigger names, particularly the founding members of the dominating paradigm have most to lose if the new paradigm wins the battle. For the smaller fish in the middle and the lower part of the ladder, it is relatively easy to avoid the looming catastrophe.

Nevertheless despite all the noted parallels, there is a big difference between the two types of catastrophes.

When the asteroid hits the surface of the planet, it does not care whether the living population of the planet accepts this fact or whether we knew it was coming. The hit is still felt by everyone immediately, and everyone has to deal with the consequences.

On the other hand, the paradigm-change-induced catastrophe only happens when a scholarly field *accepts* the change of the paradigm. So the paradigm-change-induced catastrophe can be successfully concealed for a very long time. Can it take years and even decades? Oh, yes. Ideally, the paradigm change can be considered completed when the Big Names, the champions of the old paradigm, accept that the new paradigm works better than the old one. So when do you think the established scholars are ready to agree that the new paradigm works better? You guessed correctly – never.

Kuhn famously wrote that in most cases the champions of the old paradigm never concede defeat, and therefore the full paradigmatic change happens only when the biggest names from the older generation pass away. Kuhn used the famous words from Max Planck, *“a new scientific truth does not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die, and a new generation grows up that is familiar with it.”*

And do not forget, humans have a very long life...

We are approaching the central idea of this chapter.

Although so far I have not mentioned anything that would not be covered by Kuhn’s idea of the paradigm shift, I will attempt to critically re-evaluate Kuhn’s model.

According to Kuhn, the development of science consists of long periods of static state, of “normal science” when the establishment and their followers are busy in “puzzle-solving,” and the dynamic short moments when this static state is punctuated by violent periods of change. It is crucial here to remember that the new progressive paradigms do not announce themselves as soaring asteroids, seen in the sky and felt by everyone. They can be concealed very successfully for years even decades by the highest-ranking members of the scholarly establishment and their loyal followers. And do not forget, they have both the powerful motives, and the powerful means to defend the doomed paradigm:

(1) They have lots to lose with the victory of the new paradigm, their authority, position in the history of science, access to publishing houses and journals, grants and other elements of financial security, to mention a few things that motivate their resistance to a new paradigm.

(2) They have the most powerful means to keep new dangerous ideas from reaching the very heart of any scholarly establishment, the most prestigious peer-reviewed journals. Of course, they also have the old and well-tried meth-

ods, such as a highly critical article signed by a great number of high-status scholars, or another surprisingly effective method – total neglect of an inconvenient new idea. And for how long do they need to halt the advance of the new potential idea? Until they pass away.

So we have the following situation with two conflicting sides:

(1) The supporters of the established ideas, represented by the biggest names behind the current paradigm, with all their active and passive supporters, and, on the other hand,

(2) The little-known proponents (or even a single proponent) of the new revolutionary paradigm.

How do they react to the situation of a crisis?

The established scholars virtually never feel there is a looming crisis. They might feel (this is a perennial feeling for most professional scholars) that there is a crisis in the funding policy of the government or pressure from various ideological and political sides, but feeling that the dominating paradigm they support is in trouble is usually impossible for them to notice. Have you ever heard from any of the established scholars: “We are lost! We do not know what to do with the anomalies that we observe! The old paradigm does not work anymore! We need a new paradigm!” Most of the established scholars are frozen in the blissful state of “normal science,” and they will never declare a crisis at their hands. So do not expect them to declare the crisis in the field. Most likely, diehard adherents of the old paradigm will die still believing they were correct, exactly as Kuhn (and Max Planck) described.

The proponents of the new ideas, mostly from other fields of expertise or relatively young scholars, are not actually waiting for the situation to become critical for the dominating paradigm. Their activities are not bound to the crisis. On the contrary, they claim the presence of better alternative ideas virtually constantly. They are usually ridiculed or neglected by the established big names and their supporters. In terms of the power tools to propagate their ideas, the proponents of the new and potentially progressive ideas have no effective means to push their ideas towards acceptance by mainstream scholarship, as the most effective ways to achieve the breakthrough are blocked by the representative of the dominating paradigm.

There is also another powerful force that works against the proponents of new ideas and in favor of the “conservatives.” It is the unity of the supporters of the old paradigm, whereas the group of “progressives” is often divided, with

different ideas, and the worst of all, sometimes the various progressive groups are more hostile towards each other than towards the old paradigm. Very gradually, as the new idea (or one of the new ideas) obtains a few supporters, it will have a chance of a real success, but only after the supporters of the old dominating paradigm wither and die out.

So, we have the following situation regarding the paradigm shift: (1) on one side of the confrontation, we have a group of established scholars who are never going to declare a state of crisis in their sphere, let alone accept defeat. (2) On the other side, we have a group of scholars (not necessarily united around a single idea) who are constantly pushing for change.

So for the “conservatives,” there is never a crisis situation, and for the “progressives,” every opportunity is a time to shatter the existing paradigm.

The conflict becomes more pronounced only if one of the alternative ideas obtains a few supporters. That’s when the proponents of the dominating paradigm start writing critical letters against the new idea. We do not have a critical moment for the paradigm change when it is felt that the old paradigm is having troubles (as this is never acknowledged by the established group), but only when a new potential idea gets supporters, mostly among the “smaller fish,” who do not fear the consequences of the catastrophe of the paradigm shift. As for the top representatives of the megafauna, the potentially catastrophic consequences of the paradigm shift bar their objectivity.

This is hardly a revolutionary process, it is so constant and gradual.

I propose that the development of scholarly progress and the revolutionary change of the old paradigm happen roughly according to the following scenario:

- (1) To start with, there are never-ceasing, ongoing arguments against the dominating paradigm from various thinkers and from different directions;
- (2) There is usually not a single archenemy to the dominating hypothesis; instead, there are several rival ones, each claiming to be the right one;
- (3) Many of these new ideas may be wrong, but there may be a suggestion that is destined to replace the dominating paradigm;
- (4) Among the ideas not destined to become the next winning paradigm might be one destined to become the basis for the new paradigm after a generation or two (it is just too early for this idea);
- (5) A big part of these new ideas never reaches the attention of the scholarly community or a wider audience;

(6) Only in some rare cases (and for various objective and subjective reasons) will a new potential suggestion gain momentum and find a very small number of supporters;

(7) The supporters of the new idea start proclaiming the necessity of the paradigm change, advertising they have the new Big Idea, the game changer;

(8) The fact that there are claims of more than one revolutionary idea is usually used skilfully by the proponents of the old paradigm: it is always easier to bunch together and dismiss out of hand several new ideas floating around than the single critical (and for them the most threatening) idea;

(9) Most illustrious defenders of the old paradigm never accept the new paradigm, or even the fact that the old paradigm is not working;

(10) Apart from the adherent of the new idea, and the conservative adherents of the old paradigm, there are other schools supporting other ideas as potentially alternative new paradigms.

(11) As the defenders of the old paradigm wither and die, the most promising (or the most supported) new paradigm has a good chance to become the dominating paradigm. This is time for the fabled "Paradigm Shift."

(12) Only after the "paradigm shift" is accomplished are scholars able to notice there was a period of struggle and violent change in a scholarly field;

(13) By the time the new revolutionary paradigm is accepted, there already may be scholars who can see caveats in the new paradigm and come up with a better idea that has the potential to overthrow the just-accepted paradigm.

(14) This better idea can be one of the competing new ideas that were around for years, but did not attract the attention it deserved as it was miles ahead of the other ideas;

(15) But the momentum for this newest idea is still far away, the followers of the just established paradigm are not yet old and frail, and the author of the newest idea is ridiculed or neglected. The never-ending cycle goes on another circle. We can only hope that the author of the newest revolutionary idea is a young person. Sadly, some truly revolutionary ideas start gaining supporters only after the author of the idea has passed away (like Gregor Mendel).

So, the process of development of science is much more "bushy" and "un-organized," with many more steps and gradations than, in the clear and slick model proposed by Kuhn: *"long stretch of static puzzle-solving – accumulation of anomalies, leading to short violent revolutionary shift – followed by another stretch of static puzzle-solving."* Most potentially worthy ideas are left out of

the interests of mainstream science, and it is hard to tell which ideas that exist today in various corners of our planet will be praised in fifty or a hundred years. We only learn about the scholarly revolutions and paradigm changes when they are the news from yesterday's newspaper.

Science, like a famous joke by Winston Churchill about Russia, has an "unpredictable past."

On Fear and Cravings for Paradigm Change

Despite the fear of mainstream scholars for paradigmatic changes, there is a widespread desire to present paradigmatic changes in many spheres of science. Two questions arise naturally. The first is why? And second is how is it possible to be terrorized by the possibility of paradigm change and at the same time to strive to come up with the paradigmatic changes?

It is relatively easy to answer the question of why paradigmatic change is so coveted by many scholars. Paradigmatic changes are the Big News, they are publicized in the pages of the national media, are presented in the most prestigious journals, give a boost to the reputation of the scholar or institution that proposes the new paradigmatic finding, and of course, confirms that the new idea is definitely worth generous funding. As we can see, paradigmatic changes can bring highly desirable and lucrative results.

But how can this tendency live with the fear of a paradigm change that can wipe out the megafauna of the scholarly establishment? Let us try to answer this much more difficult question.

The only possibility to propose paradigmatic changes in a scholarly field that will not threaten the establishment is to propose a relatively important finding as a paradigmatic change.

Many important discoveries, like mapping a DNA sequence of a species for the first time, or finding a new animal subspecies, or unearthing a new type of hominid remains are often claimed to be a paradigm shift, whereas paradigm shift is what it is – the profound shift that declares an earlier system of understanding fundamentally wrong. It is not a mere accumulation of facts or describing a new species.

"The transition from a paradigm in crisis to a new one from which a new tradition of normal science can emerge is far from a cumulative process, one achieved by an articulation or extension of the old paradigm. Rather it is a

reconstruction of the field from new fundamentals, a reconstruction that changes some of the field's most elementary theoretical generalizations as well as many of its paradigm methods and applications. During the transition period, there will be a large but never complete overlap between the problems that can be solved by the old and by the new paradigm. But there will also be a decisive difference in the modes of solution. When the transition is complete, the profession will have changed its view of the field, its methods, and its goals." (Kuhn, 1962:84-5).

As we can see, the real paradigm shift is nothing short of real violent revolution, with big names trampled in a bloody coup. The scholarly establishment will never allow such a coup, as they themselves will be the most likely the first victims of the revolution. "Not allow" is a very mild word, they will be the greatest enemies of such a revolution. And they have the most potent army and weapons to fight such revolutions and to prevent major loss of careers and jobs. This army includes troops of well-disciplined peer soldiers, the unbreakable bastions of peer-reviewed journals, sniper fire of well-informed skeptics, the power of scholarly mobbing by a critical letter with many dozens of well-known names. So who can overtake them? They are unlikely to allow any democratic elections and leave in peace, so the change of generation is usually the most likely background for the paradigm shift, as Kuhn (based on the words of Max Planck) claimed.

For the sake of objectivity, we should note, that non-professional scholars like the sound of the claim of "paradigm shift" even more than professional scholars. For them the claim of paradigmatic changes is often used to get others' attention. So there is an obsession with the notion of paradigm changes everywhere. Listen to Stephen Jay Gould:

"Before Kuhn, most scientists followed the place-a-stone-in-the-bright-temple-of-knowledge tradition, and would have told you that they hoped, above all, to lay many of the bricks, perhaps even the keystone, of truth's temple. Now most scientists of vision hope to foment revolution. We are, therefore, awash in revolutions, most self-proclaimed."

Hard to disagree.

So how do I propose to approach this bottomless topic? We will approach this issue by discussing one by one various factors of scholarly progress: the importance of progressive ideas and consensus, fear of generalizations, predic-

tions, dislike of exceptions, the coveted notion of the final truth, and the value of praise and critique. Let us have a quick look at several elements of the notion of paradigm changes and, by extension, the general progress of science.

On Progressive Ideas

"A man with a new idea is a crank until he succeeds."

- Mark Twain

First of all, I would like to make a suggestion that will sound controversial to many readers. I suggest considering all the critical (critical to dominating paradigm) ideas as "progressive." Well, is it really fair to call every new idea "progressive" in comparison with the established idea? Let us agree that not every new idea is really progressive. The new idea might result from the fact that its author idea lacks understanding of the basic premises, might belong to an unscrupulous amateur, whose writings are hardly worthy of reading. Yes, it is true that many new ideas might offer little to the progress of science, but unfortunately, this becomes clear only after a considerable time. We should never forget that behind the badly written text, misspelled names and irritating absence of solid references might be a worthy revolutionary idea.

As bad as it might sound, today we cannot give the final diagnosis to most of the new ideas floating around. Even if the bearer of the idea is a confirmed medical case, this does not guarantee that the idea she or he proposed is totally off target. *"There are sadistic scientists who hurry to hunt down errors instead of establishing the truth,"* said great Marie Curie. *"No idea should be suppressed. ... And it applies to ideas that look like nonsense. We must not forget that some of the best ideas seemed like nonsense at first,"* said brilliant British-American astrophysicist Cecilia Payne-Gaposchkin, who firsthand experienced such treatment.

Despite all the shortcoming of my suggestion, I want to direct your attention to the important feature that all the new progressive ideas have in common – they try to find the caveat in the old idea and try to achieve changes in our understanding of the field of scholarship. Bombarding the dominating paradigm with critical comments to question its basis is probably the healthiest way of development of any scientific discipline. The suggested changes might be small but could be paradigmatic as well. All these critical comments and ideas are like the countless small genetic drifts that take place in all living species

all the time. Most of the proposed changes are neutral or even negative and never go into the main pool of the species, but some changes gradually result in the establishment of important changes in morphology and behavior leading to new subspecies and even new species.

By the time a new progressive idea finally becomes established and accepted by the community of peers, very often it is already time to replace this idea with another, more progressive one. But of course, those scholars who were fighting for the idea that has been finally accepted are not ready to give up and accept the new idea. After the paradigm shift, former progressives gradually become conservatives.

Conclusion: I suggest that every new idea, every new critique of the old paradigm, should be considered *potentially progressive* as they try to reveal weak points in the dominating paradigm, and this critical approach is invaluable for the progress of any scientific field. Even if the critical idea sounds very much like the old paradigm that was discredited decades or even centuries ago, it still deserves a new objective and careful look. With a little twist, the old idea might prove to be the winner.

On Consensus

John Ziman, British-born New Zealand physicist and humanist, called consensus “the touchstone of reliable knowledge.” Possibly the consensus of most peers in a certain sphere is a good indication of the reliability of the knowledge on the subject for mainstream science, but we know too well that the most progressive ideas at any moment in history were and are believed by a very small group of scholars, sometimes by a single scholar. *Consensus only highlights the current level of understanding, not the cutting edge of the progressive understanding of the problem.*

Considering that most of the mainstream scholars receive funding for following their spheres according to mainstream views, and take into account that if they change their point of view, they might be out of the “circle of trust” of peers and grant-giving bodies, you can understand how dangerous the idea or “consensus as a touchstone of reliable knowledge” is. Even seemingly very reliable knowledge might prove to be incorrect in a few years.

So what are the majority of scholars doing to achieve a coveted consensus and search for new solutions? According to Thomas Kuhn, “*Normal science*

does not aim at novelties of fact or theory and, when successful, finds none.” Kuhn again: *“Under normal conditions the research scientist is not an innovator but a solver of puzzles, and the puzzles upon which he concentrates are just those which he believes can be both stated and solved within the existing scientific tradition.”*

And let us remember what seems to be quite a fair assessment of what consensus represents: “Consensus is invoked only in situations where the science is not solid enough” (Michael Crichton).

So can we make a general conclusion about the phenomenon of consensus? Here is my personal conclusion:

Scientific consensus is dangerous. It is often invoked to support the existing paradigm against the new ideas. Be critical and think twice if you are going to use the existing consensus as a support for your position, and most importantly, never, never confuse (and never misrepresent) consensus for a fact.

On Generalization

If you check the existing opinions and sayings on generalizations, you will soon find that most of them are negative, accusing generalizations of being false, misleading, even dangerous. The creator of the immortal Three Musketeers, Alexandre Dumas said, not without his famous irony: *“All generalizations are dangerous, even this one.”* The creator of Huckleberry Fin, Mark Twain seconded, accusing generalizations of another vice: *“All generalizations are false, including this one.”* So generalizations can be false and dangerous.

Generalizations are understandably unwelcome in many fields of science. *“Men are more apt to be mistaken in their generalizations than in their particular observations,”* attributed to a mastermind of political games, Niccolò Machiavelli.

Fear of generalization is not new. Charles Darwin, writing to Henry Fawcett in 1861 said:

“About thirty years ago there was much talk that geologists ought only to observe and not theorise; and I well remember someone saying that at this rate a man might as well go into a gravel-pit and count the pebbles and describe the colours. How odd it is that anyone should not see that all observation must be for or against some view if it is to be of any service!”

To avoid being accused of rushing to conclusions, Darwin delayed publication of his speculations:

"After five years' work I allowed myself to speculate on the subject, and drew up some short notes; these I enlarged in 1844 into a sketch of the conclusions, which then seemed to me probable: from that period to the present day I have steadily pursued the same object. I hope that I may be excused for entering on these personal details, as I give them to show that I have not been hasty in coming to a decision." (1859:22)

Apart from the negative attitude towards generalizations in science, there are also positive ones that show the need for generalization for the good of scholarly progress. *"The essence of knowledge is generalization ... The art of discovery is therefore the art of correct generalization.... The separation of relevant from irrelevant factors is the beginning of knowledge"* these words are from Hans Reichenbach, author of *The Rise of Scientific Philosophy*. *"Every science begins by accumulating observations, and presently generalizes these empirically; but only when it reaches the stage at which its empirical generalizations are included in a rational generalization does it become developed science,"* these are the words from Herbert Spencer. *"There is nothing particularly scientific about excessive caution. Science thrives on daring generalizations,"* said L. Hogben, a British experimental zoologist and medical statistician.

Generalization is considered a key element for the key element of scholarly activity – prediction (see the next section): *"The trick in discovering evolutionary laws is the same as it is in discovering laws of physics or chemistry – namely, finding the right level of generalization to make prediction possible,"* said Matt Cartmill, an American paleoanthropologist.

As an open-minded scholar Darwin deeply believed in speculation: *"I am a firm believer, that without speculation there is no good and original observation"* (Letter to A. R. Wallace, 22 Dec 1857). Clearly in defense of generalizations, Darwin wrote:

"False facts are highly injurious to the progress of science, for they often long endure; but false views, if supported by some evidence, do little harm, as everyone takes a salutary pleasure in proving their falseness; and when this is done, one path towards error is closed and the road to truth is often at the same time opened," (1871, Vol. 2, 385).

Any hypothesis, any theory, or any other product of scholarly mind starts with generalizations, and we should not see this as something negative. *“Every fundamental law has exceptions. But you still need the law or else all you have is observations that don't make sense. And that's not science. That's just taking notes,”* said British physicist Geoffrey West.

Once again, the attitude of Charles Darwin can set an example for us: *“I have steadily endeavored to keep my mind free so as to give up any hypothesis, however much beloved (and I cannot resist forming one on every subject) as soon as the facts are shown to be opposed to it.”*

Conclusions: Despite many obvious flaws, stigma and existing negativity towards generalizations, we have to accept that science starts with generalization. So do not avoid generalizations but be careful and keep them to yourself for some time – check the exceptions, make predictions, and be honest and brave to discard your generalizations when you discover contradicting facts.

On Predictions

We make predictions in everyday life all the time. But there are different types of predictions, and their value varies greatly. For example, if you advise a family member to take an umbrella because the sky is cloudy, this kind of prediction would hardly astonish anyone, but if somebody in 2004 predicted that on December 26 there would be a big earthquake in Indonesia, well, this prediction might have a life-changing effect for thousands of people. There are experts making predictions in various fields, sometimes for a living. Some experts can, for example, predict the winning horse, or the directions that the stock market will take, etc. But alas, they are not as accurate as we want them to be.

What about science? Does science need predictions?

To discuss this very interesting topic, I will start from a little strange and even somehow scary story from my own teaching experience.

Many decades ago, still in Georgia, I was teaching an aural training [ear training] to a young aspiring musician, a girl of about 17, who was planning to study at a tertiary musical institution. Let us call her Maggie. Maggie was extremely talented, played efficiently both guitar and piano, sang very well and composed songs. All was fine; Maggie was brilliant, but during our lessons in aural training we suddenly hit an unexpected problem: she had great difficulties in recognizing directions correctly. For example, if I was playing notes of an as-

ending scale, “A, B, C, D” she sometimes (not always) would recognize them as “A, G, F, E.”

When she repeated the phrase, she was always singing correctly, but her naming (and writing down) of the notes was often in the wrong direction. It was strange hearing her going up correctly by singing “A-B-C-D” melody and pronouncing the notes as “A-G-F-E”. We probably all know people who have problems correctly naming directions “left” and “right”, and we also know that they never make mistakes in showing the correct directions by hand gesture, but I had never seen this problem so pronounced in music. As the aural training was the first and the most important demand at Georgian music tertiary institutions, she had great difficulty passing the very first exam in aural training.

While struggling to teach Maggie, I recalled that my mother also had serious directional problems. Although she did not make mistakes in musical directions (she was a piano teacher), she was constantly baffled by right and left in the physical world and would confuse in which direction the train must go, etc. And I am sure that the most probable cause for my mother’s directional confusion was that she was a very strong left-handed person, and in her childhood she was forcibly made into a right-handed person. Actually, she still does everything with her left hand but writes with her right hand. I am not a neurologist, and never had any training in the problems of forced right-handedness, but I had a feeling that Maggie had a similar problem. “Maggie, are you left-handed?” I asked. “I was left-handed, but now I am mostly right-handed” she replied. Hearing her reply, and after a few seconds of silence, I told her quite strange words “Maggie, I think it will be dangerous for you to drive a car when you grow up.” I said this because I knew her father was wealthy, and as a single daughter, Maggie most probably would have a car in a couple of years.

And here comes the scary part of the story.

Maggie looked at me and I saw fear in her eyes: “You are the second person telling me this!” she said.

I was shocked. “And who was the first person?” I asked. She replied with a small story from her childhood:

I was about seven or eight years old and was walking with my father down the streets. My father met someone I did not know, and they talked for a few minutes without paying any attention to me. I was just standing there bored, waiting for them to finish the conversation and to continue my walk with my father. At the end of their conversation the stranger

paid attention to me. "Is this your daughter?" he asked my father. "Yes" replied my father. "Do not allow her to drive a car," he said to my father and went his way. I was shocked by his rudeness, and as I was always dreaming to drive a car, I asked my father who the hell this person was and why he said such a strange thing about me. "I have known him, not very well, for several years," said father to me. "I do not know why he said such a thing about you, but he is known in our town as a clairvoyant. He sometimes helps people find their lost belongings."

"I never remembered his strange words", finished Maggie. "Until now, when you told me the same thing!"

I explained to Maggie my train of thought, telling her about my mother's confusion of directions and her forced change of handedness. I had no idea how the stranger could make the same conclusion without information other than just seeing a little girl. Possibly he noticed any abnormalities in her eye or hand movements? Difficult to say.

We are fascinated by predictions, and we value true predictions. In the above small story, there are two predictions. My prediction was based on first-hand knowledge of Maggie's condition, the struggle most likely going on in her head, and another case with a similar problem. My prediction, so to speak, was more or less as a result of "scholarly" reasoning. Conversely, the prediction from the local clairvoyant was seemingly beyond scientific scope, and I have no clue how to discuss this kind of prediction.

But why do we need to discuss predictions in a book dedicated to the scholarly issues in the first place? Predictions might seem a very unscholarly endeavor to those uninitiated in scientific methodology.

Make no mistake: predictions play a crucial role in science. Scholars, particularly those, who are making discoveries, are *supposed* to make predictions. And the unlikelier the predictions, the more valuable they are. And if it happens that the prediction is confirmed, the vulnerable hypothesis has a right to be labeled a "theory." And if the prediction was not correct, well, then the hypothesis was "falsified." Therefore, predictions are a vitally important part of scholarly life.

One of the most famous predictions of the 20th century was made by Albert Einstein, when he famously predicted the unusual behavior of the light during the solar eclipse. When the prediction was observed to be true on May 29, 1919, the theory of general relativity received strong confirmation.

There are various attitudes towards predictions and their value. Some believe predictions are inaccurate to the level of joking openly about them: *"Predictions can be very difficult – especially about the future,"* said one of the greatest physicists, Niels Bohr. Alan Cox, a British computer programmer and a key figure in the development of Linux, might have found the winning formula to make predictions, with a healthy dose of humor: *"I figure lots of predictions is best. People will forget the ones I get wrong and marvel over the rest."* And here is a joke from brilliant Mokokoma Mokhonoana *"Historians predict the past for a living."*

Predictions are distrusted by many: *"If you learn one thing from having lived through decades of changing views, it is that all predictions are necessarily false,"* this is M. H. Abrams, an American literary critic, and this is Jodi Kantor, award-winning American journalist, author of the best-seller *The Obamas*: *"I've learned that the best political reporters never make predictions."* The legendary Chinese philosopher, Laozi even contrasted those who "know" with those who "predict:" *"Those who have knowledge, don't predict. Those who predict, don't have knowledge."* And Rick Perlstein, American historian, went further in discouraging predictions: *"Let there be a special place in Hell for pundits who make predictions."*

But if you are a scholar and claim to have made a discovery, you have no choice: you have to make predictions!

And frankly, predicting is not easy. Listen to Lisa Randall, American theoretical physicist from Harvard *"We have this very clean picture of science, you know, these well-established rules with which we make predictions. But when you're really doing science, when you're doing research, you're at the edge of what we know."* Some believe the correctness of prediction comes from the data available: *"Big data is mostly about taking numbers and using those numbers to make predictions about the future. The bigger the data set you have, the more accurate the predictions about the future will be,"* said Anthony Goldbloom, who became famous by creating predicting models in Kaggle. Well, we might argue with this: is this only about the data? What about the correct methodology and out-of-square approach?

Predictions are a vital part of hypotheses and theories. *"Theory is a window into the world. Theory leads to prediction. Without prediction, experience and examples teach nothing"* said W. Edwards Deming, American engineer, one of the pillars of the Japanese post-War economic miracle. *"Till facts be grouped*

and called there can be no prediction. The only advantage of discovering laws is to foretell what will happen and to see the bearing of scattered facts,” words of Charles Darwin.

Surprising and risky predictions are particularly valued. Karl Raimund Popper, the key figure in the 20th-century history of science confirms this *“It is easy to obtain confirmations, or verifications, for nearly every theory—if we look for confirmations. Confirmations should count only if they are the result of risky predictions.”* *“The job of theorists, especially in biology, is to suggest new experiments. A good theory makes not only predictions, but surprising predictions that then turn out to be true,”* seconded Francis Crick, Nobel Prize-winning British molecular biologist.

And here is my favorite saying that I would recommend displaying at every science department of every university: *“Science is not, despite how it is often portrayed, about absolute truths. It is about developing an understanding of the world, making predictions, and then testing these predictions.”* This one is from Brian Schmidt, an American-Australian Nobel-laureate astrophysicist.

Conclusion: very much like professional clairvoyants, scholars are supposed to make predictions. Unlike the clairvoyants, they need to have a logical thread leading to the subject of their prediction. The riskier and the more unexpected predictions are particularly valued. So if you are an aspiring scholar and want to make revolutionary discoveries, try to predict things in the light of your new hypothesis. Even more, because of human striving towards the unknown and fascination with the future, your predictions might get more attention of the scholarly world, than the hypothesis itself.

On Exception

If you are a scholar (professional or amateur) you know how annoying exceptions can be. You just came up with an original explanation of the problem, there are so many facts that fit beautifully in your model, and suddenly, you find a fact, of a group of facts that do not fit. Even a single exception might stick out like a sore thumb. *“One gram of suspicion weighs heavier than a kilo of truth,”* said Mehmet Murat Ildan in his 2001 play *Galileo Galilei*.

Most scholars, when they formulate new hypotheses, are carried away by the long list of facts that fit comfortably into their hypothesis, and they often tend to neglect the facts that do not fit their hypothesis.

Understandably, most scholars dislike exceptions and they use various strategies to deal with exceptions:

- (1) Some scholars manage to coerce exceptions into their hypothesis;
- (2) Some try to discredit (or as they say “critically check”) the annoying fact;
- (3) If there is no good reason to discredit the fact itself, then some try to discredit the person (usually another scholar), who brought the inconvenient fact;
- (4) Some manage to neglect the exceptions altogether (particularly if they were not mentioned in a peer-reviewed journal);
- (5) And if nothing helps, notorious sayings like ‘no rule without exceptions,’ or even worse, ‘the exception proves the rule,’ are always at hand (although the original meaning of this saying had a different connotation).

Of course, to a non-biased person, it is obvious that an exception cannot prove the rule, and that a rule with “exceptions” is actually a bad rule. My favorite literary hero, Sherlock Holmes, once said: *“I never make exceptions. An exception disproves the rule.”* I agree with Mr. Holmes and consider the saying “exception proves the rule” as the last resort for a bad hypothesis.

“Science does not permit exceptions,” said Claude Bernard, French psychologist, symbolically the inventor of the crucial concept of the “blind experiment.”

So, how to assess the complex phenomenon known to us as an “exception?”

It all depends on how you look at the exception.

For the majority of scholars, an exception is a deadly enemy, a hostile detractor to the dominating paradigm, or the new promising idea.

But it is very different for broadly thinking scholars. For them exceptions feel like gifts from God:

- (1) An exception is a scholar’s best friend, the only true friend that tells the bitter truth. Do not listen to the calming array of facts that prove your hypotheses; they are like flattering friends who are ready to lie to you in order to make you happier. Listen to your only true friend – exception. And only if this friend is silent, not complaining of facts that do not fit your idea, can you be truly happy. One exception can outweigh dozens of proving facts. There is no greater proof for your hypothesis than the absence of an exception. In case of exceptions, it is true that “silence is the sign of approval.”

(2) An exception is a door to discovery. This is not only a metaphorical comparison. An exception is always pointing the direction to an improvement. Many exceptions known in scholarly fields and never addressed are the lost opportunities for a better explanation, or even for a paradigm shift.

So, instead of fighting exceptions, try to use them as the leading force towards the new development of your ideas. *"Exceptions are not always the proof of the old rule; they can also be the harbinger of a new one,"* said Marie von Ebner-Eschenbach, Austrian writer. Or as G. K. Chesterton, an English writer, philosopher, and critic said, *"Paradox has been defined as 'Truth standing on her head to get attention.'"*

It is up to you how to view exceptions. If you are broad thinking scholar exceptions fascinate you and provoke to think of new ways of solutions, but if you are conservative, you are afraid of exceptions as troublemakers in an otherwise clear picture.

We could even coin a saying: "Tell me how you deal with exceptions and I will tell you what kind of scholar you are."

The progress of scholarship mostly starts with the exceptions that do not fit the existing theory of a hypothesis. Neglecting them is neglecting the new golden opportunity of the progress of science.

Conclusion: if you want to make discoveries, start appreciating and even collecting exceptions, by far the best tool to lead towards the progress of science.

On Truth

"Philosophy is the science which considers truth," said Aristotle. *"Plato is my friend, Aristotle is my friend, but my greatest friend is truth,"* said Isaac Newton. *"The first business of a man of science is to proclaim the truth as he finds it, and let the world adjust itself as best it can to the new knowledge,"* said Percy W. Bridgman, American Nobel Prize laureate physicist and a philosopher of science. Here is Konrad Lorenz: *"Scientific truth is universal, because it is only discovered by the human brain and not made by it, as art is."* In the next quote the scholarly arrogance reaches unusually high levels: *"I no longer count as one of my merits that I always tell the truth as much as possible; it has become my metier;"* this is Sigmund Freud, in his letter to none less than Albert Einstein.

The following words about the truth sounds like a religious statement: “*We know truth, not only by the reason, but also by the heart.*” These words come from one of the greatest scholars of the past, a French mathematician, physicist, inventor, writer, and importantly, a theologian, Blaise Pascal.

At the same time, truth and searching for it can be a butt of the jokes: This is George Bernard Shaw: “*People exaggerate the value of things they haven’t got: everybody worships truth and unselfishness because they have no experience with them.*” “*As scarce as truth is, the supply has always been in excess of the demand,*” this is Josh Billings, famous American writer-humourist, rival of Mark Twain.

Deeper truth might be very complex and even contradictory. Listen to Niels Bohr: “*The opposite of a correct statement is a false statement. But the opposite of a profound truth may well be another profound truth.*”

So what is the truth? How can we characterize this complex phenomenon from our contemporary scholarly perspective?

Truth, particularly the notion of the Final Truth, is an extremely dangerous phenomenon for the progress of science. The scholarship is done by discovering a *better* explanation of the existing facts than the current theory, not by discovering the *Final Truth*. And do not believe that your idea, even if it has been accepted by the mainstream scholarly community is the Final Truth. This kind of belief might put you in a very dangerous state of mind. It is this state of mind that turns progressive scholarly ideas into subjects of belief and turns progressive scholars into conservative believers who reject out of hand any new ideas.

Why is this so? This happens because knowledge (and particularly belief in certain knowledge) is very much like a beast of highly territorial habits. It does not tolerate another of its kind on the same territory. You must be very careful not to lose the long-term perspective of scholarly development and not to fall into this trap of worldwide acceptance. Even if you receive the most prestigious awards, and your idea is popular within this generation of scholars, almost inevitably in a few decades or a few hundred years the science will bring currently unimaginable changes. So, think for a minute: do you believe the idea you support will be as valid in 1000 years? Or 500, or even 100 years?

Newton’s phrase probably shows a good understanding of the limits of human scientific capabilities:

"I do not know what I may appear to the world, but to myself I seem to have been only like a boy playing on the seashore, and diverting myself in now and then finding a smoother pebble or a prettier shell than ordinary, whilst the great ocean of truth lay all undiscovered before me."

"The scientist knows very well that he is approaching ultimate truth only in an asymptotic curve and is barred from ever reaching it; but at the same time he is proudly aware of being indeed able to determine whether a statement is a nearer or a less near approach to the truth."--Konrad Lorenz

The search of the truth has been recognized as the source of mistakes. *"To know the history of science is to recognize the mortality of any claim to universal truth,"* said Evelyn Fox Keller, American physicist and author. *"Truth in science can be defined as the working hypothesis best suited to open the way to the next better one,"* said Konrad Lorenz. The partial nature of truth was also known long ago: *"Truth is a remarkable thing. We cannot miss knowing some of it. But we cannot know it entirely"* – this is Aristotle. *"We have to be ready to live today by what truth we can get today and be ready tomorrow to call it falsehood"* declared pragmatist William James.

American philosopher of science, Paul Feyerabend accused Kuhn of retreating from the more radical implications of his theory of scientific revolution, that scientific facts are never really more than opinions, whose popularity is transitory and far from conclusive.

In my personal opinion, searching for truth is fine, but scholars should be beware of believing they have found it, as the staunchest enemies of new progressive ideas, as a rule, are those who believe the Truth has already been found. Let me repeat: in the best-case scenario, scholars are expected to discover a *better explanation* of the existing facts, not finding the *Final Truth*.

Conclusion: Probably the only Final Truth is the statement that there is no Final Truth, and even if there is one, we will never know it. Final Truth is a very negative force in the development of science, and for scholars, believing that they have found a final truth is the shortest way to scholarly death. If it seems you have found the one, calm down and ask yourself, will the knowledge of the next 500 of 1000 years bring anything new in this sphere? And mind, 1000 years is a very short time in history.

On Simplicity

When reading scholarly writings, sometimes you will be amazed, possibly even disturbed, at the heaviness of the professional jargon, complexity of the sentence structure, overwhelming amount of references, and complicated logic of the arguments. And then might come a moment when you ask: “Is this author trying to tell something new and very complicated, or the absence of fresh and interesting ideas concealed with this overtly complex language?”

If we have something really important to say, we naturally want to express our idea in as simple as possible words.

“Simplicity is the ultimate sophistication,” said Leonardo da Vinci. *“Truth is ever to be found in simplicity, and not in the multiplicity and confusion of things,”* said Isaac Newton. *“You must learn to talk clearly. The jargon of scientific terminology which rolls off your tongues is mental garbage,”* said Martin H. Fischer, German-American physician.

And finally, listen to Karl Popper: *“The method of science depends on our attempts to describe the world with simple theories: theories that are complex may become untestable, even if they happen to be true. Science may be described as the art of systematic over-simplification—the art of discerning what we may with advantage omit.”* And Popper again, this time more harshly: *“In my view, aiming at simplicity and lucidity is a moral duty of all intellectuals: lack of clarity is a sin, and pretentiousness is a crime.”* I am afraid if Popper’s suggestion was accepted as a law, plenty of scholars would have been accused of committing this crime.

Conclusion: if you have something new and important to say, try to be as clear and direct as possible, in language as free from professional jargon as possible. This is particularly important if you are saying something new, and hope to reach a larger audience, especially to have more chances to reach open-minded and sympathetic thinkers out there.

On References

References are important to scholarly work, there is no question about that. They tell us about the existing background of the research, and how informed the author of the existing scholarly literature is. Many scholars, when looking at the work of an unknown author, look at the references first. Possibly because the references are often viewed as the visiting card of the scholarly publication,

for some scholars to have many references (and to have your works included in the references of many articles) became one of the criteria to assert their prestige and scholarly worth of the new research.

I want to raise a question of how important excessive references are in our time, when any new work, any author, any idea and any quote can be easily found on the internet. It seems to me the attitudes towards references should change, at least, partially. For example, the reader can find many quotes on many subjects from various thinkers in this book. Well, the traditional wisdom requires that quotes needs precise referencing, but presenting all these references (which can be easily verified on the internet) will make the text less readable, heavier, and will distract readers from the argument. Of course, if an author has nothing new to say, then the use of heavy technical language with excessive references has a very practical aim of distracting readers from the absence of a new idea, but if the author is trying to communicate important content and to use the clear and direct language, excessive references are probably better to avoid.

Do you remember what Leonardo da Vinci said about the official scholars of his day and their method of proving their dominance?

“Though I may not, like them, be able to quote other authors, I shall rely on that which is much greater and more worthy – on experience, the mistress of their Masters. They go about puffed up and pompous, dressed and decorated with [the fruits], not of their own labours, but of those of others. And they will not allow me my own. They will scorn me as an inventor; but how much more might they – who are not inventors but vaunters and declaimers of the works of others – be blamed.”

No amount of knowledge of the existing works and their precise referencing can replace original thinking.

Conclusion: references are an important part of any scholarly work, but do not overestimate them and do not use them excessively. If the readers are particularly interested in a quote from your text, an idea, or the author you are mentioning, they can easily check everything on the internet within seconds. Excessive references might be distracting to many readers. Instead of impressing readers with your wide knowledge of the existing scholarly publications, try to impress them with the originality of your ideas and bold predictions.

On Praise and Critique

I was not sure I needed to discuss these issues in this book. Praise and critique are not a part of the scientific method, neither research tools. At the same time, the issue of receiving or giving praise and critique is extremely important to every scholar, and by extension, to the history of science. Remember, science is not only happening when you are formulating a brilliant idea or publishing it. Communicating with other scholars, giving or receiving positive or negative comments, and answering to them is an important part of scholarly life. That's why I decided to mention several points on this hot and somehow neglected issue.

First of all, let us remember that we are dealing with two very different phenomena: positive (praise), and negative (critique). Second, it is hugely different whether we are at the *receiving* or the *giving* end of the praise or the critical comments. Apart from this, your current position (beginner or established authority) also affects strongly your emotions when receiving praise or critical comments. All these cases are naturally different and need various treatments. Therefore, we will discuss a few points on each of these situations.

We will start from the situations of being on the receiving end of praise and particularly of critical comments.

As a rule, it is nice to be praised, although the praise might have a very different weight for us. It is one thing to receive praise from your girlfriend or boyfriend, or any of your relatives or friends, and, on the other hand, to hear positive words from someone totally unrelated to you. And of course, praise has a special significance (we might even say, life-changing significance) when an expert from the field, who is neither your friend nor a relative, suddenly gives acknowledgment to your idea. You have done very well if your new idea was noticed by even a single expert from the field.

One sad detail should be also briefly mentioned. We have to remember that sometimes our friends and family are among the last to acknowledge our ideas. They need to hear that the ideas had been appreciated by someone else from the field. We might understand their reservations, as it might be beyond their grasp to understand the importance of your ideas. Generally speaking, receiving praise is a very positive experience, so we do not need too much of the discussions on this issue.

On the other hand, receiving critical comments is something that we all hate more or less. And it is exactly here, in reacting to critical comments, that scholars differ drastically, and it is here we might all benefit from sharing experiences and strategies on how to deal with critical comments.

Let us discuss what kind of differences we are talking about.

Most scholars (I would even say, most humans) virtually instinctively go into the defensive mood as soon as they are faced with critical comments. As a result, they are missing the tremendous potential possibilities that critical comments can bring to their work. Remember, a critical comment is not a dead-end; it is a challenge, and like any other challenges of life, if we react wisely, they can make us stronger. And what is a wise reaction to the critical comments?

We need to remember that potentially all critical comments can be used to make your argument stronger. Even if the comment was designed to destroy your idea and your confidence, you can still extract a positive outcome, by thinking more over the substance of the critical comment and sharpening your idea.

So the right first reaction on the critical comment is to entertain the idea that the author of the critical comment is correct (despite the unacceptable tone of the critical comment). Search as objectively as you can if there is even a small constructive element in the comment. And even if you are dealing with dismissive or vitriolic comments, you will do very well if you respond to the essence of the critical comment, clarifying your position, or indicating the possible change to your idea. Remember, hearing and appreciating objectively critical comments are as difficult for the author of the new revolutionary idea, as for the critics to objectively appreciate the new revolutionary idea that goes against their long-held professional beliefs.

Try not to pay much attention to unsubstantiated critique only stating that your ideas are “bad science” or a “fringe science.” Some of the best revolutionary ideas in the history of science received the same treatment, so you are in a good company!

Also, if you think that a harsh critique is the worst treatment that might happen to your idea, you are mistaken. The first and universal stage of reception for most revolutionary ideas is that you and your idea are just ignored. So be ready for long years of neglect. This might sound ironic, but receiving critique is the first sign of appreciation, the start of a dialogue. So congratulations!

And in case if you are ridiculed by someone from the field, you can always calm yourself down recalling the words of Oscar Wilde: *"Ridicule is the tribute paid to the genius by the mediocrities."* Only the time will tell which of the arguing sides is correct.

It is also possible that after looking objectively at the critical comments (which is not easy and takes lots of courage and patience), you internally agree that your idea has a fatal flaw, or a serious discrepancy with the existing facts. This is not a tragedy; be optimistic, and very possibly after admitting this to yourself, your obsessed mind (see chapter two) will immediately start searching for other possible solutions to the problem.

There is great wisdom in the words of Heinrich Heine: *"He only profits from praise who values criticism."* Unfortunately, not many scholars are open and appreciative of criticism. Try to be one of the rare exceptions. Be grateful to your critics; remember in most cases they could have just ignored you, but they took time to inform you about their opinion, however rushed and inadequate the opinion might seem to you.

It is a totally different game when you are criticized after you have been more or less accepted by a scholarly community. This is not to say all critics suddenly go silent. Sometimes critical comments might even get louder, as with recognition more people are aware of your ideas. Try to see the difference between your critics, such as the difference between the "conservatives" and "progressives." If these are "conservative critics," critics from the past paradigm, it is natural for them to fight; this means they are still alive and kicking. Do not be arrogant, particularly if you already are a winner, as the next paradigm might be based on *their* idea that you helped to overthrow. But be particularly sensitive and open-minded if there are new students from the field, or "progressive critics," who are telling you some strange new ideas and facts that you can hardly even understand. They might be telling you about the next level of the development of your field, snippets of the next successful paradigm. Try to see the problem in your hypothesis or theory through their eyes, respond, stand your ground if you believe you are right, but be generous and praise every serious attempt to find caveats in your ideas. And be frank in responding to their critique – state whether you still think your idea stands all the challenges, or indicate, if you think so, that your idea is still the "best that we have at the moment" (without bringing the notion of "truth" in the discussion, please, and ask your critics not to use this category in a scholarly discussion as well!).

Basically, remember a simple and correct life strategy: if you want to change anything in your life, want to make it better, happier, and successful, you need to better yourself. You are the only human being you can really change. Blaming others for not understanding you, or even for betraying you, does not improve things. So if you had been betrayed by your best friend, a business partner, or colleague, or your spouse, try to analyze in the first place how *you* could miss such a possibility from them, and make sure that you are better prepared for the future serious relationships in your life. In the same way, you cannot change the conservative attitude of most scholars, or their pessimism towards new ideas, but you can make your idea more appealing to them, make it better formulated, and think of more effective predictions. You can do all of this primarily by looking at the critical comments that you received.

Now let us change the direction and discuss a few ideas about *giving* praise or a critique to others.

First of all, if you are going to praise someone, make sure that it is really praise, not flattery. *"Many know how to flatter, few know how to praise,"* said Wendell Phillips, American activist and abolitionist. Be precise and sincere by indicating what you liked in the text/idea you are commenting on. Basically, if you liked any part of the text (idea), and you liked the broad thinking or originality of the idea, or simply the boldness of the author, do give some words of support, even if you do not agree with the idea and see the flaws in it.

Offering critical comments is very different. When you hear a new hypothesis or a new idea, the first and natural reaction is to start searching for caveats in it, trying to prove it wrong. There is nothing wrong with this attitude: in fact, this is the only proper scholarly reaction to any new idea. *"If we watch ourselves honestly we shall often find that we have begun to argue against a new idea even before it has been completely stated,"* said Wilfred Trotter, a pioneer in neurosurgery, expert on social psychology and herd instinct in humans. Be careful and aware of what means you are using to check the new idea. Do not start using any available means in order to *discredit* the idea or the author, do not attack the author's writing style, or the author's inadequate education, or the lack of references. You can certainly mention them, but primarily try to criticize the essence of the hypothesis, show that the author does not take into account other important factors, or show the flaw in the logic of the new model.

And if the new idea stands its ground, be prepared to accept that the new hypothesis might have a positive element (despite all possible shortcomings of the actual presentation). Also, if you do not understand any part of the text, remember Leonardo da Vinci's words when assessing someone's ideas *"You do ill if you praise, and still worse if you reprove in a matter you do not understand."*

By accepting a new potential idea, you will be joining a small elite rank of wider-thinking scholars who can move the field forward. Remember, there are many more good ideas around than scholars who can selflessly appreciate the new ideas coming from other scholars.

One piece of practical advice: always try to praise your opponents, in sports, in competitions, and in scholarly disputes. This is not only noble but also very practical. By praising your opponent, you are praising yourself, as you are often defined by your opponents. So, having strong opponents makes you seem stronger. When a sporting team defeats its rival, and claims that their opponents cannot play, they are stripping themselves of the glory of defeating a worthy opponent, whereas by praising the defeated opponent, sportsmen are praising themselves without even mentioning this.

When criticizing something, apart from being specific, leave room for the possibility that the idea might have better prospects if the author can find a solution to the specific problem raised in your critical comments. Remember, on the receiving end of your critique there is most likely an aspiring thinker for whom you represent a higher authority.

Very importantly, if you consider yourself a critical thinker (as all scholars do), be critical towards all ideas, both established and new. Also, be critical not only towards your ideas, but towards your own critical comments. *"The seeker after truth must, once in the course of his life, doubt everything, as far as is possible,"* said René Descartes.

Basically, it is nicer not only to receive praise but to give praise as well. When did you praise your colleague last time? There is great therapeutic wisdom in the following words from Rumi, 13th-century Persian poet and mystic *"Your depression is connected to your insolence and refusal to praise."*

Probably most importantly, be aware of the forward-moving character of scientific progress and the very few members who are open-minded contributors of this move forward. Many of our beliefs are going to change, so you might take part in this exciting process. Even axiomatic human beliefs change

with time. For example, our ancestors believed for a very long time that the continents are eternal and unmovable. Only about a hundred years ago did we start understanding that they are subjected to continental drift. This drift is very slow and difficult to see but is constant and inevitable as the forces of gravitation, with their subsequent catastrophic earthquakes and tsunamis. Similarly, many humans tend to believe that the dominating scholarly paradigms are solid and stable. But if you consider yourself a scholar, you must have an inner feeling that virtually all the dominating paradigms have to go sometime in the near or distant future, and it is your duty, as a scholar, to feel the approaching signs of the dooming scientific earthquake. Progressive scientists try to see the future, possibly sometimes by some false signs, but they have a feeling that the change is coming, and this is a healthy sense. Conversely, conservatives try to lull the listeners into believing that continents and dominating paradigms are forever solid.

And if you do not think there are serious scholars who believe there is not much further progress left to be achieved in science, read the next section.

On the End of Science

Believe or not, very serious scholars and experts in various fields throughout history sincerely believed that no more groundbreaking discoveries were left for the future. We can all agree that there is a certain temptation to treat the current position in science as the last word of scholarly progress. After all, “today” is the magical word for history, the very last day of civilization as anyone known it. But you need to remember, that every past day of every past year of our history was the most progressive day of the human civilization at the time, and every future day of every future year will be the same. It is easy to fall under the spell of “today” and believe we have reached the pinnacle of progress. We could call this phenomenon the “syndrome of today.” The strength of the belief in claims about the end of the scientific progress among some people could compete with the intensity of the claims of the end of the world. And despite many disappointments in past predictions, there are recurring both religious and scholarly claims on this often-repeated topic.

So, let us have a quick look when were such claims made, and who made them.

Let us go back to the very beginnings of the 20th century, the year 1900. Lord Kelvin was one of the best-known names from the history of science at that time. Born in Belfast in 1824, he did ground-breaking work in the mathematical analysis of electricity and thermodynamics and helped to bring the discipline of physics to its modern state. Absolute temperatures are stated in units of *kelvin* in his honor. For his work on the telegraph, he was knighted in 1866 by Queen Victoria, becoming Sir William Thomson. In 1892 in recognition of his achievements he was made Baron Kelvin. He was the first British scientist to be elevated to the House of Lords (by the way, Isaac Newton and Charles Darwin never made it this high). In short, it is not easy to find a scholar who had greater influence and recognition in his time, and to be fair, his fame lives on.

So what did Lord Kelvin think of the future of the science he represented?

“There is nothing new to be discovered in physics now. All that remains is more and more precise measurement.” In fairness, this widely known phrase might have been misattributed to Kelvin. Scholars are finding earlier expressions of this prophecy, which confirms that the idea seemed very possible to many thinkers of the time. For example, eminent physicist, Albert A. Michelson, the first American to win the Nobel Prize in science, declared in 1894 that *“it seems probable that most of the grand underlying principles have been firmly established.”* German physicist and mathematician, Philipp von Jolly famously advised his student Max Planck in 1878 against going into physics, as *“in this field, almost everything is already discovered, and all that remains is to fill a few unimportant holes.”*

As we see, Kelvin was not the first (and definitely not the only) scholar to pronounce such pessimistic words about the end of physics by the end of the 19th century. Some even think that he never made such prophesy. Well, we know as a fact, that Lord Kelvin definitely made other similarly grand and false prophecies. If some were correct, airplanes would not be flying today (his words were: *“No balloon and no airplane will ever be practically successful”*), and more tragically, we should be heading towards extinction for lack of oxygen. As we can see, even such an eminent scholar fell under the spell of “the syndrome of today,” and made declarations that make us rightfully doubt his prophetic abilities.

Around the same time, in 1888, Simon Newcomb, a Canadian–American astronomer, autodidactic polymath, professor of mathematics in the U.S. Navy and at Johns Hopkins, who made important contributions to timekeeping as

well as other fields in applied mathematics such as economics and statistics, also fell under the spell of “today” and declared: *“We are probably nearing the limit of all we can know about astronomy.”*

A bit earlier, about 1875, future pioneer of the study of electromagnetic waves, Heinrich Hertz, still a student, had a similar feeling that there was not much left to discover: *“Sometimes I really regret that I did not live in those times when there was still so much that was new; to be sure enough much is yet unknown, but I do not think that it will be possible to discover anything easily nowadays that would lead us to revise our entire outlook as radically as was possible in the days when telescopes and microscopes were still new.”*

The inability to see the ways of further progress was expressed in many fields. Surgeons predicted the end of humanely possible surgeries. *“The abdomen, the chest, and the brain will forever be shut from the intrusion of the wise and humane surgeon,”* said Sir John Eric Ericksen, Surgeon-Extraordinary to Queen Victoria in 1873. Some expert-engineers warned it was impossible to create something like a light bulb: *“Such startling announcements as these should be deprecated as being unworthy of science and mischievous to its true progress,”* said Sir William Siemens, a German-born engineer in 1880, replying to Edison's announcement of a successful light bulb.

Let us go earlier in history. The year 1490, two years before the historic trip to the Americas by Columbus, a Spanish Royal Commissioner, obviously with great expertise on the topic, rejected Columbus's proposal to sail an alternate route to the lands full of spices and potential new lands. We do not know the names behind the Royal Commissioner's advice, but we know that the same negative reply had come from Portuguese experts earlier. Fortunately for Columbus, the king and the queen decided to fund the expedition anyway. The reason for rejection was clearly expressed in the Royal Commissioner's phrase, *“So many centuries after the Creation, it is unlikely that anyone could find hitherto unknown lands of any value.”*

Similar sentiments are evident from earlier times. In the first century CE, a Roman statesman, engineer, expert of the system of aqueducts, Sextus Julius Frontinus authoritatively declared: *“Inventions reached their limit long ago, and I see no hope for further development.”* By that time Romans were on the top of the Western world, and Frontinus clearly fell under the spell of the “Syndrome of Today.” We live twenty centuries after Romans, and we can certify that quite

a few inventions, unknown to Romans, have been invented and put to use by later generations.

Sure, you might think scholars learned from history, that claiming the end of science is as doomed as searching for the Final Truth. Nope. Some of the most serious and prestigious scholarly journals publish articles on a similar topic written by very serious scholars even in our 21st century. For example, does the name of the journal *Nature* sound serious to you?

In 2013, an issue of *Nature* contained a very interesting article with the title “After Einstein: Scientific genius is extinct” by Dean Keith Simonton. Before discussing the central idea of the article, let us mention the author’s qualifications (remember, it is not easy to publish in this top-ranking peer-reviewed journal).

Without a shred of doubt, the author is well qualified to discuss the complex issue of brilliance in science. Here are a few sentences from Wikipedia:

“Dean Keith Simonton is a Distinguished Professor of Psychology at UC-Davis. He is particularly interested in the study of human intelligence, creativity, greatness, and the psychology of science. He obtained his M.A at Harvard in 1973, and his Ph.D. in 1975 [at the age of 27]. He is a fellow of the American Association for the Advancement of Science and a fellow of the American Psychological Association. He has over 340 publications, including 13 books. One of his books, The Origins of Genius, received the William James Book Award.”

To finish discussing the expertise of the author, we might also mention that in 2006 he published a paper that ranked the IQ and several other intellectual capabilities of all US presidents (Simonton, 2006). Very impressive indeed!

As we can see, Dr. Simonton is more than qualified to discuss authoritatively the intellectual brilliance of generations of scholars, and by extension the future of scholarly development. So what did he have to say in one of the most prestigious journals of our time?

Dean Simonton fears that originality in the natural sciences is a thing of the past. According to him, there just isn’t room to create new disciplines or overthrow the old ones. *“It is difficult to imagine that scientists have overlooked some phenomenon worthy of its own discipline”* [Sounds a little like the words of Spanish Royal Commissioner rejecting the proposal of Columbus]. Simonton asserts that most scientific fields aren’t in the type of crisis that would enable “paradigm shifts” (Kuhn), and instead of finding big new ideas, scientists cur-

rently work in large groups on the details in increasingly specialized and precise ways.

The most interesting idea expressed in the article is Simonton's understanding of cutting-edge scientific research. Simonton points out that *"cutting-edge work these days tends to emerge from large, well-funded collaborative teams involving many contributors"* rather than a single great mind.

Wait a minute. Development of scholarship with new ideas is a very non-group thing: it depends on the development of thought that came to someone for the first time. So by nature, it is a very individual endeavor. Groupism and peer bodies are a liability for science. *"If you want to kill any idea in the world, get a committee working on it,"* said Charles Kettering, one of the most prolific American inventors, and the founder of Delco.

Let us recall Max Planck's words about the role of individual scholars and big organized groups:

"New scientific ideas never spring from a communal body, however organized, but rather from the head of an individually inspired researcher who struggles with his problems in lonely thought and unites all his thought on one single point which is his whole world for the moment."

There is a good correlation in Simonton's text. No paradigm shifts are expected, so no need of the individual brilliance, the extensive efforts in puzzle-solving will do from now on. And let us be frank: for most of the big names of the scholarly establishment, Simonton's words sound like a dream come true; what could be better? Their ideas will never be bettered, they will never be proven to be wrong, their grants can keep flowing forever, their reputations are forever assured, and their loyal followers will be forever working on puzzle-solving. And most important, it is finally clear that all those ambitious heretics trying to herald scholarly revolutions (paradigm shifts) are just all crackpots – and all this is assured! For not only the next 10 years, but the next 500 years, or forever!

Well, if we think deeper about the idea of this eternal stability, scholars should be careful about embracing this point of the view. If we try to see the development of science from Simonton's perspective, we will see that this "dream come true" situation actually creates a very dangerous reality for the future of a community of peers. If governmental bodies and the community at large realize that all these well-funded research groups are working hard only

to solve minute puzzles, and no big ground-breaking discoveries are to be expected from them, they will start asking big questions about whether to continue funding all these existing well-funded research groups.

Let us remember that scientists are *expected* to come up with new revolutionary ideas. Do not forget, after the Second World War, the number of professional (read “paid”) scientists increased a mind-boggling forty-fold, and this was mostly the result of the final grand event of the war. After the brutal demonstration of the devastating power of science in the form of two nuclear explosions, governments drastically increased funding and talented youngsters started pouring in. *“We scientists are clever—too clever—are you not satisfied? Is four square miles in one bomb not enough? Men are still thinking. Just tell us how big you want it!”* asked Richard Feynman. Apart from his famous irony, you can feel the belief in the power of scientific research.

On the other hand, if we believe Simonton, and if the governmental and private funding bodies listen to his pessimistic ideas about the end of scientific revolutions, they might ask why anyone should put so much funding into something if some of the greatest authorities in the field forecast no more great discoveries. Fortunately, governmental bodies, very much like the King and Queen of Spain, do not always listen to expert opinions. Even Simonton himself declared he would like to be wrong: *“I hope that my thesis is incorrect. I would hate to think that genius in science has become extinct.”*

But do not forget: the idyll of the “large, well-funded collaborative teams involving many contributors” sounds too tempting to established scholars and cohorts of peers busy working happily on puzzle-solving, hopefully forever, without any fear for the catastrophic event known as a Paradigm Shift.

How to Make a Discovery?

*If I have a thousand ideas and only
one turns out to be good, I am satisfied.
- Alfred Nobel*

I do not want to finish this chapter with a negative section about the end of science. On the contrary, as silly it this might seem, I want to discuss several practical issues for those who are passionate to embark on the difficult and exciting journey of making a discovery.

Why not? If you are fascinated by the world around you and, like Marie Curie, want to contribute to the growing knowledge of humanity, this might be your natural way to live your life. Thinking constantly on the problems of your interest and coming up with new ideas fills exciting hours, days, weeks, and years. Of course, waiting to get a positive reaction from scholars from the field, not to mention the loss of opportunities to make your life more comfortable and successful, are negative sides of the life of a passionate discovery hunter. But as always, it is the process of the hunt, not of putting the hunting trophy on the wall, that makes life interesting and full. And of course, if you wish to be a free scholar, with freedom comes a new problem – you need to find some way to make a living somehow. This is definitely possible, as many celebrated scientific thinkers and famous artists had very mundane “day jobs”. One of the greatest philosophers of all time, Baruch Spinoza worked as a lens grinder, composer-innovators Charles Ives and Philip Glass worked respectively as a clerk at an insurance company and as a plumber, and American writer Kurt Vonnegut worked as a car dealer, to name a few.

For those who are not deterred by all the uncertainties of this path and still want to do the intellectual journey into the future of science, here are a few hints and practical suggestions:

- To start with, do not be afraid to be obsessed with your idea. On the contrary, discoveries mostly come to obsessed minds. To be obsessed with an idea means that your brain is searching for new solutions for the problems in the sphere of your obsession every minute of your life, including your sleep. That’s how the discoveries are made, when every word, every vision, every smell, every sound subconsciously reminds you of your obsession. Do not rush to find the solution; give time, get sleep, and live your everyday life with a positive feeling that the new idea might appear quite suddenly.
- Do not be surprised if the new idea comes, not when you are sitting at your desk, but during unexpected activities, like walking, in the bathroom, while shaving, washing your hands, brushing your teeth, or doing some more private business, during eating, even during sleep, and some other activities. It is useful to keep a pen and a piece of paper in your pocket all the time to make small notes. Record not only fully formed ideas or potential discoveries, but questions and half-formed ideas even if you are unsure of their worth.

- Re-read your old notes and questions after some time. You might suddenly see the old idea or an old strange question from your notebook in the new light, that suddenly makes eminent sense, and understand its true potential;
- You probably have role-models among scholars. Read their original writings and also read about their lives. Try to follow their advice, although remember to trust your own judgment in the first place. Believe in your own abilities and your judgment; discoverers do not like to follow others, they chose their own, new, uncharted ways.
- Try to deeply understand the historical fluidity of dominating paradigms. Even the strongest dominating paradigms of the day are more like the continents we live on: they seem stable but are in fact moving all the time. Contrary to the view of some serious academics, that fear that nothing big is left to discover, you need to feel that most of the existing paradigms will be rejected in a few decades or centuries. With your obsessed search, you are a vital part of the progress.
- Do not try to find a “Final Truth” and do not hope that your ingenious idea will never be bettered. We will never know whether the Final Truth really exists. As a discoverer, you must be content if you can find a *better* explanation of the existing facts and controversies.
- If you are willing to be a participant in these exciting changes, you have to prepare yourself for the bad news that I mentioned several times. Be prepared for years of neglect and ridicule. The good news is that your own belief that you are right, and the feeling that you are serving the progress of science, is constantly with you. Be optimistic; you are not the first one getting such a bad response – all the big discoveries went through this. Even if you are at some point proved wrong, you still will have (and should have) great intellectual gratification for serving the future of science with your daring thinking.
- Regarding where to search for the discoveries, apart from the sphere of your obsession (if you already have one) try to critically check the reports of the phenomena that are not believed by contemporary mainstream science. Mind that such popular controversial topics as Bigfoot, the Loch Ness Monster, parapsychology,

UFOs, or crop circles already have thousands of enthusiasts. If you are still passionate about any of these popular topics, go into it, particularly if you believe you have new interesting data or a new perspective to make your arguments more appealing;

- Check the rejected reports of less prominent and less popular phenomena. Remember, for example, that one of the first recorded reports of meteorites falling from the sky was ridiculed (*"I would sooner believe that two Yankee professors lied than that stones fell from the sky,"* said Thomas Jefferson in 1807 on hearing an eyewitness report). Similarly, the perfect professionally written description of Polynesians part-singing was not believed by European musicians because of the paradigm that polyphony was a late invention by medieval Christian monks (see Kaeppler et al., 1998:15);
- Check the exceptions in various fields of scholarship, and if any of them occupies your imagination, direct your intellectual power towards solving the mystery. Read as much as you can on the matter, and allow totally unrelated and various thoughts to arise that might have any connection to the problem;
- Remember, some of the biggest discoveries are very often right under your nose. To reveal them you need to ask novel questions about the well-known things that we encounter every day. So try to look at the phenomena around you from a new angle, ask questions about their origins, function, history, cultural diversity around the world. Thinking out-of-square is crucial. Remember, discoveries are usually found in directions scholars would *not* go naturally; that's why it needs a fresh look from an unexpected angle;
- If you like experimenting and you are doing an experiment to confirm a new or an existing hypothesis, listen to a Nobel Prize winner American-Italian physicist, creator of the world's first nuclear reactor, Enrico Fermi: *"There are two possible outcomes [of the experiment]: If the result confirms the hypothesis, then you've made a measurement. If the result is contrary to the hypothesis, then you've made a discovery."*
- Remember what Alfred Nobel said about his ideas: *"If I have a thousand ideas and only one turns out to be good, I am satisfied."* Be ready to discard your idea, if you find facts that contradict it, or

think hard to accommodate these facts, without losing your integrity as a scholar.

And finally, please, discard all my advice if you already believe you have your own methodology or techniques regarding coming up with new revolutionary ideas and making discoveries. As Paul Feyerabend suggested, there can be no rules in regard to scientific method, so just go on following your own path towards discovery. And by the way, there are a few other helpful hints from scholars to assist those who crave to make a scientific discovery (see, for example, Gottfredson, 2010; or Johnson, 2011).

The exciting and mysterious world of discoveries is right in front of you! Good luck!

Conclusions

In this chapter, I proposed deviating from Kuhn's model, where there are long stretches of time when scholars are happily engrossed in puzzle-solving within the old paradigm, followed by the short and violent crisis situation, when the old paradigm runs into a brick wall and ensures the appearance of a new paradigm. We actually have a much more complex, bush-like situation. On one hand, the followers of the old paradigm virtually never propose that their field is in a crisis. And on the other hand, there is hardly a moment when there are no attempts to find caveats in the dominating paradigm. Therefore, for some scholars, there is a constant crisis situation, while for others, there is never a crisis situation. That's why the paradigm shift is mostly seen when it is accomplished, and why science is mostly advancing, as Planck poetically put it, by "one funeral at a time."

Potentially, every paradigm is destined to be overthrown by another sooner or later, so scholars should never lose the feel of a scholarly perspective. Otherwise, we will start accepting those prophets who were quick to declare the end of science in various centuries. *"If we worked on the assumption that what is accepted as true really is true, then there would be little hope for advance,"* said Orville Wright, one of Wright brothers credited with inventing and flying the world's first successful airplane.

In this chapter, we discussed several important elements of scholarly progress, including the issue of progressive ideas, the danger of relying on consen-

sus, the need for generalizations and scholarly predictions, the importance of exceptions, the futility of the notion of final truth, and other issues, including some practical suggestions for those fascinated by the search for new ideas and making discoveries.

And finally, out of two faces of the paradigm change, (1) the fearful environmental catastrophe, or (2) a rejuvenating fire that brings new life over the land, it is up to you to decide where you stand. Remember words of Helen Keller, a blind and deaf thinker who could see further than many of us with intact eyes and ears: *"No Pessimist ever discovered the secrets of the stars, or sailed to an uncharted land, or opened a new heaven to the human spirit."*

Chapter 6

SKEPTICS AND PEERS

Ode to Skeptics

*I ask you, which is the greater threat to science and mankind,
accepting a claim that can have no possible benefit,
or rejecting a claim that can have great benefit?*

- Edmund Storms

Every scholar should be a skeptic. This naturally means that a scholar should look with a healthy dose of skepticism at everything – from established paradigms to the newest ideas, including his or her own ideas and even own critical comments. It is virtually a requirement for a scholar to be skeptical. As a result, most professional scholars praise themselves for being skeptics. What can be better!

Unfortunately, this definition of what skeptics do does not fully agree with reality. Many professional scholars, claiming to be skeptics, are, in fact, deeply conservative thinkers. They take the existing paradigms at face value and display strong skepticism only towards new ideas and those sidelined by mainstream scholarship topics and directions. I think it would be fair to call such unidirectional skeptics as “neophobic skeptics.” They are very different from those who we can call “true skeptics.” Genuine scholars and true skeptics should be, as Freeman Dyson put it, rebels and unorthodox thinkers, continually testing the boundaries of the known scholarly and cultural world (Dyson, 2006).

So who is a Neophobic Skeptic? A Neophobic Skeptic is usually a well-informed expert, often with full academic credentials. He looks at every deviation from the existing paradigm and every new idea as an annoying nuisance that must be rooted out as soon as possibly by all available means. By their psychological constitution these neophobic skeptics are not skeptics, but fundamentalist believers.

You are gravely mistaken if you think that fundamentalism is only possible in the realms of religion. Fundamentalists are widely present among scholars, and sadly, even among eminent skeptics as well. It is a very telling fact that one of the most prominent skeptics of our times, Michael Shermer, an American science writer, historian of science, the founder of The Skeptics Society, before becoming a skeptic, was a fundamentalist Christian. This change might seem strange to some readers, but to others, it may seem like a natural change of one fundamentalist system of beliefs (of accepted religious dogmas) to another

fundamentalist system of beliefs (of the accepted mainstream scholarly paradigms). If anything, the skeptic must have a free and open mind, not fundamentalist beliefs. Frans de Waal famously wrote: *"The enemy of science is not religion... The true enemy is the substitution of thought, reflection, and curiosity with dogma."*

Another inspirational figure of scientific skepticism of earlier generation, Martin Gardner, said wonderful words more than a half-century ago: *"Modern science should indeed arouse in all of us a humility before the immensity of the unexplored and a tolerance for crazy hypotheses."* Gardner's 1957 book *Fads and Fallacies in the Name of Science* became a seminal work of the skeptical movement. At the same time, unfortunately, he also fell into the trap of name-calling the unorthodox thinkers. For example, at the end of the first chapter of Gardner's book, we read:

"Just as an experienced doctor is able to diagnose certain ailments the instant a new patient walks into his office, or a police officer learns to recognize criminal types from subtle behavior clues which escape the untrained eye, so we, perhaps, may learn to recognize the future scientific crank when we first encounter him."

Sociologist of religion Anson D. Shupe politely pointed out a criticism of the book, that *"he (Gardner) accepts too comfortably the conventional wisdom, or accepted social reality, of current twentieth-century science and middle-class American Christianity. Somehow it is evident (to me at least) that he is implicitly making a pact with the reader to evaluate these fringe groups in terms of their own shared presumptions about what is 'normal.' Thus he is quite confident throwing around labels like 'quack,' 'crank,' and 'preposterous.' In science, the use of such value judgments can be quite time-bound..."* (Shupe, 1981: 50).

It is hard not to agree to the criticism.

When dealing with unorthodox ideas, at least some of the neophobic skeptics display the talent of noticing the smallest inconsistencies in the text describing the new idea (not everyone bothers to do this), but at the same time, they are unable to see any disagreement with the facts that the existing paradigm generates. Somehow, they lose the bigger picture, forgetting the valuable history lessons that no paradigm is destined to reign forever.

Dividing skeptics into groups is not a new thing. We know, for example, that skeptics are sometimes divided into so-called “dry” and “wet” categories. The former uses derogatory terms and ridicule and does not go into discussion with the new ideas; the latter tries to use a more balanced approach and scholarly methods of evaluation. As you may guess, the neophobic and fundamentalist approach is particularly clear in so-called “dry skeptics.”

Unfortunately, for many readers, the word “skeptic” is probably associated only with the scholars who criticize so-called pseudoscientific subjects (from alchemy, Bigfoot, and UFO to alternative medicine). In this section, I discuss the skeptical attitude towards all kinds of new scholarly ideas as well, sometimes with clearly pronounced scholarly predictions. Later we will discuss several cases of new ideas and the response they received from the peer community, but let us first discuss why we need groups of peers in the first place.

Friendship, Peers, and Peer Pressure

The origin of human friendship, the desire of every normal human individual to be included in a group of other humans, comes from our shared evolutionary history as a social species. Being together was a crucial part of the survival of our distant ancestors for millions of years.

Belonging to a group of professional peers has very different psychological mechanisms. Unlike friendship that has a solid basis in our evolutionary prehistory, belonging to the group of professional peers is not natural for humans for two fundamental reasons. First of all, the tendency of humans having various professions is a very late development. Second, people of many professions are natural competitors to one another. As a result, belonging to a profession, or being a member of a peer group, is not natural for humans. At the same time, paradoxically, maintaining good professional ties with peers is essential for making a living in your profession. It is essential to keep this duality of being professional peers in mind in the contemporary world, based on the economic power-struggle between various professional groups.

Although there are a few great examples of people of the same profession sharing a genuine friendship, in general, friendship is not natural in groups of peers. Adam Smith famously declared: *“People of the same trade seldom meet together, even for merriment and diversion, but the conversation ends in a con-*

spiracy against the public, or in some contrivance to raise prices." Cornelius Vanderbilt seconded: *"There is no friendship in trade."*

There are fascinating parallels between the professional (including scholarly) peer groups and the teenage peer groups. Members of both do not like their members to be very different, neither to fall too much lower nor to rise too much higher. They both have a special passion for inner recognition: for both, the true recognition is the recognition from their peers, not from the wider community. They both have unique codes of conduct, rituals, and secret language. They are both very strict about dissent. And they both pressure the new members, trying to make them more or less uniform. They both have accepted leaders who, for various reasons, have the fullest authority, and are the speakers for their groups. Popularity among academic peers is quite often connected to the position of power – for example, being in a senior position at a prestigious university, or editor-in-chief of a prestigious academic journal, or winner of a prestigious award. Quite often, all these elements are combined in the same scholar.

Like acknowledged leaders of teenage peers, such VIP academics are considered leaders of the groups of peers. And still, even the most distinguished scholars should not go beyond this. Most academic peers dislike when peers become too popular with the wider society. This "tall poppy syndrome" can be sometimes felt if you talk about Konrad Lorenz with ethologists, or Albert Einstein with theoretical physicists, or Linus Pauling with biochemists, or Bernard Spilsbury to criminalists, or Alan Lomax with my colleagues, ethnomusicologists. True peers are peers, all must be equal, and although there are leaders, they still are not expected to have wider extra-peer popularity. And of course, tall poppies are met with particular hostility if their ideas or beliefs potentially threaten the stability and financial security of the Establishment and the interests of the peer group. *"Nothing is thoroughly approved but mediocrity. The majority has established this, and it fixes its fangs on whatever gets beyond it either way,"* remarked Blaise Pascal.

Peer community and peer review are basically defense mechanisms from any attempts to change the accepted norms and beliefs of a scholarly field that endanger the status quo. It is a self-serving institution that wants to keep things as they are. It is a long and difficult process to be accepted into the group of professionals as a "peer", and as soon as you are there (and if you want to remain there), you should follow communal interests, constantly checking

whether your innovative ideas align with the security and stability of the peer community.

The central point of my critique is that the peer community does *not* primarily serve science or the scientific field. Instead, it serves scholars, their corporate interests; in short, it serves peer interests. If you are an outsider for any reason, even if your revolutionary idea is reasonable and has potential, you are doomed to negative responses from the professional peers. Even if you are from the same field, but your ideas are too unorthodox and unsettling for the established paradigm, you will fall out of favor with your professional peers.

So even if there is no friendship in trade, there certainly is the professional loyalty of all faithful group members for their common goals and shared interests. So if you think you made a big discovery, a game-changer, think hard: do you really want to go against your peer group's interests?

And as in every long-lasting life partnership, scholar-peers also make compromises. With the peer pressure in scholarly fields, compromises made for the sake of acceptance are quite usual. Even the greatest thinkers tried not to anger their peers. Hume was critical of his earlier writings for the sake of acceptance: Hume asked his contemporaries to judge him on the merits of his later texts alone, rather than the more radical formulations of his early, youthful work, dismissing his philosophical debut as juvenilia: "*A work which the Author had projected before he left College.*" Nevertheless, despite Hume's protestations, a general consensus exists today that Hume's strongest and most important arguments, and most philosophically distinctive doctrines, are found in the original form they take in the *Treatise*, begun when he was just 23 years old, and now regarded as one of the most important works in the history of Western philosophy. Radical ideas have more chance for acceptance with greater lapses of time.

It is symptomatic that newcomers to the peer community are understandably careful not to anger their more conservative peers with their stories of the rejection they experienced. Do not forget, sometimes the tone of your voice, and the tone of a written text can affect the attitude towards you and your ideas. You have a better chance if you are humble. "*We often refuse to accept an idea merely because the tone of voice in which it has been expressed is unsympathetic to us,*" pointed out Friedrich Nietzsche.

Mystery of the Peer Review

By far, the largest and the most effective body of the academic scholarly world is the array of peer-reviewed journals. There are about 30 000 active peer-reviewed scholarly journals, with the output of over two million articles every year. There is no bigger assurance of being accepted in the academic establishment than having an article in a peer-reviewed journal. Peer-reviewed journals are not only the greatest assurance of a scholar's belonging to the scholarly establishment, but they are also the greatest defensive system that scholarly establishment has ever built. If you keep dangerous new ideas out of the reach of the sacred territory of the peer-reviewed journals, the reigning paradigm is relatively safe.

The world is fast becoming graded. We grade not only competitive spheres of life (for example sport), but spheres that have nothing to do with direct competitions, like a ranking system of the world universities, ranking of the countries according to their student's performance in several key subjects in the teaching curricula. Informal competition between countries and their scientific achievements was called by Harry Johnson, Canadian economist and social scientist, the "scientific Olympics."

It would be strange if there were no ranking system for scholarly journals, and of course, there is more than one. Peer-reviewed journals are on the top of the ranking of journals for scientific discoveries, although many active scholars would agree that they have long become a powerful force against any fundamental, paradigmatic discoveries. If you try to check, for example, the story of Nobel Prize-winning revolutionary ideas, they, as a rule, are known to be rejected multiple times by the most authoritative peer-review journals and managed only to appear in a relatively low-key journal.

And still, all stories of the neglect of great new ideas by the top-ranking peer-reviewed journals aside, any staff member of any of the Western universities knows too well about the deep-seated love and reverence of university officials for publication in peer-reviewed journals. Very often, they prefer a small article, a review, or a letter to the editor in a peer-reviewed journal to a research monography with potentially ground-breaking ideas. The perennial demand for more articles in peer-reviewed journals is one of the hardest requirements for a significant number of academicians at universities. As soon as you become a university lecturer, you are asked to produce several articles a

year in peer-reviewed journals. No, you are not required to do this to advance science, but simply to fulfill the requirement. Because of this senseless race for numbers, peer-reviewed journals became not the cutting edge of science, but the necessary elements of the university admission scheme. So the aim of peer-reviewed publication in most cases is the publication itself, not advancing science. And if you happen to make an interesting and “publishable” discovery (that does not go against the current paradigm), do not publish it as a single publication, instead make a series of articles, or as scholars say, “slice a salami.”

All that was said above was discussed in the “money” chapter. If you are a professional composer, and you try to make a living composing music, you do not start writing an opera if you had been commissioned to write a symphony. According to a well-known quote, “*those who pay the piper, call the tune.*” So if you are a composer, listen to what the paying client wants. Only if a composer does not depend on writing music for a living (like Charles Ives, for example), can he/she write opera whenever there is a creative urge to do so.

Among professionally educated scholars there are several forces (some complementary and some contradictory) acting behind the closed doors of the peer-reviewed journals (PRJ):

(1) We have a large number of active scholars following the demands of their universities and trying to pen several articles a year in PRJs – they are basically happy to write *anything* that will be accepted, in order to ease the pressure from their employers. Scholars who wish to find an academic job also know painfully well that many universities require an impressive number of PRJ publications. The main problem for the members of this big group is that places are limited, and competition is fierce. As a side result of the competition, the number of authors behind most of the small articles in PRJ is gradually increasing.

(2) We have a small group of established scholars who have plenty of articles in PRJs. They are representatives of the reigning paradigm, are usually safe at their university position, and can publish as many articles in PRJ as they wish. They certainly are the VIPs of the scholarly field, the extant megafauna of the scholarly establishment. The only problem for the members of this elite group of scholars is that they need to keep a sharp watch, in order to keep the dangerous new ideas from appearing in their sphere, or at least keep these dangerous ideas from appearing in the PRJs, the very heart of the scholarly estab-

lishment. We might remember, megafauna are the prime target of a meteor collision disaster. Big responsibilities always come with big power.

(3) We also have a group of new romantic researchers with new revolutionary ideas. They wish to enter the scholarly establishment on the wings of their creative ideas. They might believe that PRJs, with their accumulated vast knowledge and expertise, are the best place to appreciate the originality of their ideas. Their problem is that they can hardly anticipate any positive reply or even a fair review of their potentially interesting ideas. Members of this group gradually become divided down the timeline roughly into “realists” and “forever romantics.”

(4) Some learn fast from the lessons of the PRJ rejection letters, so they gradually lose the romantic aspirations for revolutionary ideas and join the first group, members of which are ready to please the editorial board of established scholars with the submissions they wish to see; they also look for a group of colleagues who are ready to accept them as another co-author on the potential PRJ publication. So former “romantics” turn into “realists.”

(5) Some romantic scholars remain romantic for a longer time, and in some hopeless cases even forever. They lose chances of finding a decent position; they are gradually marginalized by academia. They often make their living outside prestigious university positions, sometimes outside universities altogether. And still, some of them are still happy and proud to feel that they are against the mainstream inertia, potentially heralding the new age of the development of the scholarly progress. These can be classified as “romantics forever.”

These differences are all results of natural processes. People involved in scholarly research share the usual human strengths and weaknesses. They have different personalities, life stories, experiences, and flexibility to make amendments in their life goals; they are vastly different in family background, financial situation and finally, they come from various countries and speak different languages. All these factors influence the life of scholars and their scholarly output in the most profound way. And if you noticed, we were talking here only about those who were academically fully educated, not guys like Charles Darwin, Alfred Wallace, Gregor Mendel, or even Leonardo da Vinci. Although thinkers like them, without the “proper” academic education, provide iconic examples of great revolutionary thinkers, they are, as a rule, not competing for university positions with professional scholars, and as a rule, are unable to make a living out of their revolutionary (even successful) ideas. The presence of such individ-

uals complicates the already complicated stratigraphy of the scholarly community.

It is certainly a great democratic achievement that today anyone who is interested in scholarly research and possesses a certain level of computer skills has a chance to send their research output to international journals, including the most prestigious journals ones. Unfortunately, this democratic dream does not extend much further than the ephemeral “chance.” Given the high number of submissions and limited resources, many submissions do not reach the reviewer at all. For example, the Proceedings of National Academy of Sciences alone rejects more than 16,000 papers every year, and *Nature* rejects most of the over 10,000 submissions received, many declined without being sent for a review.

If you think that with this stringent approval process and fierce competition, only the best of the best submitted to the PRJs are accepted, you are sadly mistaken. Many scholars with firsthand knowledge of PRJ machinery agree that the published materials are not always of the highest standard. According to Drummond Rennie, deputy editor of the *Journal of the American Medical Association*, an organizer of the International Congress on Peer Review and Biomedical Publication:

“There seems to be no study too fragmented, no hypothesis too trivial, no literature too biased or too egotistical, no design too warped, no methodology too bungled, no presentation of results too inaccurate, too obscure, and too contradictory, no analysis too self-serving, no argument too circular, no conclusions too trifling or too unjustified, and no grammar and syntax too offensive for a paper to end up in print.”

The peer-review process had been accused of several vices that are unfortunately inherent in the currently accepted process:

(1) One of the greatest dangers of PR for the free development of the scientific field is that the editors and reviewers have full control over what reaches readers, and this makes them potent gatekeepers.

(2) The peer-review process is a powerful tool to suppress dissent against currently accepted theories.

(3) Reviewers tend to be especially critical of conclusions that contradict their own views and beliefs and support the materials that match them.

(4) Established scientists are more likely than others to be sought out as referees, particularly in high-ranking journals. Sociologists of science suggest that peer review makes the ability to publish susceptible to control by high ranking established scholars and their personal preferences.

A coalition of seven comprehensive universities committed to inclusive excellence in teaching, learning and research in Australia, after some research, concluded that "*peer review disadvantages researchers in their early careers, when they rely on competitive grants to cover their salaries, and when unsuccessful funding applications often mark the end of a research idea*" ("Peer review 'works against' early career researchers" *Times Higher Education*, July 16, 2018). Sometimes seeing the title is enough to get the general feeling towards the existing practice of the peer-review: "Peer review and over-competitive research funding fostering mainstream opinion to monopoly" (Fang, 2011).

Moti Nissani, geneticist and social science researcher from Wayne State University in Detroit, published an informative article examining the prevalence of the resistance facing new, mostly young and obscure authors' original works in academic scholarship. He distinguishes three possible views on the subject – minimalist (that instances of offhand rejection and neglect are very rare and do not merit attention), moderate (that such instances are not very rare and merit research), and maximalist (suggesting that such cases are prevalent, and scholarly research needs reform). In this article, Nissani proposed useful characteristics of "marginal scientists": young; Ph.D. not from a top university; did their research (and Ph.D.) in a remote area of inquiry (recent migrants); had been trained and employed by institutions far from the centers of power and prestige in a discipline; are employed in industry rather than in university departments; not employed by the university (Nissani, 1995:91; see also, Mulkay, 1972). The author discussed over 50 cases of neglect and resistance to original ideas and strengthened the case for the need for reform of science.

Let me finish with the words of another insider of peer-reviewed journals, Richard Horton, editor of the British medical journal *The Lancet*:

"We portray peer review to the public as a quasi-sacred process that helps to make science our most objective truth teller. But we know that the system of peer review is biased, unjust, unaccountable, incomplete, easily fixed, often insulting, usually ignorant, occasionally foolish, and frequently wrong."

Positive and Negative Cropping

*If you restrict the journal to publishing
only what pleases the referees, you end up
publishing what is popular, and while it does make
everyone feel more comfortable, you are guaranteed to miss
the occasional breakthrough.
- Alex Dessler*

It is widely known that peer review works at two levels: “cutting the bottom end” and “cutting the top end” of the total output in the field.

Very low-quality works, obviously wrong ideas, and poorly written texts mostly do not even reach peer reviewers. But if they reach them, peer review cuts the part that is low quality and worthless. This is a positive side of the peer review.

The problem is that peer review also eliminates the top end, or the new exciting and potentially promising scholarly ideas. This is quite tragic. Such revolutionary works, suggesting new, truly breakthrough ideas that can potentially lead to the change of existing paradigms, are relatively rare. Rejection of these ideas in some cases comes from the fact that the author of the new idea can be miles ahead in the field, and an ordinary scholar is unable to understand the importance of the new idea. Well, sometimes, they refuse to understand. It is human nature. Do not forget, any big news is bad news for the established peer community. Rejection of new revolutionary ideas comes from the corporate interests of scholars or a peer community – many peer reviewers have vested interests in maintaining the status quo, have their own grants and submissions, so any big paradigmatic changes in their field threatens their stability.

Now let us discuss in a few more words the biggest problem in “cutting the bottom” (positive cropping) and “cutting the top” (negative cropping).

The central issue is that it is sometimes notoriously difficult to understand in each individual case whether this particular idea or article should be considered “bottom” or “top.” Yes, we must accept that the submitted text from an unknown author might look confusingly similar to both categories! The idea potentially can be from the “top,” but the execution of the text can be from the “bottom.” Ideally, an expert-scholar, who is doing peer review, should be able to grasp the importance of the idea if it is potentially fruitful, even if it is not very professionally written.

Ideally, a scholar should not concentrate on the deficiencies of such submission (fragmented, unsubstantiated, not well referenced, etc.) if the idea itself might be fresh and potentially fruitful. But, of course, this kind of “altruistic approach” would be against the survival interests of the scholar, against the stability and living resources of the existing scholarly community. Having become professionals with a stable salary and funding grants, most scholars lose their basic altruism, and their scholarly objectivity becomes obscured.

On the other hand, apart from missing the occasional breakthrough idea, another serious problem of the peer-reviewed process is the failure of eliminating bad quality articles. This problem is highlighted when intentionally fake articles that should have been rejected were accepted for publication. The internet is full of scandalous cases of peer-reviewed journals accepting such fake articles. The existence of such cases (usually known by the generic name “peer review failures”) means that peer review makes mistakes not only by cropping what should have reached the reader but failing to crop the low-quality works that should have been eliminated.

However we might criticize the mechanism of peer review for its many failures, we have to admit that it is a very effective defense for the peer community from new heretic ideas. Even Linus Pauling, the only scholar in to receive two unshared Nobel Prizes, was attacked by the medical establishment for his unorthodox ideas about the vitamins. Among other things, Pauling was criticized by the medical establishment for not having a Ph.D. in medicine. Well, at least we can say that Pauling had a comfortable life, and, despite a life-threatening medical condition, was able to live to a ripe age of 93 (possibly thanks to his own methods of using vitamins).

On the other hand, an innovative Hungarian doctor Ignaz Philipp Semmelweis was not as lucky. Semmelweis recommended that physicians wash their hands in chlorinated water between deliveries in maternal wards. Hardly a ground-breaking suggestion, you might think, but this suggestion was a sensation at odds with medical norms of mid-19th-century Western Europe. Semmelweis had very telling statistics to back up his suggestion, as he managed to reduce the mortality in his clinic from about 20%-30% to less than 1%. And what was the impact of these numbers?

Despite Semmelweis’s widespread popularity among the general population of Vienna and Budapest (particularly among the most interested segment of the population – women), his peers, the professional doctors, managed to

neglect all the facts and statistics that he presented and accused Semmelweis of ignorance of the basic principles of medicine. Here is the masterpiece of high-ranking medical experts criticizing the new idea of disinfecting their hands before each surgical operation: "Doctors are gentlemen, and gentlemen's hands are clean." This deadly argument was voiced by the leading obstetrician of the time, certainly a VIP of the field, Charles Meigs from Philadelphia. Embittered and isolated, Semmelweis lost his nerve, and finally, in 1865, he was forcefully placed in a psychiatric clinic, where he was severely beaten by guards, and died after two weeks from internal injuries. He was 47 years old.

Pauling and Semmelweis were both experts in their fields, but because of their unorthodox ideas, they were persecuted by the very scholarly establishment to which they belonged. Despite certain similarities, they had profoundly different lives: Pauling had a very successful scholarly career and passed away at the age of 93, but Semmelweis was ostracised, ridiculed, and finally placed in a madhouse, where he died. They both were experts in the fields they served, and both tried to implement new unorthodox ideas.

So what can we expect when non-professionals try to bring in new unorthodox ideas?

On Professional Language

One of the hallmarks of the community of peers is their secret professional language. Professionals try to create a new language, and they try to have their own ideas expressed in a way that conceals them from the uninitiated – professional jargon is, in fact, a "secret language." Sometimes there is absolutely no substance behind this jargon, but for the uninitiated writings in technical professional language sound and look like "wisdom of the gods." It is no coincidence that great scholars, who truly had something to say, were often writing in the simplest possible language that uninitiated could also follow. Compare, for example, the language of Darwin and Huxley – Darwin's writings are understood by many, you do not have to have professional knowledge of biological jargon. On the other hand, Huxley, as a true professional, often wrote in heavy jargon so that many could not understand. Darwin himself admitted not understanding half of Huxley's lectures because of his jargon. It was typical that professional biologists were much more impressed by Huxley's technical presenta-

tions than Darwin's writings, although Huxley ultimately survived in the history of biology for his loyalty to Darwin's ideas.

My colleagues, professional musicians and musicologists, also have our professional language: that of written music. Academically educated musicians can always impress others with their ability to read musical notation. Paul McCartney's father, himself a wonderful musician (and like Paul, self-taught) wanted his son to learn music "properly," with a solid education and of course, the reading of sheet music. Paul never did. The same way, Paul also wanted his son James to learn music "properly," and James never did either. Although Paul (as the rest of The Beatles members) could recognize the notes, reading music is much more than recognizing written notes.

So what? Both Darwin and The Beatles, without the knowledge of the "secret language of professionals," managed to create a rich legacy that defies the notion of academic education. Many professional biologists would be happy to share a small part of the legacy of Darwin, the same way that many professional musicians would love to share a small part of the innovative legacy of The Beatles.

No question about that, it is handy to know the professional jargon, but do not forget Martin H Fischer's words: *"You must learn to talk clearly. The jargon of scientific terminology which rolls off your tongues is mental garbage."*

Experts Making Blunders

We all make mistakes, sometimes small ones, and sometimes big ones, even catastrophic ones. This is understandable, and no human is immune from mistakes. But when we hear that experts made mistakes, it catches our attention, particularly if the mistake is a major one. Well, we should allow such mistakes, even blunders, for experts to make. And for sure, even the famous thinkers known for their open, creative mind, experts of their fields, make blunders.

I will start with my own field – music. It was a true revolution when new technology made it possible to record the fleeting sounds. Today you would struggle to find a family, at least in the Western World, that did not own some sound recording and playback equipment. Can you believe that there were people that doubted the practical and commercial value of this invention? Listen, for example, to these words: *"The phonograph has no commercial value at all."* And who said that? No less than the inventor of the phonograph himself,

Thomas Edison. Be aware that sometimes we might not appreciate our own inventions and ideas.

The telephone was another revolutionary technology that met with resistance from the experts. This is a quote from a *Boston Post* article on the new invention in 1865: "*Well-informed people know it is impossible to transmit the voice over wires and that were it possible to do so, the thing would be of no practical value.*" The opinion of experts was so strong, that even the businesses that eventually benefitted immensely from the new means of communication, like Western Union, held negative views, declared even a decade later, in 1876: "*This telephone has too many shortcomings to be seriously considered as a means of communication. The device is inherently of no value to us.*"

Sometimes the negative opinion might have other aims, for example, to encourage the professions threatened by the new invention: "*The Americans have need of the telephone, but we do not. We have plenty of messenger boys.*" These words came in 1876 from Sir William Preece, chief engineer of Britain's Post Office. I am sure "plenty of messenger boys" felt relieved hearing these assuring words.

At other times negative assessment is triggered by strong commercial rivalry. This is what Thomas Edison said in 1890 about alternating current: "*Fooling around with alternating current is just a waste of time. Nobody will use it, ever.*" Edison was advocating against Tesla's idea to use alternating current as a more potent and practical version of energy. We know that the suggestion to use the alternating current for the execution of criminals also came from Thomas Edison, who hoped that this macabre fact would deter the general population from using this lethal source of energy in everyday life.

The invention of cars was one of the most practical novelties in the history of civilization, but if you think that cars were immune from critique, read this "*The horse is here to stay, but the automobile is only a novelty – a fad,*" said the President of the Michigan Savings Bank, speaking to Henry Ford's lawyer, Horace Rackham. Rackham ignored the advice and invested \$5000 in Ford stock. A few years later, he sold his shares for \$12.5 million.

Flying was a long-term dream for humanity, but there were negative opinions even when success was very close. "*Heavier-than-air flying machines are fantasy. Simple laws of physics make them impossible,*" said Lord Kelvin, President, British Royal Society, in 1895. In the same year Edison, declared: "*It is apparent to me that the possibilities of the aeroplane, which two or three years*

ago were thought to hold the solution to the [flying machine] problem, have been exhausted, and that we must turn elsewhere." A few years later, just two years before the first successful experiment, Wilbur Wright, one of Wright brothers, after a disappointing flying experiment in 1901 pessimistically declared: *"Man will not fly for 50 years."* Later, when flying became a reality, there were rushed prognoses that aviation was nearing the limits of its capacity. *"There will never be a bigger plane built,"* a Boeing engineer was quoted as saying, after the first flight of the 247, a twin-engine plane that could hold a sensational ten passengers.

Space travel is rightfully considered one of the greatest achievements of humankind, but the visionary scholars were ridiculed as lacking basic education. *"Professor Goddard does not know the relation between action and reaction and the need to have something better than a vacuum against which to react. He seems to lack the basic knowledge ladled out daily in high schools,"* declared a *New York Times* editorial about Robert Goddard's revolutionary rocket work in 1921, five years before the first successful launch of his rocket. Richard van der Riet Wooley, British astronomer, in reviewing P.E. Cleator's *"Rockets in Space,"* in *Nature*, March 14, 1936, said:

"The whole procedure [of shooting rockets into space]... presents difficulties of so fundamental a nature, that we are forced to dismiss the notion as essentially impracticable, in spite of the author's insistent appeal to put aside prejudice and to recollect the supposed impossibility of heavier-than-air flight before it was actually accomplished."

There was great skepticism among the highest-ranking professionals even on the brink of success. Sir Harold Spencer Jones, Astronomer Royal of the U.K., declared: *"Space travel is bunk"* not only the year space travel became a reality (1957), but just two weeks before Soviet spaceship Sputnik orbited the Earth.

It is hard to imagine contemporary warfare without tanks, but the first steps were very hard for the metal monster: *"Caterpillar land ships are idiotic and useless. Those officers and men are wasting their time and are not pulling their proper weight in the war,"* said the Fourth Lord of the British Admiralty authoritatively, while a discussion regarding the introduction of tanks in war in 1915. Field Marshal Douglas Haig, at tank demonstration in 1916, clearly expressed his opinion, *"The idea that cavalry will be replaced by these iron coaches is absurd. It is little short of treasonous."*

Air forces form probably one of the most effective parts of any contemporary military power. But listen to the words of Ferdinand Foch, Professor of Strategy, an influential French general and military theorist who served as the Allied Commander-in-Chief in 1918 and successfully coordinated the French, British, American, and Italian efforts into a coherent whole: *"Airplanes are interesting toys but of no military value."*

The use of nuclear power became an accepted part of our life, and one of the biggest sources of energy for the future, but not everyone shared this enthusiasm. Arguably the most celebrated scholar of all time, one of the fathers of nuclear process, Albert Einstein declared in 1932: *"There is not the slightest indication that nuclear energy will ever be obtainable. It would mean that the atom would have to be shattered at will."* Ernst Rutherford, revered as the father of nuclear physics, was another great mind who had big doubts on this matter. In 1933 he declared: *"The energy produced by the atom is a very poor kind of thing. Anyone who expects a source of power from the transformation of these atoms is talking moonshine."*

The nuclear weapon remains the most powerful military weapon that ended WW2 and in fact prohibited any serious thoughts of another World War. But when the USA was involved in making the A-bomb, there were big skeptics among the authoritative military. Admiral William Leahy, who in 1945 opposed the use of the weapon against Japan, was in the first place very skeptical of it, and when President Truman asked for his opinion on the project to build an atomic bomb, he replied: *"That is the biggest fool thing we have ever done. The bomb will never go off, and I speak as an expert in explosives."*

The ubiquity of television in contemporary life makes us wish that the vocal opponents of the TV were right in their predictions. As it was declared in the *New York Times* in 1949, *"The problem with television is that the people must sit and keep their eyes glued on a screen; The average American family hasn't time for it."* Darryl Zanuck, a film producer from 20th Century Fox, declared earlier, in 1946: *"Television won't last because people will soon get tired of staring at a plywood box every night."* What a nice dream!

It is hard to imagine life without satellites, but in 1961 an authoritative expert of the development of radio and communications T.A.M. Craven, Federal Communications Commissioner declared: *"There is practically no chance communications space satellites will be used to provide better telephone, telegraph, television, or radio service inside the United States."*

Computers became such an integral part of our personal life that it is hard to believe how hard was to convince some of the experts of the field: *"I think there is a world market for about five computers,"* declared Thomas J. Watson, Jr., chairman of IBM, in 1943. Well, we should confess computers became smaller in a few following decades. But wait, even in more civilized times, in 1977, the founder of Digital Equipment Corporation Kenneth Olson declared: *"There is no reason for any individual to have a computer in their home."*

What about the Internet, one of the most practical and useful new technological faces of humanity? Even in 1995, with the Internet in use, there were big skeptics among the experts. Robert Metcalfe, one of the pioneers of the Internet himself, founder of 3Com and inventor of Ethernet, promised to eat his words if his prediction was not correct. And what was his prediction? *"I predict the Internet will soon go spectacularly supernova and in 1996 catastrophically collapse."* He turned out to be the man of his word, and in 1997, as promised, he publicly ate his words in written form.

Sometimes big ambitions come as a result of the dismissal of more modest plans for the new inventions. Apple Computer Inc. was founded virtually because Atari and Hewlett Packard were not interested in Steve Jobs's and Steve Wozniak's personal computer. Steve Jobs tells the story of another blunder from seasoned professionals:

"So we went to Atari and said, 'Hey, we've got this amazing thing, even built with some of your parts, and what do you think about funding us? Or we'll give it to you. We just want to do it. Pay our salary, we'll come work for you.' And they said, 'No.' So then we went to Hewlett-Packard, and they said, 'Hey, we don't need you. You haven't got through college yet.'"

Hewlett-Packard expert's mentioning the inventor's lack of college education makes their mistake even more poignant.

Great artists were no better in predicting great pieces of art, either. *"I'm just glad it'll be Clark Gable who's falling on his face and not Gary Cooper,"* said Gary Cooper on his decision to turn down taking the leading role in the history-making *Gone with the Wind*.

Greatest experts were not only too negative towards the new prospective inventions, they were also blind to the looming disasters. This sunny prediction from Irving Fisher, Professor of Economics from Yale University was published

in 1929, just before the greatest ever economic crisis that changed the USA and the Western world forever: "*Stocks have reached what looks like a permanently high plateau.*"

Reasons for Neophobia among Skeptics and Peers

As always, there are objective reasons that cause this blind neophobia among skeptics and peers from academia. I do not claim to know them all, but I am ready to mention some of the contributing factors.

- First, there is an existing tradition of believing in the old paradigm and the established order. In some cases, the traditions might go back centuries and even millennia. Some readers might laugh, but the scholarly community sometimes can be as conservative as the patriarchal communities in mountain villages in the Caucasus or Balkans, and interestingly, the longer the tradition, is the harder it is to change it. When in the first part of the 17th century, William Harvey correctly described the circulation of blood through the heart, brain, and body, he was bitterly ridiculed by peers. By that time, the accepted truth was the view of Galen, the second-century Roman physician, who worked with many wounded gladiators in his practice. Galen was sure that blood was created from food in the liver, and then sent to the left side of the body, to the heart. In this case, the tradition of more than 1500 years held strong in the minds of most physicians. Very interestingly, neophobia was so strong that many physicians of the day declared that they had "rather err with Galen than proclaim the truth with Harvey." In his later years, ostracized by the scientific world, Harvey became a recluse, living in private and peace rather than launching another attack against conservative neophobic colleagues.
- Second, it is not only the scholars who want to stick with old ideas and beliefs. We humans by nature are generally conservative. We hate big changes. At least we hate them when these changes are first introduced. People making changes in the content, or even just in the packaging of the products we see on the shelves of our supermarkets, can tell you how stubborn and conservative customers can be in their blind adherence to the old product and old packaging. Innovative and iconic buildings like the Eiffel Tower or the Washington Monument were first

widely hated and ridiculed. It takes time and the more adventurous spirits of some members of a society to gradually accept the new order of things, new buildings, new foods, new services, and new ideas.

- Third, at any given moment of history, it seems to us, to our ancestors, and our future descendants, that we are at the pinnacle of civilization, science and technology. This was the case in the distant first century BC, or 15th century AD, or 21st century, and probably will be in the 26th century. We are always impressed by the amazing progress and advances that our species has made, and believe on a subconscious level that humanity already reached the limits of its development, forgetting the new ideas that the times ahead will bring. I have mentioned this phenomenon earlier as the “syndrome of today.”
- Fourth, remember that most of the eminent scholars of the day made their name, wrote their books and articles, mostly supporting the current paradigm. Some might even have been the Founding Fathers of a paradigm that has been reigning for decades. For established scholars with lucrative positions and grants, any new big idea is a potential threat for their position, financial security, prestige, and authority. It is no wonder that even the most creative and out-of-box-thinking scholars instinctively want to see the fallacies of the new hypothesis threatening established beliefs and stability. *“We not only believe what we see, to some extent we see what we believe ...The implications of our beliefs are frightening,”* said Richard Gregory, a British psychologist and Emeritus Professor of neuropsychology at the University of Bristol. For many puzzle-solving young peers from the scientific community, who built their careers by supporting the existing paradigm, accepting new ideas maybe extremely painful.
- Fifth, for obvious reasons, the new idea initially is supported by its author only. Even if the name of this single author is destined to become very recognizable in a few decades or centuries, today it means nothing. On the other hand, the supporters of the old paradigm are virtually everyone, including the household names of the scholarly establishment, the authors of the books that university students learn from. If the new author is sure about the new idea, so are the multitude of supporters of the old paradigm. And even if the new author manages to present facts that clearly indicate the fallacy of the previous paradigm,

“cognitive dissonance” kicks in and makes the life of the old paradigm seemingly even stronger and more supported than ever before.

- And finally, and probably most importantly, if you have been already accepted as a peer in a scholarly community, or you crave to be accepted there, going against the mainstream ideas and established scientists is a very unwise policy. Whistle-blowers are often hated, and they often lose their jobs. Contrary to the public image of the brave whistle-blowers celebrating in the end, in real life most disappear without reaching the wider circles of community. So before voicing positive comments about the new revolutionary idea (and clearly angering your bosses), your inner, more practical self will ask you to think twice – what is more important, to keep your position and reputation, or to speak your opinion (which, by the way, the same little voice is telling you, might be wrong)? In this situation, you must be as strong an adherent to your beliefs as Charles Darwin was in order to speak what you believe is correct. And by the way, you might remember, Darwin was a wealthy man and never had a boss.

It is particularly sad that new ideas are sometimes criticized not because the established scholars see no value in them, but on the contrary, because they fear the new idea might be successful and hence will threaten the current order of power. These words belong to a physicist, who reportedly (and probably wisely) requested anonymity:

“New ideas are always criticized - not because an idea lacks merit, but because it might turn out to be workable, which would threaten the reputations of many people whose opinions conflict with it. Some people may even lose their jobs.”

On the other hand, some scholars do not try to conceal their critical opinion even about the intellectual capabilities of other scholars. *“One could not be a successful scientist without realizing that, in contrast to the popular conception supported by newspapers and mothers of scientists, a goodly number of scientists are not only narrow-minded and dull, but also just stupid.”* These words belong to James Watson, the 1962 Nobel Prize winning American molecular biologist, geneticist, and zoologist, one of the co-discoverers of the structure of DNA. (Well, it is definitely easier to be so open when you have a Nobel Prize under your belt....)

Bias, fear of losing the respect and loyalty of peers, and other privileges that being a loyal peer brings, rules the actions of many otherwise very worthy thinkers. Said Danish physiologist, August Krogh, another Nobel Prize winner,

"We may fondly imagine that we are impartial seekers after truth, but with a few exceptions, to which I know that I do not belong, we are influenced—and sometimes strongly—by our personal bias; and we give our best thoughts to those ideas which we have to defend." Scientific progress is constantly locked in a deadly struggle between two contradictory forces—the conservative forces of established scholars and their adherent and the potentially progressive forces of newcomers and freethinkers who try to overpower the domination of the old generation of scholars. Their goals are directly opposite: scholarly stasis for established scholars and the constant dynamic development of ideas for the newcomers.

In the epoch when scholars can daily learn about new exciting facts and new research results, in the epoch when scholars can find and contact each other across the globe within minutes, scholarly progress is still not much faster than before the advent of email communications and the World Wide Web. The current slow speed of scholarly progress tells us that there is something wrong with how scholarly research is conducted. And possibly it is still the neophobic inner constitution of the academia that makes scientific progress slower. We are still progressing at the pace of "one funeral at a time."

And do not forget, as time passes, humans live longer.

Scholarly Establishment Manifesto

As the saying goes, there is a grain of truth in every joke. So here is a joke about the Scholarly Establishment, and it is up to you, dear Reader, to decide how much of it you perceive as a joke.

So here is nothing less than **The Scholarly Establishment Manifesto**:

"Our understanding of the progress of science is the basis for our internal Manifesto. So we declare herewith:

(1) Everything (well, almost everything) in science is already sorted out. There will be no more paradigm changes, no scientific revolutions. Only small details and a few stubborn facts are left to allocate and explain. Our sacred duty is to work out these final remaining details and, most importantly, to defend the true foundations of our field from heretics and free-thinkers.

(2) We are carefully guarding the interests of our profession and the well-being of all the well-behaved members of our community of peers. Our corporate interests are the first priority for us. Anyone who tries to bring in a big paradigmatic change is silly and, most of all – unprofessional, and cannot understand the central idea of our Manifesto (see point #1).

(3) We, Professional Scholars, believe that the democratization of science is a cheap populist step. It is unrealistic to think that everyone can make a scientific discovery. Science is a closed territory where only those who have proper credentials can enter and propose credible ideas. The fact that some discoveries came from people without proper and formal credentials does not change our deep conviction in the power of formal professional credentials. We are all peers because we all went through a similar educational process, mastered technical language, and of course, we all have Ph.D.s in this sphere. In short, we are educated, and science must be done by educated people only.

(4) If a new hypothesis gets on our nerves, we criticize it. If we cannot criticize it in essence, we criticize the writing style or the insufficiently made references. Alternatively, if we cannot criticize the hypothesis, then we criticize the author, finding holes in his or her credentials and past publications. If we cannot criticize the author, we can always find several colleagues who find the new hypothesis equally frustrating and write a common rebuttal letter. We do not need to criticize the hypothesis or its author in order to devastate both; we need just several general accusations. Remember, the credentials of the signing members are persuasive in themselves! And finally, if nothing helps, we can ignore the new hypothesis and hope that the idea will go unnoticed.

(5) If facts do not fit the reigning paradigm, well, we have several weapons against them: (a) we can discredit the author who brought in these facts, (b) we can coerce the fact to fit our model, (c) we can announce that this particular fact is a single exception and cannot have any importance, (d) and finally, we can just ignore it, the fact, or the whole publication, that most likely appeared in a low-grade and of course, non-peer-reviewed journal.

(6) We diligently follow the existing models and axioms. How good the scholar is must be checked primarily according to the scholar's understanding of the vitality of the current paradigm and the scholar's ability to make a list of references. How you say things is more important than what you say.

(7) The best publications in peer-reviewed journals should have the anticipated outcome, and the outcome must confirm and strengthen the existing

paradigm. For us supporting the existing paradigm is as important as for politicians supporting their own party. Without the support of peers, we are nothing.

(8) We particularly hate unprofessional intruders from other spheres who poke their noses in our sphere. Keep out. While we are busy distributing scholarly grants, we do not need some outsiders to change the paradigm on which we all base our scholarly works and grant applications. By our united force, we can always find ways to discredit unwelcome intruders and their ideas and keep them out, if not forever, at least for years and even decades, even if they receive public support and the highest possible international scholarly awards.

(9) We do not like those of us who become too popular with the wider community. This cheap popularity is not a real measure of a scholar's worth. Wider society does not really understand all the professional details of the output of this scholar, so their high position in the eyes of the society is often misleading. We, peers, only are in a position to assess the true worth of scholarly output in our sphere. We can bring down any "tall poppy" with the united force of the entire scholarly establishment.

(10) Our best scholarly weapon is "peer review." We do not only cut down very unprofessional writings, but we do not let "tall poppy" works appear in the most respected peer-reviewed journals. Only the works of those of our peers who share our common ideas can be published in peer-reviewed journals. Remember, peer-reviewed journals are only for those who share the beliefs of peers. So until you believe in our constitution (see point #1), you cannot be a part of the scholarly establishment and cannot appear in peer-reviewed publications.

(11) Some think that cutting the badly written works is a good side of the peer review process, but cutting down the few original and prospective works is a bad side of peer review. Let us disagree. From our point of view cutting down the badly written papers is not as important as cutting down the papers proposing new dangerous ideas, ideas that might destabilize the field and jeopardize hundreds or even thousand respectable scholars. So peer review's primary duty is to maintain stability in academia by eliminating dangerous new big (and obviously wrong) ideas.

(12) Are you saying we are very strict and conservative? Yes, we are. To be a part of the scholarly establishment is a serious matter, a matter of money, prestige, comfortable living, travel to exotic countries, good houses, good cars, good jobs, and power, so romantic fantasies have no place among us. The reali-

ty is very harsh. A strict following of our rules is appreciated among members of our Peer Community. If you want to be with us, do not trust any new big ideas and forget about the possibility of new big theories. The most important quality of science is stability. If you do not believe this, see once again the cornerstone of our constitution –point #1.

(13) If you still believe your idea is better than the existing paradigm, think again. Even if there is a remote possibility for it, you need to know that you will need to wait long years to see the elusive acknowledgments of your ideas, which might happen long after your demise. What your unity with us gives you is the success that is here and now. By the way, mind that there is a huge competition for the places for the most loyal in our sphere.

(14) And finally, you are either with us or against us. It is your choice. And if you want to be with us, you need to prove that with your talent and loyalty, you are worth our attention and trust with the membership of a sacred circle of Scholarly Peer Community and Scholarly Establishment.”

Summary of the Long and Winding Road to Professional Scholarship

Let me be blunt: For many professional scholars, the initial romantic dream to develop their field of scholarship is gradually lost during their continual struggle for positions, publications, publishers and grants. They gradually come to the realization that they just want to get there, they want to be recognized as professional scholars, become members of a coveted peer community, attain a Ph.D., university job, a couple of peer-reviewed publications, and possibly professorship becomes their lifelong goal.

As soon as they are accepted as a member of a peer community, they start defending their new spiritual home, the coveted Scholarly Peer Community that they now belong to, from radicals and freethinkers that do not want to follow the rules of a peer community member. They become a part of a vicious circle of academic scholarship: after reaching their goals of becoming members of the peer community, they start watching from their elevated position younger colleagues, who are now competing with each other to get into the same coveted community with the opportunities of positions, grants, professorship, and publications. The established scholars treat younger colleagues the same way the previous generation of scholars did them.

Conclusions: Should there Be a Backfiring Mechanism to Hold Responsible Peers and Skeptics for Their Mistakes?

"I am not very skeptical... a good deal of skepticism in a scientific man is advisable to avoid much loss of time, but I have met not a few men, who... have often thus been deterred from experiments or observations which would have proven servicable."
- Charles Darwin

Here is another controversial suggestion, this time proposing some form of responsibility of those who have a higher authority over the fate of fellow humans. I am talking about a professional backfiring system.

Why not have a professional backfiring system: when an idea finally becomes accepted and acknowledged as a step forward in scholarly development, we need to have a look at which professional reviewers and professional journals neglected and declined this idea in the past. This kind of "negative publicity," of course, will not deprive reviewers and journals of their positions or grants but will possibly make them and their colleagues more attentive to every new manuscript they receive. Instead of throwing the manuscript out after seeing the unfamiliar author's name, they might think twice about whether there is something promising in the text. If this happens, the ultimate winner is scholarly progress.

If existing editors and reviewers complain that they simply have not enough time to spend on every MS they receive, possibly it is worth hiring more professionals (preferably open-minded ones) to deal with the large number of submissions. And if journals propose to award reviewers who manage to fish out some fresh and prospective ideas from a large number of obscure submissions, we might all be big winners, and this might be a worthy compensation for extra money and time spent on extra reviews.

Let us fantasize, as many good ideas started as impossible fantasies. Why not do the same as for the judges who vouch for the release of the dangerous criminals in the society – so that if they commit a crime again, the judges who allow them to be freed, take some part of the responsibility as well, possibly even with the associated professional penalty. The same way, why not let the traffic police, who give driving licenses have the same backfiring system if an unusually large number of their "licensed" drivers commit road offenses, particularly that led to injury and death?

Professionals in the mentioned spheres will be against such a system of backfiring. They will say that if such a system is introduced, no judge would want to take responsibility and release past criminals, or no traffic officer will want to give driver's licenses to young drivers, etc. Of course, there is a truth in such an argument, and there should not be any repercussions for a few offenses committed by former criminals or bad drivers. But some form of accountability for the actions of any judgmental body would be very welcome for the sake of a safer and better society. Authors of the peer review assessments and editors of the journals would be dead against such mechanisms as well, as they feel at the top of the scholarly world, and such accountability will put new unwanted pressure on them.

Dick Rove was a famous example who was ridiculed many times for rejecting the most successful rock band in history, The Beatles, and announcing (January 1st, 1962, virtually at the beginning of the guitar decade) that "*bands with the guitars are on their way out!*" George Martin, always a gentleman, supported his colleague's blunder declaring that on the basis of their Decca recordings he would also turn them down, although it is a fact, that after hearing the Decca recordings, he was interested sufficiently to offer them an audition that became his history-changing meeting with the Beatles.

Why should we not give the same due to Thomas Bell, professor of zoology and lecturer in anatomy, President of the London Linnaean Society, presiding at the historical meeting on July 1, 1858, where the Theory of Natural Selection was publicly announced for the first time. According to Bell's annual report, delivered in May 1859, the whole year was "uneventful." "*The year which has passed... has not been unproductive in contributions of interest and value...it has not indeed been marked by any of those striking discoveries which at once revolutionize, so to speak, the department of science on which they bear*" (Browne, 2002:40-42).

Duplicated above Another expert opinion on the Darwin-Wallace joint presentation came from Samuel Houghton in his remarks made to the Geological Society of Dublin on February 9th, 1859 about the work that forever revolutionized our understanding of the world:

"This speculation of Mess. Darwin and Wallace would not be worthy of note were it not for the weight of authority of the names under whose auspices it has been brought forward [he means the geologist Charles Ly-

ell and the botanist Joseph Dalton Hooker]. *If it means what it says, it is a truism; if it means anything more, it is contrary to fact.*"

After hearing the verdict of the high-ranking Member of the Royal Society, Darwin summarized Haughton's words disappointedly: "*all that [was] new in there was false, and what was true was old.*" Neglect from Bell and dismissal from Haughton were the only reactions of the best men of science of Great Britain on the theory of natural selection.

Of course, when an expert makes a mistake that does not involve strong consequences, like death or injury, probably the ensuing regret and feeling of shame are enough punishment, but in some cases feeling responsibility and having a backfiring system might not be a bad thing for them to give another thought before throwing the MS into the rubbish bin.

Those who are in power of wider trust should feel responsible for this trust, and think twice before condemning or criticizing others who are devoid of similar trust and respect from the wider audience or peers. It is particularly sad when a person of higher standing uses his reputation to get away with unjust critique or bad behavior.

If any readers of this text are or will be in a position of power to judge a newly written paper by an unknown writer, think of the ease with which you can destroy the fruits of someone's years of work by pointing to a few inevitable errors in the text. Instead, try to see if the text contains some promising ideas and suggest ways to highlight these ideas.

I want to finish this section with a personal story. I had a younger brother, Nugzar (Nukri), born about two years after me. He was tall, handsome, with lots of talent in several spheres, blond, with blue eyes and great social skills, and an outrageous rebel right from the day he was born. My mother said he never allowed himself to be restrained from the very first day of his life. On the contrary, I was raised in the old fashioned cradle and never complained against restraint. Apart from our different looks (I always was brown-haired, shorter, hazel eyed, and introverted), we also behaved differently in many respects. If my behavior was mostly acceptable for parents and teachers, Nukri's rebellious behavior stretched their patience to the limit. If I spent most of my free time with books, in reading, my brother, with his much greater social skills and interest for real life, was in the streets with others kids, sometimes involved in minor offenses against the rules of the Soviet Union of the 1960s (for example,

smoking a cigarette was an offense, God forbid smoking something else). I mention these details as the story is directly connected to our respective reputations. In short, for the older generation, if anything was wrong, of course, it was my brother to be blamed. I was strongly in a position of trust, unlike my troublemaker brother.

So here is the story. It happened when we were probably about 11-12 years old. One day, during the morning cleaning time, I did something that did not seem too bad to me. We had a very soft piece of soap, which changed shape easily. I guess it was simply a very low-quality soap like many things in the Soviet Union. So after washing my hands, I squashed it and left the piece of soap disfigured. After about an hour, my father asked me in a very friendly manner, "Joseph, did you disfigure our soap?" He asked me this quite gently, but as soon as he asked, I realized I had done something wrong, and to my great shame and regret, I tried to cover my bad behavior. So I lied and said I did not do it.

After a few minutes, I heard my father talking to my brother, and the conversation was fast escalating to more unfriendly tones. I could hear my mother also participating in the conversation about the disfigured soap. I did not need to hear the whole discussion to work out what was happening – of course, my parents, after asking me about the soap, asked Nukri as well. And of course, Nukri declined that he disfigured the soap. I instantly realized what I had done: of course, my parents believed me as I was a "good" kid and did not believe my troublemaker brother.

So I went directly to my parents and told them that I lied and that I did disfigure the soap. They smiled at me and told me it was okay. A few minutes later, I overheard my parents talking to each other. They were sure that I was taking the blame for my naughty brother's behavior. So instead of believing that I could lie, they were giving me even more credit for generous behavior! I went to my parents again and told them I really did what they thought was done by my brother. I do not know if they believed me or not. Many years later, when my brother and I were in our fifties, I reminded him of this story. He did not remember it. Sorry if my readers expected something much more dramatic. For me, the story was very dramatic and even traumatic, and I remember it very acutely as a cautionary story of responsibility for those who have a higher reputation and trust from others.

Those who are in power to have wider trust should feel responsible for this trust, and think twice before condemning or criticizing those who are devoid of

similar trust and respect from the wider audience or peers. It is particularly sad when a person with a higher standing uses his/her reputation to get away with unjust critique or bad behavior.

If any of you readers will be in power, as an expert of the field with required qualifications, to judge a newly written paper by an unknown and possibly an unprofessional writer, think of the ease with which you can destroy the fruits of someone's years of work by pointing to the inevitable errors in the text or badly organized references. Instead, try to see if the text contains some promising ideas, and together with noting of all the shortcomings of the submission, try to suggest the ways to highlight these ideas. With a more careful attitude, you will serve not only the field you represent, but also save your conscience from the perennially present fears that you might be adding your name to the long list of professional experts who missed a potentially ground-breaking discovery.

Chapter 7

AXIOMS, OR HOW WE MAKE OUR BIGGEST MISTAKES
WHEN WE ARE ABSOLUTELY SURE

Is it Possible for the Axiom to Be Wrong?

Unthinking respect for authority is the greatest enemy of truth.
- Albert Einstein

Let us recall the meaning of the words “axiom” and “axiomatic truth.”

“Axiom” comes from the Greek *axíōma*, which can be loosely translated as “the one which commends itself as evident.” An axiom is a statement that is taken to be true, and as such, can serve as a starting point for further reasoning or a scholarly argument.

In short, an axiom is something you assume to be true without proof. In epistemology (this is a term for “theory of knowledge”), a self-evident proposition is a proposition that is known to be true by understanding its meaning without proof, or at least, by simple ordinary human reason.

One of many meanings of this term is particularly interesting for us: an axiom is *“that which a pupil is required to know beforehand.”* So if you do not know about the axiomatic truth, you do not even deserve to be a pupil.

This all leads us to proclaim another axiom: that the self-evident truth, the axiom, cannot be wrong.

But wait a minute. There are some disagreements as well. For example, some epistemologists deny that any proposition can be self-evident. For most others, for example, one's belief that oneself is conscious is offered as an example of self-evidence. However, one's belief that someone else is conscious is not epistemically self-evident. A widely known example of a self-evident proposition is *“A finite whole is greater than, or equal to, any of its parts.”*

There are a few claims of self-evident truth that are the basis for prolonged controversy. For example, one of the most famous examples of a claim of self-evident truth is given in the United States Declaration of Independence: *“We hold these Truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness.”* The controversy over this sentiment went so far that during the debate over the Kansas–Nebraska Act in 1853, Senator John Pettit of Indiana famously declared that the statement “all men are created equal” was not a “self-evident truth” but a “self-evident lie.”

A positive thing about axioms is that they give us a starting point for many scholarly discussions. On the other hand, the negative thing about axioms is

that when they are wrong, they can understandably Prevent the development of science (or a society) for very long periods of time.

But, how on earth can axioms be wrong in the first place? Did not we agree that the real power of axiom is that it is self-evidently true? Does not this mean no reasonable person or scholar should start questioning an axiom?

Probably the most amazing thing about axioms is that although they might seem to us to be perfectly true and rock-solid, they actually can be wrong. We have plenty of examples of axiomatic and self-evident prepositions later proved to be wrong, but for now let us imagine the amount of time, energy, sweat, tears, and blood needed to achieve the new understanding of the proposition that is believed to be not only the truth but axiomatic, self-evident truth. It is popularly believed that the unanswered questions that had been open for centuries, slow the progress of science. Well, on the contrary, it is rarely the unanswered questions, but rather the wrong answers, wrong statements, that we believe to be true, are the worst enemies of scientific progress. So if you want to be a true revolutionary scholar, the author of new paradigms, my advice would be to start distrusting axioms. Believe it or not, axioms are potentially the biggest problems for the development of science!

So, let us remember as a central message of this book: the axiomatic truth that we accept without reasoning as a self-evident truth can be wrong. A very discomfoting idea indeed! It feels like we cannot trust anything, even the self-evidently correct and seemingly obvious statements.

Please, do not rush to criticize me, declaring that it is impossible for the axiom to be wrong. We can find plenty of examples of axiomatic, self-evident statements, widely believed during the history of human intellectual development, to be the instances of the Absolute Truth confirmed later to be wrong (sometimes with great sacrifice).

Do we need examples?

Lay people, including scholars, believed for a long time (for quite obvious or “self-evident” reasons) that the Earth was not moving. Proved to be wrong.

Similarly, for the obvious self-evident reasons, it was believed that the Earth was the center of the Universe. Proved to be wrong.

The sun, the moon, and stars were believed to be traveling around the solid Earth. Proved to be wrong.

And of course, it was obvious for everyone that the Earth was flat until it was proved to be wrong;

Similarly, for a long time, it was believed that animal species were immutable, that the continents were not moving, or that there was no need for surgeons to wash their hands between chirurgical operations – all were found to be wrong.

There is no need to discuss the long and sometimes tragic human stories behind each of these once-believed-to-be-axiomatic statements and start debating the fate of several eminent names like from Galileo Galilei, Giordano Bruno, Nicolaus Kopernikus, to Charles Darwin, Alfred Wegener, and Ignaz Semmelweis. These thinkers were against widely believed axiomatic statements, and they either paid the ultimate price because of their beliefs, like Giordano Bruno, or were simply neglected during their lives, as was the case with Alfred Wegener's ideas of continental drift.

I can hear some readers protesting that all these cases are from the past, and hardly can happen today, in our democratic, open, and internet-connected world. This is a widely spread fallacy discussed earlier as the “Syndrome of Today.” This syndrome makes a powerful appearance not only in our 21st century but in every century of human history, as every century felt it was at the time – the ultimate pinnacle of human progress and civilization. So make no mistake, for the readers of the 23rd century our 21st-century scientific achievements and social mores will look as “dark” and “backward” as 19th-century scientific achievements and social mores seem to us today. And similarly, the beliefs of the 23rd century will also seem “dark” in comparison to the 25th century.

Truly great discoveries usually come after proving any of the reigning axiomatic truths to be wrong. Great discoveries are as a rule “Axiom busters.” It is not accidental that the last chapter of this book is dedicated to the single most dangerous enemy of scholarly progress—statements that seem perfectly solid truth. I cannot stop repeating myself: we make our biggest mistakes not when we are hesitating but when we are absolutely sure. Read this sentence a few times, until it starts reverberating in your brain like a ticking time-bomb for each of the existing axioms.

Apart from scientific axioms, there is another type of proposition currently accepted as “self-evident truth” for political reasons, popularly known as “politically correct propositions.” It is a very big topic but we only scratch the surface as we discuss the two biggest threats for the free creative development of scholarly fields.

Financial Reward and Political Correctness: Two Biggest Threats of Free Development of Science

We already discussed the danger of financial rewards for scientists to the progress of science. With finances, the existing danger is more or less obvious: in the major part of the Western World we have a free economy, but this freedom does not translate into free science. Since scientists' lives (and by extension science itself) directly depend on the economy, and such a direct dependence never leads to freedom, "free market economy" can be translated as "life dominated by the economy," or a "science dominated by economy," not as "free life" nor "free scientific progress."

The danger to the free development of science coming from the notion of Political Correctness is of a very different nature. It is a common sentiment that science must be free from political directions and prejudices because when free development is constrained or pressured for any reason, it makes our efforts in education, medicine, and many other spheres less effective and sometimes even futile.

As a rule, the sentiments of Political Correctness come from the noblest of intentions (as have many wrong ideas historically, by the way). For example, when some scholars try to prove that no cultures practice cannibalism as a culturally accepted norm (see, for example, Arens, 1979), they follow the underlying notion of a politically correct and "self-evident" fact, or an axiom: cannibalism is a barbaric and inhuman behavior that no human society adheres to. According to this politically correct and noble approach, the myth of cannibalism was created by European colonizers who wanted to justify enslaving the natives of many exotic lands. Well, despite the noblest reasons behind Aren's arguments, contemporary anthropological science already passed this moral-political stagnation and accepted that cannibalism was a well-established and widely practiced behavior (even in European past) that possibly had positive moral connotations with very practical reasons (discussed below).

The most powerful tool to avoid the dictate of the political time-bound sentiments is to remember that *facts cannot be racist, only the interpretation of the facts can be*. For example, it is a fact that people from various regions of the world have different colored skin, different hair, different predilections to various diseases and health hazards, and acknowledging this diversity is not racism. Racism starts when someone declares that people with a certain color skin are

“better” than people with another color of skin. It is a scientific fact, and all the existing differences are the only natural results of living in very different environmental conditions. Because of these reasons they developed various resistances to certain local health threats and different levels of UV radiation. We can certainly discuss such differences among various populations, and such discussions only benefit the general health care of world populations. This kind of discussion is not racism it does not so much matter whether we use the term “race” or more accepted “population.”

In Western contemporary life, science attained almost religious power over the minds of people, and any scholarly suggestion or conclusion can be used by various people and political parties for diverse purposes, including the most despicable ones. We cannot fully avoid this, and we need to be conscious of it, but banning discussions on the subject altogether for fear of negative connotations is not a fertile scholarly strategy. We should not ban certain directions in scientific progress because of such possible consequences.

We must be sincere with facts, but careful with our interpretations.

And a million-dollar question: how can a scholar be free of the moralizing and censoring power of political correctness, together with the demands of the economy-driven competitive scholarly world?

Only those who do something else for a living and do the scientific research for themselves, as an unpaid passion, are truly free. They are free of the demands of the strict market economy, free from seeking the approval of peers in order to be published, free of searching for grants for the “politically correct” themes acceptable to the grant-giving bodies, and relatively free of social and political prejudices. As a result, the biggest scientific revolutionary movements first appear not from ranks of professional scholars, who do the research for the external approval and reward, but by the often invisible romantic researchers and maverick scholars who do the research often rewarded only by the mysterious “intrinsic motivation.” This last chapter of the human story behind the scientific discovery consists of several possible cases where axioms that might be wrong, still have a hold on laypeople and the majority of scholar’s minds. I must declare from the beginning that I have a personal interest and close connections (some closer, some more distant) to all the cases that I am going to discuss in this chapter. The topics are quite wide. We will discuss the axiomatic beliefs on the origins of the human tradition of choral singing, origins of speech, the nature of some developmental pathologies in human popula-

tions, human evolutionary history, and a few other cases, even the possible evolutionary reason behind the amazing peacock's train.

I will try to be very direct and clear in explaining the initial self-evident nature of each of the discussed axiomatic beliefs, explaining the existing or emerging doubts behind them, and presenting the possible new explanation of the existing facts. And as required by scientific method, I will propose daring predictions that are not difficult to test if there is such a will among professional scholars from these spheres. Let us remember, the final word for the acceptance of a new scholarly paradigm still belongs to professional scholars. This is a very slow movement towards the acceptance of the new reality, but still the only way towards wider acceptance.

I hope some readers of these unorthodox propositions will be tempted to test these seemingly far-fetched predictions in order to prove my suggestions false. And we can see later what might happen. I will waste very little time of yours – I will indicate clearly three things (1) the strengths and self-evident nature of the existing axiom, then (2) I will present fact/facts that do not agree with the axiom, and finally (3) I will indicate the possible solution of the problem, with the associated simple and clear scholarly predictions. These cases will not be fully discussed here, so for those who are interested, I will provide references where fuller discussion of the problem can be found.

Axiom 1: “Polyphonic Singing Came After Monophony”

The very first axiom comes from the world of musicology, my own professional field, and represents a specific area of the study of the history of music. More precisely, it is about the origins of the amazing human tradition of the group singing in different parts (choral singing).

It was clear from the very first moment scholars started asking questions about choral singing, that polyphony came out from monophony in human cultural history. To develop the tradition of singing in polyphony (which means singing in several parts), you would need an existing tradition of singing in a single part. This line of arguing was so sound, so self-evident, that amazingly, not a single scholar of music history ever bothered to formulate the idea of polyphonic singing emerging from the earlier existing tradition of monophonic singing as a scholarly hypothesis. The smaller remaining questions that music historians tried to solve were “when” and “where” polyphonic singing (or cho-

ral singing – I am using these terms synonymously) was developed as a new cultural invention.

Arguably, the most authoritative living figure in Western ethnomusicology, Bruno Nettl from the University of Illinois expressed this universal agreement of music historians very well. In an article, written more than 50 years ago, while discussing the evolutionist viewpoint on the history of music and origins of polyphony, he suggested that although this [evolutionary]

“viewpoint cannot be generally accepted, but ... has been tacitly agreed upon for the special problem of polyphony. There is, indeed, no culture that has no monophonic music at all, and since each polyphonic composition must consist of (independent) monophonic structures, it can perhaps be assumed that monophony preceded polyphony in each culture” (Nettl, 1961:360-361).

Let us remember, this is not Nettl’s hypothesis, he just put in words what was tacitly agreed by all preceding generations of music historians.

Indeed, this simple reasoning sounds very convincing. After all, who would argue against the well-known fact that singing in one part is simpler than singing in many coordinated parts? Therefore, we can all agree that singing in one part (monophony) historically must occur earlier than singing in many coordinated parts (polyphony). A very clear example of this kind of evolutionary progress from monophony to polyphony is well documented in the early history of Western European classical music, where the early medieval unison Christian liturgical singing was later developed into rich multipart choral tradition, reaching its pinnacle in J.S. Bach’s amazing compositions.

Contradictions

For a long time, everything was fine, and no contradiction was observed. To tell the truth, everything would be fine forever for this self-evident postulate, if these damned recalcitrant facts did not interfere. Do you remember our discussion about the “exceptions”?

As far as I know, the earliest indications of the existence of such uncomfortable facts reached the ears of European learned men as early as the 1770s. As it was reported in great detail, during their first meeting with Europeans in 1777 Polynesians from Tonga Islands had a tradition of polyphonic singing. This

was sensational, since it was widely believed that vocal polyphony was the brainchild of medieval European monks, developed sometime in the 880s. It was even believed that the name of the first clergyman who combined two pitches simultaneously—Hucbald (840-930)—was known and duly glorified. It was therefore believed that polyphony, a Christian development of the initial monophonic music, was brought to the wider world by European Christian missionaries.

The existence of polyphonic singing in remote islands of the Pacific Ocean challenged the foundation of the axiomatic belief of the late European (Christian) origin of polyphonic singing.

So what was the first reaction of the learned men of Europe?

Total rejection of the reported fact!

European professional musicians deeply doubted the ability of Polynesians to sing in different parts, as they believed it

“a great improbability that any uncivilized people should, by accident, arrive at this degree of perfection in the art of music, which we imagine can only be attained by dint of study, and knowledge of the system and theory upon which musical composition is founded. ... It is, therefore, scarcely credible, that people semi-barbarous should naturally arrive at any perfection in that art which it is much doubted whether the Greeks and Romans, with all their refinements in music, ever attained, and which the Chinese, who have been longer civilized than any other people on the globe, have not yet found out.” (Cook and King, 1784:3:143-144. Cited in Kaeppler et al., 1998:15).

Simple as that. “We believe it is impossible, so sorry, the facts that were presented, cannot be true.”

We can only imagine the disagreement that probably raged in the 1780s between, on one side, a couple of well-educated persons, who witnessed and reported the presence of polyphony among Polynesians, against a great number of European armchair scholars who believed in the impossibility of the reported facts. I should add here, that the individuals who reported the presence of polyphony among Polynesians (people like Lieutenant James Burney, son of English composer Charles Burney, Surgeon William Anderson, or the French biologist Jacques-Julien Labillardiere from another contemporaneous expedition), were obviously musically well-trained, as they mentioned such details as

the number of polyphonic parts (four) the presence of unusual “discordant” combinations of sounds (obvious dissonances), the presence of a “flat third,” narrow range of voices, and even the presence of the drone in the lowest part. So the description was very detailed and professional, leaving no doubt about the presence of four-part polyphony or its structure. And still, European scholars were unshaken in their belief, that polyphony among the barbaric Tongan Polynesians was impossible, and that’s it, discussion over.

The problem for the wrong axioms is that even if you neglect a piece of evidence that contradicts it, sooner or later other discrepancies follow. During the 19th century, more contradicting facts were found, similar to the first. For example, it was found out that extremely elaborated vocal polyphony existed among the Central African Pygmies, the Kalahari dwelling San People, and many other African tribes, as well as among the isolated tribes of Papua New Guinea, and many other peoples far from the centers of Western civilization. Use of the recently invented phonograph, which revolutionized our knowledge about the world’s music, made the old belief very shaky by the first decades of the 20th century.

Finally, in the 1930s German scholar Marius Schneider, a member of the Berlin School of Comparative Musicology, proposed a transformed version of the theory of the origins of human polyphonic singing. In his new version, polyphony was invented not by European medieval monks, but in traditional music, and was later adopted by European Christian musicians (see also Collaer, 1960). According to Schneider’s *History of Polyphony* polyphony was invented in South-East Asia, and gradually reached Europe via cultural diffusion.

The idea that one of the highest manifestations of musical culture, vocal polyphony, was not invented by Europeans, did not go well with the ruling Nazi ideologists of Germany of the 1930s. Although Schneider as a thinker was greatly respected by the authorities, his idea about the Asian origins of polyphony was greatly disliked and criticized, and his two-volume *History of Polyphony* was burned together with the works of Jewish thinkers and other unacceptable authors. The political atmosphere around Schneider worsened, so by 1944 he had to emigrate from Germany to Spain. Schneider, who is mostly remembered among my West-European and American colleagues for his radical anti-communist views, often is unknown from this other side, as an independent thinker who had to emigrate from Nazi Germany because of his “politically incorrect” views.

German ideologists must have been very methodical at their infamous book *autodafe*, since despite repeated attempts to obtain Schneider's historic 1934-35 edition of the *History of Polyphony* the only edition that I was able to find was the 1969 second extended edition of the book.

The new possible explanation and predictions

Throughout the 20th century the idea of the origins and gradual distribution of vocal polyphony in traditional music was more or less accepted. There were various suggestions for the original "first region" from whence vocal polyphony spread throughout the world: regions like the Balkans and the Caucasus dominated these hypotheses (Kuba, 1909, Stoin, 1925, Rihtman, 1958, 1966, Kaufman, 1966, Schneider, 1969). The idea of the emergence of polyphony from a monophonic singing tradition as a cultural invention remained present in all these models.

The change came in 2006, simultaneously in the works of two ethnomusicologists unknown to each other at the time. Victor Grauer from the USA, collaborator of Alan Lomax's widely known Cantometrics project, and my own work (Grauer, 2006; Jordania, 2006). Despite a general similarity between the two works, there were big differences in their approaches. In Grauer's model, pygmy hocketing polyphony was declared humanity's earliest musical tradition, counting at least 100 000 years of the existence (Gauer, 2006, 2007), and its source was the imitation of the natural world (particularly bird choruses) by our already human ancestors.

In Jordania's model, the origins of choral singing were not connected to the imitation of bird choruses. It was declared as an important element of humans' defense system from predators via the double impact of loud rhythmic singing (accompanied by clapping, stone hitting, synchronous body movements): (1) external impact – scaring away predators and competitors with the combination of loud synchronized sound and the group's synchronized movements, and (2) internal impact – putting our distant ancestors into an altered state of consciousness which I called Battle Trance. In this state humans, even today, do not feel fear and even pain (Jordania, 2006, 2011, 2017). This initial type of common ancestral polyphonic singing was declared narrow-range loud singing, based on the use of sharp dissonant seconds, since this type of polyphony has

been observed in a great number of very isolated regions of the world (see Jordania, 2015: 272-277).

Although both Grauer and Jordania declared polyphonic singing to be the earliest tradition our ancestors took from Africa, they disagreed about the age of polyphony and the theory of evolution their models support. In Grauer's model, the origins of vocal polyphony go as far as 100,000 years and are connected to the "Recent African Hypothesis" of human evolution. The puzzling absence of polyphony in about half of the world's musical cultures is explained by the effects of the Toba catastrophe (Grauer, 2006). In Jordania's model, the roots of human polyphony are much deeper, reaching back at least 2,000,000 years, and are connected to the 5-6 million-year-old process of hominid's shifting from arboreal to terrestrial living (in simple English, moving down from the trees to the ground for good) and working out the defense system from African predators. This model is connected to the initial exodus of our archaic ancestors from Africa about 2 million years ago. This evolutionary model is known as the "Network Theory," or the more widespread although more politically volatile "Multiregional Hypothesis." I prefer to call it the "Ancient African Model" of human evolution, as both theories agree on the African origins of humankind, but differ significantly on time – about 2 million years versus about 100,000 years).

In regard to prediction, I predicted that the initial tradition of polyphonic singing should be in decline all over the world, leading to a gradual disappearance of vocal polyphonic traditions. And in fact, in my books (2006, 2015) many examples of the disappearance of vocal polyphony were observed. On the other hand, not a single example of the natural development of vocal polyphony in formerly monophonic cultures was documented. The reason for the decline and gradual disappearance of polyphony was proposed to be the shift from pitch-related language to fully articulated speech. And the reason for the absence of polyphony in about half of the world's musical traditions was declared to be possible differences in the time of the shift to articulated speech: regions where the shift to the articulated speech happened earlier, must have lost the traditions of polyphony, and in regions where the shift happened later, the tradition of polyphony is still present.

This unlikely proposition found support in paleoanthropological evidence.

A possible direct link to the development of fully articulated speech and the formation of certain parts of the modern human face was expressed in 1980

(Krantz, 1980). According to Krantz, the last element that formed contemporary human anatomy was articulated speech. It was the demands of new verbal skills that put pressure on remodeling our face.

Now, if we look at different regions of the world, we will find that the appearance of clear facial continuity of the archaic and modern people residing in these regions has very different timelines (Wolpoff, 1989, 1999). This continuity (mentioned by Wolpoff as “regional continuity”) is the deepest in East Asia and reaches 250 or even 350 thousand years ago (kya); the second deepest continuity region is Australia (links with Ngandong specimen reach 200 kya), followed by western Europe, where archaically-looking Neanderthals were changed by contemporary-looking modern humans about 35-40 kya; finally, the region where the regional continuity is the shortest is sub-Saharan Africa, where the similarity to sub-Saharan populations facial features first appears only 11 kya.

The time difference between the extremes (East Asia and sub-Saharan Africa) is more than 30-fold. If communication shifted to articulated speech in these regions in these timelines (that I proposed based on data of regional continuity), then it suggests that the regions where the shift happened long ago (like in East Asia) polyphonic singing must be long gone, and in regions where the shift was more recent (like in sub-Saharan Africa) polyphony must be still widely spread.

Here is the general picture of the spread of polyphony in major regions of the world: the most monophonic regions are East Asia and Australia, and the regions with plenty of live traditions of polyphony are Europe, and the largest and the most active region of polyphony – sub-Saharan Africa.

So we can say, that the initial predictions were fulfilled:

(1) Polyphonic traditions are declining all over the world (there are not a single example of developing polyphony in traditional music whereas there are plenty of examples of decline and disappearance of polyphonic traditions, even in Africa, among Pygmy peoples);

(2) Regions where the shift to speech supposedly happened earlier, indicated by the earlier links of facial morphology (“Regional continuity”), namely East Asia and Australia, are devoid of vocal polyphonic traditions; whereas regions where the shift to speech supposedly happened later, indicated by the later links of facial morphology, namely western Europe and Africa (sub-Saharan Africa), are full of living traditions of vocal polyphony.

I should say I cannot complain about the reaction of at least some of colleagues, experts of traditional polyphony. One of the eminent experts of traditional polyphony, leading expert of African polyphony, Simha Arom wrote,

"I totally agree with the main idea of Joseph Jordania about the ancient origins of choral singing and its gradual disappearance. To my opinion also, there is no "evolution" from monophonic to polyphonic singing, and I was glad to see that the argumentation of this idea is so strong and logical..."

In 2009, very unexpectedly, my work received the highest international prize in the sphere of my professional activity – ethnomusicology, the Fumio Koizumi Prize, and the commendation directly indicated that the prize was given *"in recognition of his contribution to systematic analysis of folk polyphonies of the world, proposing a new model for the origins of traditional choral singing in a broad context of human evolution."*

Many music historians, probably from age-old habits, do not care about the new development in the sphere, so when it comes to the origins of polyphony, the old idea of the late development of polyphony from monophony is still very much alive. New ideas take time to be widely accepted, but as I said above, I cannot complain, as the signs of acceptance are there.

But this is not the end of story and predictions about the new idea of the origins of polyphony. I have to say that the predictions go further, and generate seemingly even more unlikely predictions of differences in speech pathologies among various populations of the world, but we will discuss these topics separately, as they conflict with other existing axiomatic prepositions.

And finally, as promised, the origins of human choral singing, the lifelong subject of the study of the author of this book, can be found in many of his works, for example, in a book (Jordania, 2015), and if you want to read something shorter, an article (Jordania, 2015a).

Axiom 2: “Differences in Stuttering Prevalence in Various Cultures Can Only Have Cultural Reasons”

Contemporary Western speech therapists suggest that stuttering is a genetic condition that cannot be completely cured, but using the proper therapy can be made easier to cope with (Bloodstein, 1993, 1995).

The widespread belief among speech therapists is that if differences in the frequency of stuttering exist across various populations and cultures, they must have a cultural basis, such as a linguistic feature of the culture or child-rearing practices. Some languages are tonal and some are not; some languages have plenty of syllables in each word, and some languages have monosyllabic words. Apart from these differences, parents in some cultures are more anxious about the normal disfluencies of their children during the sensitive period of their acquiring speech, and in some cultures, parents are very relaxed about the mistakes their children make during that sensitive period. So all these factors might affect the stuttering prevalence in a culture or population. But let us do one thing at a time.

Initially, it was believed that stuttering is universal for all human cultures and races. According to Robert West’s century-old idea, human speech is a function overlaid on ancient systems for eating and respiration, and because speech is one of the latest abilities we acquired, it is one of the most readily lost or impaired (see Bloodstein, 1993:179). This idea is widely accepted by speech pathologists. At least, I can say that I have never seen anyone criticizing this idea.

It has been rightly pointed out that humans, “could still be in the process of adapting to this change [articulated speech]” (Livingstone, 1973:29). In this context, it is interesting that speech pathologists note the tendency towards reduced numbers of stutterers in contemporary society (for example, see the section “Is the incidence of stuttering declining?” in Van Riper, 1971:51-52; See also Bloodstein, 1995:140-141). Wendell Johnson attributed this change to the influence of his “diagnosogenic theory” (discussed below), Charles Van Riper, to the impact of new methods of speech pathology, and some to the influence of Freud’s theory (Bloodstein, 1993:133). Whatever the reason, the gradual reduction of stuttering in human populations make eminent sense from the evolutionary point of view: the more time generations of humans spend in practicing to speak, the better fluency becomes.

Contemporary speech therapists agree on a couple of postulates, for example, that (1) a genetic factor has a major role in the onset of stuttering, and that (2) we cannot actually “cure” stuttering, so the main aim of contemporary speech pathology is to help a person to adapt to the speech fluency problem and lessen the social impact of stuttering. Another postulate with almost universal agreement is that stuttering equally affects people in every culture.

Contradictions

The first contradictions were noticed still in the 1860s. James Hunt was arguably the first scholar to note that American Indians did not stutter (Hunt, 1861/1967). Speech therapists did not pay attention to this fact. This is understandable. Unlike the problem of the origins of polyphony, which is primarily a theoretical scholarly problem, stuttering has always been primarily a medical, practical problem. The interest in stuttering among Native Americans came back in the middle of the 20th century when a theoretical framework was discovered that could explain the imbalance of stuttering prevalence.

The 1940s heralded the birth of a new period, possibly even a new paradigm, of study of the reasons behind stuttering. One of the most recognizable names from the sphere, Wendel Johnson was the author of a revolutionary approach suggesting that the main cause of stuttering was cultural factor, not genetic factor. According to Johnson’s very sensible theory: (1) All children have a difficult and sensitive period when they are acquiring speech; (2) Different societies and even different parents have different attitudes towards this vulnerable period of speech development; (3) In some cultures adults pay too much attention to this normal stage of childhood development and put unnecessary pressure on a child. They punish the child (sometimes physically), pointing out that s/he is stuttering, and actively try to stop the child from stuttering; (4) This pressure, punishment and the label “stutterer” deeply enter the child’s mind and are the reasons for the fear of speech and social withdrawal. So this is the main reason stuttering does not go away and stays with a person for all his or her life. “Stuttering starts in the ears of parents, not in the mouth of children” was Johnson’s famous slogan (see Johnson, 1944, 1959; Snidecor, 1947; Stewart, 1959).

Johnson’s theory was labeled the “diagnosogenic theory of stuttering” and it dominated speech pathology from the 1940s up to most of the 1970s. During

this period Johnson conducted studies in different cultures and found impressive differences in the incidence of stuttering. He also claimed to have found a correlation between societies where the child-rearing practice was very relaxed and where the stuttering incidence was much reduced or even absent. The bulk of his research was based on studies of two populations: European Americans and Native Americans. Johnson and his students claimed that they failed to find even one full-blooded Indian who had a fluency problem. Indians, according to Johnson, do not stutter, because Indian parents are very relaxed about their children's speech, and even during adulthood Indian social culture and etiquette appreciate silence more than intense verbal communication. Therefore, according to Johnson's theory, the decisive factor in the onset of stuttering was cultural, not genetic.

From the end of the 1970s, the genetic approach towards the genesis of stuttering prevailed (Blodstein, 1995). Johnson's and his students' claim about the absence of stutterers among Indians was found to be an exaggeration (Lemert, 1953; Zimmermann et al., 1983). At least some stuttering individuals were found among the tribes that Johnson and Snidecor claimed had no stutterers. It was suggested that among Indians it was usual to hide individuals with health problems. Most importantly, it was also found that Native Americans from British Columbia (Nootka, Kwakiutl, and Salish) had not only a couple of stutterers like some other tribes, but quite a high number of stuttering individuals, about 1%, the usual for European and American populations (see Lemert, 1953).

As a result, Johnson's "diagnosogenic theory" of the onset of stuttering was gradually marginalized. A genetic theory was favored as the decisive element in the onset of stuttering. According to the genetic theory, cultural practices are not so important, and genes determine the level of fluency of each individual. In this new paradigm, major differences in the incidence of stuttering among different populations were beyond the explanatory capabilities of the genetic theory, and unfortunately, the cross-cultural studies of the incidence of stuttering in different populations were mostly marginalized. But the facts of the various stuttering prevalence did not disappear.

There were at least a couple of cross-cultural studies of stuttering prevalence indicating that differences are quite noticeable (Cooper & Cooper, 1993:194-196; Finn & Cordes, 1997:222; see also Bloodstein, 1993:65-66, 1995:136). According to these publications, the number of stutterers is unusu-

ally high among African-American populations and in the West Indies, consisting mostly of populations of sub-Saharan African descent. According to some studies, difference in the prevalence of stuttering between African-American and European Americans reach the ratio of 3:1 and even 4:1 (See Cooper & Cooper, 1993:194-195). Even higher numbers of difference were indicated: 5.5% in some populations and even 9.2% (Cooper & Cooper, 1993:195-196; Nwokah, 1988; Finn & Cordes, 1997:222-223), concluding that the incidence of stuttering among Nigerians and West Africans may be the highest in the world (Cooper & Cooper, 1993:195; Nwokah, 1988).

Summarizing prevalence studies, E. Cooper and C. Cooper concluded:

“On the basis of the data currently available, it appears the prevalence of fluency disorders varies among the cultures of the world, with some indications that the prevalence of fluency disorders labeled as stuttering is higher among black populations than white or Asian populations” (Cooper & Cooper, 1993:197).

Recent genetic study by the leading Australian expert on stuttering Mark Onslow noted that the available literature points to big differences between various cultures and countries (as low as 0.3% and as high as 5.2%), but Onslow doubts the correctness of the studies, *“since there is no sound theoretical reason to suppose that the point prevalence of stuttering would vary so much from country to country”* (Onslow, 2019:56). Apart from this, Onslow reports the *“new study conducted in the USA with many participants (119 367 participants) convincingly reported more stuttering among African Americans than other Americans. Why that could be the case is challenging to explain...”* (Onslow, 2019:56). In a personal letter to me (from 22 June 2017) Mark Onslow again pointed out the challenge of explaining the noted difference between African Americans and the rest of the Americans: *“I really have no idea why African Americans seem to have a higher incidence of stuttering than other Americans, considering their linguistic similarity, and if the finding is replicated I will seriously have to think about it!”*

The new possible explanation and predictions

If readers remember our discussion regarding the origins of choral polyphonic singing, they might remember the very unlikely and even politically dangerous suggestion of the asynchronous shift to articulated speech in various human ancestral populations. I suggested that the first to develop speech must have been archaic populations of East Asia, followed by Australian aboriginal populations, then West European populations, and finally sub-Saharan African populations. Time differences, based on the existing paleoanthropological evidence of regional continuity from different regions are considerable: from around 350 kya in East Asia, to 11 kya in sub-Saharan African populations. With the easily understandable correlation between more time spent using the articulated speech and fewer problems of speech fluency (with an already noted tendency of reduction of stuttering numbers in mind), I predicted that the widely known European mean prevalence of stuttering (around 1%) cannot be accurate for many other populations. I predicted that on one hand, the populations of East Asia (and Australian aboriginal populations) should be found to have the lowest stuttering prevalence (much lower than 1%), as they must have spent the biggest amount of time “practicing” the new complex skill of articulated speech. On the other hand, populations of sub-Saharan African origins should have much higher than mean the mean European 1% of prevalence, as they have spent much less time “practicing” articulated speech.

We can postulate here that cultures with live traditions of vocal polyphony (Europeans and particularly sub-Saharan Africans) are predicted to have higher stuttering prevalence than cultures without traditions of vocal polyphony (East Asians, Native Americans, and Australian Aborigines). In short, cultures with more polyphony are expected to have more stuttering individuals.

The above-mentioned puzzling facts about the differences between the stuttering prevalence of African Americans and other Americans fall perfectly in this new suggestion, but this is not all. If the Native Americans, at least some tribes, really have a reduced number of stutterers (and there are clear indications for this, see, for example, Stewart, 1985:314), in the light of the well-known genetic links between the Native American and East Asian populations, this reduction of stutterers is also understandable. Even more, the above noted a higher number of stutterers among British Columbia Nootka, Kwakiutl, and

Salish tribes obtain new significance if we mention that exactly these tribes practice the most polyphony among North American Indian tribes (Nettl, 1961).

The crucial point of my new suggestion concerns the vast populations of East Asian origins, and particularly the Chinese. As the most non-polyphonic population, according to my model, they must have shifted to speech the earliest, and should have a low prevalence of stuttering. I will not give the full details of my long search for the data on stuttering prevalence among Chinese, as it is a long story full of drama. To give a reader a taste of the various methods that I tried since 1986, I will only mention that I tried virtually every method available, starting from going to Chinese restaurants and acupuncture centers and interviewing ethnic Chinese who worked there, then participating in the international conference on speech disorders, interviewing 33 Singaporean professional speech therapist about their experiences with Chinese stutterers, and finally publishing apparently the first research article on the topic, together with an American speech therapist, Sheree Reese, associate professor and Clinic Director in the Department of Communication Disorder and Deafness at Kean University, New Jersey (see Reese & Jordania, 2001).

Without a doubt, all the research results can be treated only as preliminary, and still, it is interesting that they all point to a much lower stuttering prevalence among Chinese and other populations of East Asian origins (like Kazakhs and Yakuts). How much lower? According to the preliminary data, the stuttering prevalence among Chinese may easily be less than the mean European prevalence of about 1% by a factor of ten or more.

What is the reaction of professional speech therapists to my unorthodox suggestions? Whenever I start explaining to them about the possible existing big differences in stuttering prevalence between cultures, they immediately have a strong impression that I want to resurrect the diagnosogenic hypothesis proposed by Johnson in the 1940s. But this is not the case – unlike Johnson, I am convinced that the different prevalence of stuttering has a genetic, not cultural basis. So, how to explain the existing difference in prevalence? According to my new suggestion, there are *various genetic predilections towards stuttering in various human populations*.

As the readers can see a new idea is very bold, even politically dangerous, but the positive thing is that the predictions are quite clear. So far there are not many large and convincing studies of the stuttering prevalence across cultures. As a matter of fact, there is probably only a single study with a large number of

participants (Boyle et al., 2011, see also Yairi & Ambrose, 2013, Onslow, 2019) that suggests that African American have a higher predilection towards stuttering than other Americans. A large number of studies had been done decades ago, and today they can only be considered preliminary. And it is still interesting that virtually all these earlier cross-cultural studies do confirm the prediction that the lowest number of stutterers is to be found among East Asian and Australian Aborigines, and increased numbers of stutterers among the descendants of sub-Saharan populations.

So if professional speech therapists are reading these words, and they are intrigued or sure the proposed predictions are laughably wrong, please conduct studies to prove my predictions wrong. Even a simple study of several Chinese schools can eliminate my biggest argument. But such a study might, on the contrary, provide important proof to my unorthodox idea of various genetic predisposition of various populations towards stuttering.

And finally, as promised, for those who wish to read more detailed discussion and references on this topic, including a long and winding story of the search for information on Chinese stutterers, I suggest my 2015 book, through the Amazon, or, better, find it freely available on the internet via my personal website (Jordania, 2015:508-527).

Axiom 3: “Dyslexia Prevalence is Directly Connected to the Language Writing System”

Unlike the case of stuttering prevalence, in which the possible effects of the culture and language are considered very controversial (see the rejection of Johnson’s theory), when it comes to the prevalence of dyslexia in any given culture, it is believed to be connected with linguistic or orthographic factors.

Dyslexia is a developmental disorder that is indirectly connected to speech, via reading and writing. About 10% of the European and North American population suffers from dyslexia (the estimates vary widely – see below). People with dyslexia find it difficult to acquire reading and writing skills and are generally behind their peers at schools, although they can be extremely bright.

Several important factors link developmental dyslexia and stuttering:

Both pathologies have a major innate component; atypical dominance of the brain hemispheres is crucial to both; incidence prevails among males; the magnificent array of dyslexic scholars (which includes Albert Einstein and

Thomas Edison) proves that, like stuttering, developmental dyslexia is not connected to mental retardation (West, 1997; Snowling & Thomson, 1991; DeFries et al., 1987); and another coincidence between stuttering and developmental dyslexia is that the latter differs greatly in prevalence in different regions of the world.

Despite so many similarities, there are important differences. First of all, we must note that unlike stuttering, in which no one actually disputes the presence of the condition, there are still disagreements regarding the nature and character of dyslexia (see Blair, 2007). A BBC4 documentary "The Dyslexia Myth" argued that the common understanding of dyslexia is not only false but makes it more difficult to provide the reading help that hundreds of thousands of children desperately need. Drawing on years of intensive research on both sides of the Atlantic, the film challenged the existence of dyslexia as a separate condition, and highlighted the many different forms of reading styles.

At the same time, an increasing number of studies link dyslexia to genetic markers. In particular, the region on chromosome 6, DCDC2 has been linked to dyslexia as a result of a major recent study (Meng et al., 2005. See also Schumacher et al., 2007).

Also, although dyslexia (like stuttering) is believed to affect more males, there are claims that the actual sex difference is not so big and that the difference in the referral rate is strongly affected by the behavioral stereotypes (Shaywitz et al., 1990).

And finally, unlike stuttering, which is often a transient phase in children's development (around four out of five stuttering children recover by the age of 7-10), dyslexia is a persistent, chronic condition.

The correlation between the writing system and the prevalence of dyslexia was suggested as early as the 1960s (see: Makita, 1968). Psychologist Tim Miles from the University of Bangor, Wales, came to the similar conclusion:

"We do not know at present whether the biological anomalies which occur in dyslexics are common in all countries of the world or whether the distribution of these anomalies varies from one country to another. It seems likely, however, that the former is the case and that variations in the form taken by dyslexia in different parts of the world depend on environmental factors and, in particular, what writing system is used" (Miles, 2004).

According to a cross-cultural survey reported in the “Cambridge Encyclopedia of Language,” the prevalence of dyslexia ranges from 1% and 33% (Crystal, 1987:274). The most interesting fact for our discussion is that the lowest incidence (1%) was found in China (Crystal, 1987:274). Such a drastic difference of developmental dyslexia is usually attributed to the peculiarities of the Chinese logographic writing system. Rozin, Ponitzky, and Sotsky reported that American dyslectic children did not have substantial problems learning to read Chinese characters (Rozin et al., 1971). So again, scholars point to the obvious differences in writing systems to interpret the significant differences in the prevalence of dyslexia.

So let us summarize. The discussed connection between the orthographic system and the prevalence of dyslexia is very easy to understand – some languages have simple spelling rules; for example, Spanish and Italian sound almost identical to what you see on the paper in a written form. Some other languages are even more precise (like my native Georgian orthography). And of course, there are other languages where the links between spelling and actual pronunciation are quite difficult to notice and remember – English is a prime example. In professional jargon, languages like English are known as languages with a “deep phonemic orthography,” and languages with an easier reading system like Italian or Georgian are known as languages with a “shallow phonemic orthography.” It is not hard to understand, that the differences in the prevalence of dyslexia can be connected by this factor – the deeper the “phonemic orthography” of the language, the more difficult is to learn the complex spelling/reading rules, the bigger are the problems in reading and writing for this language users. On the other hand, with languages that use shallow orthography, where you basically “read what you see” the number of dyslexics must be minimal.

Contradictions

Once again, everything would be fine if the stubborn facts did not contradict this clear and logical theory. And unfortunately for the reigning paradigm, the number of such contradicting facts is impressive. People from cultures with the simplest writing systems (like Spanish, or Italian, or Serbo-Croatian, or Georgian) have problems in reading and writing as much as British citizens, and on the contrary, the Chinese child who has to learn one of the most complex and

multi-level writing systems, apparently have very few individuals with reading and spelling difficulties.

So, despite the seemingly obvious correlation between the writing systems and the prevalence of dyslexia, the evidence available does not support this suggestion. The same low incidence of developmental dyslexia, as in China, is also found in Japan, where the writing system kana is much closer to European writing systems than to Chinese characters. As for the popular suggestion that the simple and logical characteristic of Japanese kana is the main reason for the very low incidence of dyslexia among the Japanese population, it has been criticized by Flores d'Arcais:

"...if for Japanese children, as Makita (1968) proposed, the completely shallow kana orthography could favor reading activation, the same low incidence should be found for Serbo-Croatian, or, almost to the same extent, in Italian or Spanish, and this is not the case" (Flores d'Arcais, 1992:45).

The author concludes that *"the evidence available is not clear and strong enough to support the notion of a real advantage of logographic systems in reducing the risk of developmental dyslexia"* (Flores d'Arcais, 1992:45).

I must note here those scholars who suggest that the simplicity of the Japanese writing system is the main reason for the significant drop in the prevalence of dyslexia among Japanese children avoid discussing the contradicting argument about other cultures with equally and even more simple writing systems, where children still suffer from a high prevalence of dyslexia.

So if the prevalence of dyslexia does not depend on nature or writing system, what can be the reason behind such an impressive differences in the prevalence of dyslexia?

The New Possible Explanation and Predictions

Before I voice my suggestion, let us first of all remember that stuttering is not the only "evolutionary" disorder that could be affected by the chronology of articulated speech. Significant differences in the chronology of the emergence of spoken language in human populations could have caused differences in the distribution of other forms of innate speech (or reading) pathologies. One more time, according to the suggested model, different forms of innate speech (and reading) pathologies should be less common in East Asia and among indigenous populations of America and Australia. On the other hand, I expect the preva-

lence to be much higher in sub-Saharan populations and their descendants. So, the correlation again is expected to be “more polyphony – more speech and reading problems.”

Therefore, I propose the difference in the prevalence of dyslexia is directly connected to the genetic predisposition of the population towards dyslexia.

Despite the problems in establishing the reasons for the lower rate of dyslexia among the populations of the world, the possible influence of the genetic factor in these differences has never been seriously discussed. I believe that excluding the possibility of a genetic factor in the huge difference between the prevalence of dyslexia among the Chinese and Japanese populations on one hand, and the European and American populations on the other, limits the chances of scholars to establish the true reasons behind the significant cross-cultural differences in the prevalence of dyslexia.

So here are the predictions of this unorthodox suggestion: if the new suggestion has a healthy kernel then it should be found in future studies of the prevalence of developmental dyslexia all over the world:

1. The mean European and North American figure of about 10% of prevalence of dyslexia is inadequate for many other regions;
2. Populations of East Asian regions (representatives of very different language families and writing systems) and their descendants in different countries should have a much lower rate of the prevalence of dyslexia; The same goes for Australian Aboriginal populations.
3. Populations of sub-Saharan Africa and their descendants in different continents should have a much higher rate of the prevalence of dyslexia, irrespective of the languages they speak.

We are talking here about very significant differences, reaching possibly ten-fold or even bigger numbers.

So again, if my suggestions sound wrong, it must be very easy to destroy all my arguments with some studies of the dyslexia prevalence. Even within the USA, for example, my prediction should be easy to check, as I expect much lower dyslexia prevalence in Asian Americans (and even native Americans), and, on the other hand, much higher prevalence in African Americans.

And a final comment: the fuller discussion of this topic with more accompanying references can be found in the book “Choral Singing in Human Culture and Evolution” (Jordania, 2015:503-507).

Axiom 4: “Acquisition of Phonology in Children is Similar All around the World”

Learning correct pronunciation, or, in professional jargon, “acquisition of a phonological system,” is one of the hallmarks of normal linguistic development. It is believed that the process of the acquisition follows universal rules among the children of totally different ethnic and racial origins (see Jakobson et al., 1963). The correctness of this idea was demonstrated many times by a number of studies. Although the phonetic elements have different, sometimes confusing names, it is still clear that the order of acquisition of the phonological elements follows universal rules. Children of every culture start first pronouncing the nasal sounds (like “n”), then grave sound (like “a”), followed by voiced sounds (like B), diffuse sounds (like “T”), continuant (like “Sss”) and finally strident sounds (like “P”).

So the universally accepted idea proposes that all children of all cultures and races follow the same rules of developing the correct pronunciation of all needed speech sounds. As far as I know, no study has suggested that there are major differences from these rules, and I cannot point to any exceptions. So where is the problem to this quite self-evident and confirmed rule?

Contradiction

Sometimes contradicting evidence is totally ignored, although it has been there from the beginning and actually is very easy to see. For example, in the article “The Role of Distinctive Features in Children's Acquisition of Phonology” (Menyuk, 1968) Paula Menyuk details the acquisition and proportion of correct usage of consonants by Japanese and American children. The main result of the study is that

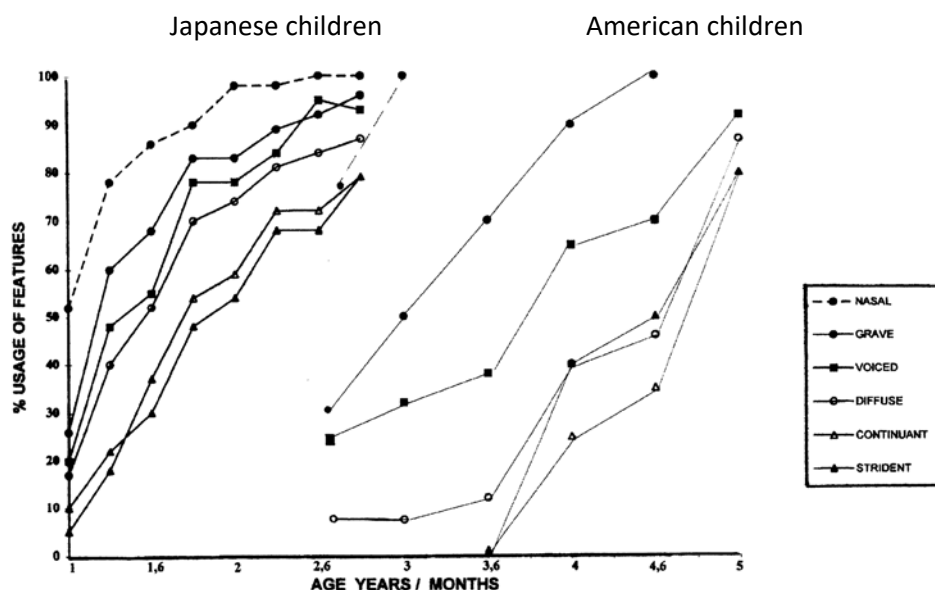
“...one can observe the same order in the acquisition and relative degree of mastery or correct usage of sounds containing the various features by groups of children from two differing linguistic environments, indicating that a hierarchy of feature distinction may be a linguistic universal” (Menyuk, 1968:142).

So the order of acquisition of a phonologic system (nasal, voice, grave, continuant, diffuse, strident), as predicted by Jakobson, appears to be the same for

American and Japanese children. But there is an important and so far totally ignored the difference between American and Japanese children's acquisition of phonology, and we are going to discuss it now.

The only detail that differs in the acquisition of a phonologic system by Japanese and American children is a very substantial *difference in age*. The acquisition of a phonologic system by American children starts from the age range of two and a half and finishes at the age of five years, while the same system is acquired by Japanese children from the age of one to three years (Menyuk, 1968:140-141; see also Nakajima, 1962).

There are two graphic figures in the article, showing the percentage of usage of features in consonants used correctly by American and Japanese children (separately). When viewed separately, as they are presented in the article of Menyuk, both figures look quite identical. But it is a different case if you put these figures together in the same timeline perspective. I combined the graphics of both Menyuk and Nakajima figures and we have the following picture:



As it is easy to see, the conspicuous difference in the age of acquisition of a phonological system by Japanese and American children is obvious. Japanese children appear to have almost finished the process of acquisition of a phono-

logic system by the age of two and a half years, when American children are just beginning this process. This evidence is completely overlooked not only in the discussed article, but other publications dedicated to the problem.

Possible New Explanation and Predictions

The already mentioned new idea that the ancestors of different human populations shifted to articulated speech in different epochs, leads to another bold prediction: the acquisition of the phonological system in the ontogeny of children from different regions of the world may occur at different ages, more precisely, children of East Asian, American Indian, and Australian Aboriginal origins should acquire a phonologic system earlier than children of European, and particularly, of sub-Saharan African origins.

To check this proposal, one needs to compare the acquisition of a phonologic system among different populations on different continents. Not much is available, although, fortunately, there are a couple of studies and publications, which contain interesting information.

According to the study by Lydia So and Barbara Dodd, the acquisition of the phonologic system among Cantonese-speaking children is more rapid compared to that of English-speaking children (So & Dodd, 1995).

In another study with many graphic pictures which reveal the significant differences in the age of acquisition phonetic development of English-speaking and Mandarin-speaking children, 90 percent fluency is achieved by English-speaking children from the age of three to seven years, and the same high rate is achieved by the Mandarin-speaking children from the age of one and a half to four and a half years (Zhu Hua & Dodd, 2006, see and compare the figures on pages 42 and 92).

Of course, more research is needed to get the fuller picture and to understand the nature of the existing differences in the age of acquisition of the phonological system. And if it happens that further studies confirm my predictions about the earliest acquisition of the phonological system by East Asian and Aboriginal Australian populations, and the later acquisition by European and particularly, sub-Saharan populations and their descendants, then we have to seriously consider the possibility that the genetic predisposition of various populations of the world plays a major role in this imbalance.

Interested readers can find a more detailed discussion on this topic (see the chapter “My child said today ‘biscu-it’: Cross-Cultural Aspect of the Acquisition of the Phonological System” in a book: Jordania, 2015: 534-537).

Axiom 5: “Dazzling Peacock Tail Evolved to Attract Females”

There are not many propositions that are believed in biology as strongly as Charles Darwin’s evolutionary reasons behind the amazing beauty of the peacock’s tail (the professional term is peacock’s “train”). The peacock’s visual features were always considered so cumbersome and harmful for survival, that it was believed that the only reason for the peacock sporting the huge tail was to entice female peahens with their beauty. According to this model, for a big and colorful peacock, it is more difficult to stay unnoticed and survive predators, but this negative factor is compensated by another, positive factor: a more impressive tail ensures the better chances of its bearer in having many offspring. “What if I die young when I can have more children?” is the winning evolutionary slogan.

Amazingly, scholars were so sure about the sexual selection reason behind the attractiveness of a peacock’s dazzling display that they did not even consider it necessary to test this idea with an experiment or a field study. For generations of biologists, this idea sounded as axiomatic as the idea of late cultural origins of choral singing sounded to the generations of music historians.

It was only at the beginning of the 1990s, more than a century after the publication of Darwin’s work on sexual selection (1871), that Marion Petrie, Tim Halliday, and Carolyn Sanders finally published the results of their study on peacocks’ mating behavior. According to their results, as expected, females chose males with bigger trains and with the biggest number of eyespots (Petrie et al., 1991). Unfortunately, the study was not large enough, as researchers studied only one lek (a congregation of males) of 10 males for a very limited time, and the method employed did not convince everyone – researchers disfigured some of the male’s tail feathers and covered several eyespots to observe the results. A bigger study was needed.

Finally, in the second half of the 1990s, a much larger, the seven-year study was conducted in Japan to verify and confirm the Petrie/Halliday/Sanders findings with solid field results. And it was here that troubles started.

Controversies

As in many other cases, all was fine until the facts intervened. In this case, the difficult facts appeared only after scholars virtually “asked” the peahens their opinion on their male counterpart’s tail. How did scholars ask this all-important question?

During seven long mating seasons (from 1995 to 2001), researchers from the Graduate School of Arts and Sciences at the University of Tokyo, under the leadership of Mariko Takahashi, with famous Japanese diligence studied the free-ranging population of Indian peafowl at Izu Cactus Park in Shizuoka, Japan. I want to repeat that researchers did not aim for the revolutionary results; on the contrary, they just humbly expected to find more solid confirmation of the power of sexual selection behind the peacock’s dazzling tail.

And very unexpectedly, researchers came to the conclusion that the peahens were totally indifferent to the peacocks’ tail beauty, and the tail condition did not correlate with the reproductive success of their bearers. I do not know the results of the delay (analyzing field results? Doubts whether it was worth publishing negative results?), but very interestingly, the publication of these unexpected results took another seven years (Takahashi et al., 2008). The reaction, though, was swift. Discovery News presented the results of the study as sensational:

“The feather train on male peacocks is among the most striking and beautiful physical attributes in nature, but it fails to excite, much less interest, females, according to new research. The determination throws a wrench in the long-held belief that male peacock feathers evolved in response to female mate choice. It could also indicate that certain other elaborate features in galliformes, a group that includes turkeys, chickens, grouse, quails, and pheasants, as well as peacocks, are not necessarily linked to fitness and mating success” (Viegas, 2008).

The proponents of the sexual selection did not take the unwelcome news without a fight. Petrie and her French colleagues actually wrote a rebuttal of the Takahashi et al. study, in the same year (Loyau et al., 2008). Without rejecting the diligent study, they proposed that a phenomenon of “plasticity of female choice” might be involved. When translated into plain English, this term means that peahens might change their taste in choosing males very much as

humans do, and that contemporary peahens are not as interested in the size and beauty of the classic peacock tail as their grandmothers were.

This argument does not seem very convincing, as it seems quite difficult to believe that, after hundreds of thousands (possibly even millions) of years of female excitement for their male counterparts' trains, suddenly, during the 1990s (between the studies of Marion Petrie and Mariko Takahashi) peahens for some unknown reason lost interest in the peacock's dazzling display.

Here, with this controversy, we can also recall that Darwin was sometimes also puzzled by the strange features of sexual selection in some species. For example – why, in some species, are females just as distinctly-colored as their male counterparts? Or why, in species where a male can win a female's affection by physically defeating a competing male, do males still retain these beautiful colors and unusual features that hinder their fighting abilities? Despite the mounting questions, scholars remained reluctant to question the paradigm of sexual selection and search for alternatives. Still in the 1990s, a modified sexual selection model was suggested by Merle Jacobs, author of the "food-courtship theory" (Jacobs, 1999). The theory suggests that peahens are attracted to peacocks for the resemblance of their eyespots to blueberries. Creationists also benefited from this unexpected result and confusion among biologists after Takahashi's results were published. If sexual selection was not behind the peacock's tail, they mused, then what else could be the reason for this "unnecessary beauty" if not the will and aesthetic sense of the Creator?

Possible explanation and predictions

We are often so blinded by the visual that we fail to notice other elements of morphology and behavior. Have you ever seen a discussion of peacock's *voice* or *behavior* together with their appearance? And as soon as we pay attention to these details, it is becoming clear that peacock's dazzling tail might be just one, the visual element, of the so-called "aposematic display". But what does this unusual term mean?

"Aposematism" is one of the two great strategies of survival, another much better strategy being "crypsis." The differences between them are easy to understand:

Cryptic species (both predator and prey species) try to survive by staying unnoticed. They are usually camouflaged, are mostly silent, try not to have a

body odor, and as soon as they are noticed by a predator, they try to escape as fast as possible. Cats and rabbits are examples of classic cryptic species among predator and prey species.

Aposematic species (both predator and prey species) do not try to conceal themselves. On the contrary, they try to “announce” their presence by all the possible modalities: they are often very visible by their contrastive body colors, they often make constant sounds as they walk, they as a rule have a body odor and can produce stronger smell if threatened, and, when confronted by a potential predator, instead of running away, they try to intimidate the predator by their increased body size, threatening sounds, and gestures, and fearless behavior. Skunks and porcupine are examples of classic aposematic species. Aposematic species are more usual among prey species, as the predators that announce their presence are understandably less successful.

Aposematism for many biologists is merely a “warning coloration” but it is much more than coloration. For a species that uses aposematism as a survival strategy, it pays to use aposematic signals in *every possible modality*. That is the reason that a skunk, when facing a predator, starts an elaborate display of various intimidating behaviors: it raises tail and even stands upright on its front legs, trying to look as tall as possible (visual signal), makes threatening growling sounds (audio signal), intensifies the body odor (still before using his deadly olfactory defense as the ultimate weapon), and to prove it is not scared, keeps its ground without moving away from a predator.

Now let us look at peacocks. Apart from their huge size, particularly with the open tail, they have all the other elements of classic aposematic species: the peacock has a very strong, piercing voice (audio signal), secretes very smelly dropping if handled against its will (olfactory signal), and often does not go away even if a potential danger (for example, a tiger) is nearby.

Therefore, my suggestion is that the peacock’s amazingly big and beautiful tail evolved primarily under the forces of natural selection, not sexual selection, and its evolutionary function was and still is to scare away rival males and predators, not to woo females.

Darwin wrote in 1871: *‘To suppose that the females do not appreciate the beauty of the males, is to admit that their splendid decorations, all their pomp and display, are useless; and this is incredible’* (Darwin, 2004:557). It is clear from these words that he did not even consider the possibility that the “beauty and splendid decorations” could also be used to scare away predators and rival

males. After all, the peacock's dazzling tail might be not as useless and harmful for survival that it was believed by generations of biologists.

How do things stand at the moment? The ground-breaking Japanese study of Takahashi sometimes gets simply neglected, and the sexual selection model is still the only explanation for the peacock's dazzling tail (see, for example, a recent article by Patricia Brennan from the Department of Ecology and Evolutionary Biology, Yale University, Brennan, 2012 - no mention of the conflicting study results).

I have to mention as well, that the theory of sexual selection always had critics (including even Alfred Wallace, the co-discoverer of the theory of Natural Selection), and it was natural that sometimes alternative ideas appeared. For example, in the 1930s, R.W.G. Hingston (1933) and J. Huxley (1938) pointed out that male adornment is instrumental in establishing dominance relationships among males.

If we take into an account that to look bigger (and more colorful) is one of the natural selection's favorite strategies to scare away predators and competitors and avoid unnecessary physical confrontations, the idea that the peacock's train was primarily designed by the forces of natural selection to scare away rivals and predators seems very plausible.

Such strategies thrive not only among aposematic species, who use "don't come closer" signals virtually every moment of their lives. Most non-aposematic species (including the perfect predators – cats of all sizes) use aposematic signals occasionally to avoid unnecessary and potentially dangerous physical confrontation, and substitute ritualized non-violent aposematic displays for costly fights (see for example, Eibl-Eibesfeldt, 1979).

Therefore, I predict that if behavioral ecologists try to check the possibility that peacocks morphology and behavior evolved as an aposematic strategy, they will be surprised to find many facts that confirm this strange sounding idea. In 2016 and 2017 I gave related presentations at two international meetings of behavioral ecologists, and I can say that apart from rare exceptions, the reaction was that of suspicious distrust.

And finally, the readers can see a fuller discussion of this topic in the book *A New Model of Human Evolution* (Jordania, 2017:113-119). Actually, this book (which can also be found free on the internet for interested readers) is almost entirely connected to the mostly neglected principles of aposematic signals in the natural world.

Axiom 6: “Human Ancestors Were Hunter-Gatherers”

Open any popular book or professional encyclopedia on the history and evolution of our species, and you will be assured that our forebears were hunter-gatherers. There is often gender division implied in this scenario – predominantly men were hunters, and women were gatherers. Hunter-gathering continued in prehistory until our ancestors became agriculturalists, or started to grow/maintain their food after they domesticated useful plants and animal species. The hunter-gathering phase continued for at least 90% of human history, depending on where we start counting. Some human societies even now live mostly as hunter-gatherers (for example Hadza and some pygmy societies in Africa).

The image of brave hunters together killing mammoths and other big game has long become an inseparable part of the story of human history. Raymond Dart has done probably the most to glorify the power of our distant ancestors, ruthless hunters (Dart, 1949, 1953).

In the 1970s, this generally agreed and comfortably believed scenario gradually obtained a few critics.

Controversies

Lewis Binford was arguably the first to suggest that our ancestors were mostly scavengers, not hunters (1985). The signs on the consumed animal bones indicated that human ancestors accessed the carcass after the big predators had dinner, which means humans were scavenging kills made by big predators. Of course, there were also lucky cases when the animal died of natural causes and was found by humans first, but this bounty was most likely very rare, so the dependence on so-called “passive scavenging” must have been a more important strategy. The branch of paleoanthropology that studies the scratch marks on ancient bones is called “taphonomy.” There were also indications that the prey animal, usually a large ungulate, was killed by a predator (for example, a lion) but humans started eating the kill very early. The stratigraphy of lion teeth/fang marks interspersed with human stone tools indicated the possibility of humans using not “passive” but “active”, also known as “confrontational” or “power scavenging” (Bunn, 2001, see also Bickerton & Szathmáry,

2011; Blumenschine, 1986). Unlike passive scavenging, those engaged in power scavenging must face the original predators and chase them from their kill.

Chasing away a group of hungry lions from their kill looked too dangerous and therefore unrealistic. Okay, scholars mused, possibly our ancestors could scare away hyenas and even leopards but scaring away lions (and even bigger predators of the day in Africa) seemed too unrealistic to be feasible. Then it was noticed that some of the groups of Africans, who still use scavenging (like the Hadza, discussed in the mentioned article) still use power scavenging, scaring away the hungry lions from their kills. The interested reader can easily find videos on YouTube where showing Africans scaring away hungry lions from their fresh kill. Schaller and Bertram also confirm that lions run away when sighting humans on foot (Schaller, 1972; Bertram, 1972), See for example: “All my observations were made from a Land Rover, not for the reasons one might think but because lions in the wild are afraid of humans on foot” (Bertram, 1972:33). So was this the case with our distant ancestors as well? And if yes, then comes an important question: how did the slow-running and toothless primate achieved this?

Possible Explanation and Predictions

When discussing the possible means of how our distant ancestors were obtaining meat (via hunting, via passive scavenging, or via power scavenging), scholars for many generations had been neglecting an important question: how did our ancestors defend their lives from the major predators of the day in the first place? This neglect of early human defense strategies started with Charles Darwin, who suggested in 1871 that humans were possibly formed in an environment free of dangerous predators, possibly on a large island, like Australia, New Guinea, or Borneo (see Darwin, 1871/1981 Princeton U.P. edition, p.157). Well, we know now that humans were formed in Africa, a continent with large, deadly predators (Darwin also considered this possibility), but the neglect of the potent defense strategies still continues.

I proposed that the defense strategies utilized by our ancestors were crucial for morphological and behavioral evolution of our species. I dedicated a whole book to this problem (Jordania, 2017) and there is definitely no need and place to discuss many conclusions of the book, but I want to point to one proposal. I suggested that humans are an aposematic species. I proposed that after de-

scending from the trees (this process started some 5 million years ago), instead of following the route that other African apes followed, the route of crypsis survival strategy, the line leading to our direct ancestors took the survival strategy based on aposematic display. So, instead of becoming mostly invisible and silent as other ground-living African apes, human ancestors were involved in the gradual transformation of their morphology and behavior towards a more effective aposematic display.

This was a very long process. They gradually achieved impressive height by evolving constant bipedal posture and gait, longer legs, and long curly hair on top of the head. Apart from visually impressive appearance, our ancestors also evolved extremely potent audio signals, by using loud group singing, augmented by rhythmic synchrony, and the use of dissonant harmonies (perfect for achieving the “Beau Geste Effect” or sounding more numerous). Additionally, they developed the unique altered state of consciousness, “Battle Trance,” in which they lost the fear of death and pain, and were religiously dedicated to group interests; with their unique ability to use effectively stones and branches as projectiles, they gradually developed a non-contact defense strategy. As a result, since becoming terrestrial, they lost the canines that were out of practical use for the new aposematic defense and found their mouth free for more subtle use for future, more advanced communication. Many other elements were also involved (like lowering the male voice range, or the presence of body odor that makes daily showering necessary for us today, and even eyespots for night-time defense), but I do not want to discuss them as they can be easily found in the book I already mentioned (Jordania, 2017:127-270).

My central thesis is that all these aposematic strategies were developed initially for defense from the attacks of African predators, and after the system became very effective, our ancestors found out that the same intimidating strategy was very effective in confrontations at the kill sites that other predators made. The solution to a constant supply of meat was found as our ancestors became the “King Power Scavengers” of African Savannah.

Being a passive scavenger and being a power scavenger are very different activities, with markedly different results. If the remains of a zebra after the lions finished a dinner still contains about 15-kilo meat scraps of various sizes (see Pobiner, 2016), the same zebra, obtained soon after the killing, can easily provide a few hundred kilos of meat, enough for more than one day.

Therefore, I predict that if evolutionary biologists look closer to the possibility that the early interaction with lions and other African predators was a major factor in the evolution of our species, they will find many confirmations of this idea, particularly from the point of view of the aposematic defense strategy.

And finally, much fuller discussion of these topics can be found in my 2017 book, which is, like most of my books, is freely available to interested readers.

Axiom 7: “Cannibalism Is the Most Barbaric and Deviant Behavior”

If we had a questionnaire to reveal the most disgusting, the most abhorrent and deviant human behavior, it is very likely to be won by cannibalism. Humans eating flesh of other human is as bad as it gets, and is rightly portrayed as such in myths, books, and horror movies. Cannibalism was the only officially accepted behavior that was enough reason for the Spanish conquistadors to enslave the native peoples of South America, because these tribes, as it was believed, stepped outside of humanly accepted behaviors.

Of course, when it comes to survival in some specific situations where humans are facing death from starvation, from the besieged cities to the disaster of the Uruguayan plane that crashed whose survivors were stranded in The Andes, no one can really accuse those who resorted to cannibalism purely to survive, but when there is a choice, eating human flesh is as horrible as it gets. William Arens even made international fame by entirely rejecting this shameful legacy from human history as a gross lie and exaggeration by European colonizers (1979).

So, after such a resounding condemnation, what can be considered “controversies” to the universal disgust by cannibalistic behavior?

Controversies

The most important fact that puts doubts into the belief that cannibalism has been viewed as a disgusting, abhorrent behavior for human, is the very wide distribution of cannibalism throughout human history all around the world. The readers should excuse me for not giving the long list of world regions, tribes, and confirmed cases of cannibalism – they can easily access this information in the Wikipedia article on human cannibalism. Instead, I want to mention here

some other interesting and contradicting facts that are not mentioned in Wikipedia.

One such fact is the ubiquitous use of the words describing cannibalistic behavior as the highest expression of love and affection. “The baby is so cute I want to eat him,” a woman raised in Western values excitedly says to her friend, and the friend, the proud mother of the cute baby, gets the message right, that her friend really loves her baby. Regarding the mention of cannibalism, none of the two women realizes what these words really are alluding to. When we express our excitement on seeing a cute kitten, or a puppy, we often declare we want to eat them. This is also understood without realizing the literal meaning of the words. The same way, when a girlfriend tells her boyfriend (or the other way round) that he/she is very sweet, none of them are thinking literally of tasting the flesh of each other. And as much as I have asked people from various cultures, I have found such expressions, linking cannibalistic behavior with utmost love and affection, are virtually universal to probably all cultures of the world.

Another relatively well-known fact is that in some cultures that cannibalism was practiced, the act of consuming someone’s flesh was considered to be an expression of respect and even love. We can even recall here the mystery of Christian Eucharist (Holy Communion), in which believers symbolically consume the flesh and blood of Jesus Christ. Where are all these controversial sentiments about cannibalism coming from?

Possible Explanation and Predictions

When dealing with the problem of avoiding predators (sorely missing in the scholarly literature and discussed in the previous case) I came across Indian-born British naturalist, hunter, environmentalist and author Jim Corbett’s assertion that when predators (like leopards) have free access to the corpses of deceased humans, they might get used to the new food, and when access to the free food supply is stopped, they might start attacking live humans. Two of the most prolific man-eating leopards, both killed by Corbett, so-called Rudraprayag and Panar leopards, ate respectively around 125 and 400 humans. And both made their appearances after deadly epidemics. The Panar leopard followed the severe bout of the cholera epidemic in the first years of the 20th century, and the appearance of the more famous Rudraprayag leopard in

1918 followed one of the deadliest pandemics in human history, the so-called “Spanish Flu.” Why are these facts and Corbett’s insightful idea important to our discussions of human cannibalism and the possible links between cannibalism and love?

There are several options to deal with the remains of human bodies. You can bury them, burn them, you can put them on a boat and let it go sailing, you can mummify them and put them into a specially-built sarcophagus, you can feed them to vultures, keep them in coffins hanging from rocks, etc. There is also another option—to eat dead bodies. Of course, this last option is the least acceptable for us, but unfortunately, our early ancestors did not have any other options. Simply speaking, for the millions of the years they had only two options: to eat bodies, or not to eat them.

In the short term, if you do not eat the dead body, the predators will eat it – goods such as food never go wasted in nature. You might think this does not matter as the person was already dead, but it does matter in the long run, because, as Corbett proposed (and this was confirmed by later studies as well) if predators can easily obtain and eat human/hominid corpses, there is a good chance that they will become habitual man-eaters (Waltl, 2016).

It is important to remember that I am not suggesting that hominids were killing and eating fellow hominids (as is suggested in the famous “man the hunter” hypothesis, proposed by Dart). Instead, I am proposing that hominid groups were co-operatively and self-sacrificially fighting against predators, and in the case of a fatal attack from predators they collectively attacked predators to reclaim the dead body. And then the body was cannibalized in a ritualistic manner. To fight against predators for the body of a fallen group member, and then to cannibalize the body in a ritualized way, has totally different evolutionary and moral overtones. Our distant ancestors are getting undeservedly bad publicity for their habit of cannibalism. They loved their fallen friends, were ready to give life to reclaim their bodies, unaware that with their dedication they were saving lives of their own and of their children as well.

Therefore, I maintain that the practice of cannibalism was an important survival strategy aimed to stop predators attacking early hominids. Most contemporary big and powerful predators that can easily kill humans do not usually include humans in their diet unless they are incapacitated by wounds or prompted by some other circumstances – this aversion towards hunting hu-

mans I believe is the result of millions of years of “predator education” and “strategic cannibalism” by our ancestors.

So I predict that if scholars start viewing my suggestion that cannibalism was an important strategy of predator control, many contradicting facts about this emotionally charged human behavior will find a logical explanation.

And finally, as in previous cases, here is the reference where the interested reader can find a more detailed discussion with references: a chapter “Prehistoric Cannibalism as the Survival Strategy of Human Ancestors” in Jordania, 2011:119-121, and a chapter “Cannibalism, Ritual, Love and Violence” in Jordania, 2017: 296-303).

Axiom 8: “Horoscopes Will Never Ever Yield any Scholarly Confirmation”

It is hard to imagine a worse topic to finish a book dedicated to scientific issues than to discuss the scholarly support of the horoscope. All those skeptical readers who doubted the worth of anything that this author says from the very beginning, received a resounding confirmation: is the author going to propose, no more no less, a totally non-scholarly and pseudo-scientific argument to support the existence of horoscopes? How bad is that?

And still, I want to suggest to all the critical readers, please read what I have to say on this “silly” topic. It seems to me that the gradually mounting research is giving us some hope that the old belief, that the time of our birth might be providing some advantages and disadvantages to us. And if so, this is a step closer to the idea of horoscopes...

Controversies

If we consider that the study of children born during different seasons of the year is a perfectly scholarly topic, we are already coming to a step closer to validate some postulates of the horoscope, more precisely a simplified version of it, so-called Sun-Signs. Studies on this topic suggest that that the time of birth can tell us a few scientifically verifiable things about a person. Scholars at different universities have studied the correlation of the season of birth with several health issues – predilection towards allergies, predilection towards the

heart diseases, weight, height, and other important details and came to the positive and verifiable findings (see, for example, Day et al., 2015).

Here I want to add some personal observations to this point. Let me start with a short story that started me thinking about the problem.

As a professional scholar, raised in the atheistic Soviet Union, I had a natural aversion to horoscopes from my younger years. It was clear to me that all these conversations about the importance of such faraway planets as Mars or even Uranus were all beyond any scientific explanations and meanings. And one day in the long-gone 1982, when I was 28, I had a good chance to demonstrate the correctness of my doubts towards horoscopes to a large group of my gullible students. As a recent Ph.D. owner, I was lecturing a large group of students on Georgian traditional music. During that memorable lecture, I saw that a few of my students were sitting in the last row, reading something under the desk. I was not used to my students not paying attention to my lectures. At the same time, I was too liberal to just order them to stop reading and start concentrating on what I was talking about.

So instead I asked them to share with the group what they were reading, as evidently their reading was more interesting than my lecture. It was a horoscope! So I suggested they bring the horoscope to the lecturer's desk and read it aloud for everyone to hear. And to make the reading more interesting and critical, when reading about signs, I proposed students that were born under the given time frames, to come out, and verify whether the information presented could apply to them. There was certainly plenty of laughing and joking during the reading, but my curiosity was aroused at the points when the characteristics concerned the health and physical features of the people born under the same zodiac sign.

The characteristics of Aquarius included, for example, that they usually have a larger head. I am myself an Aquarius and I do have a larger head but making big conclusions out of this single fact is not a scholarly approach. The horoscope reading also proposed such other specific details for other signs as weaker eyes, or possible deformations of a backbone, or problems with blood circulation. And as if fate did not want me to provide clear support for my intent to demonstrate the futility of horoscopes, there were several clear cases when some of the students from the discussed zodiac sign confirmed the health predictions.

I remember very well, how intrigued I was. This informal and totally unscientific play-interview of about 100 participants in no way convinced me that horoscopes had something of true value, but it made me ask a question to myself (I *love* asking questions): “Is there any *theoretical possibility* that people born in a similar timeframe have the same physical characteristics or health problems?” Totally unaware of the existing research on this topic, the answer that this question brought to me is what I want to share with readers as the possible explanation of the problem, with clear predictions as the scientific method requires.

Possible Explanation and Predictions

First of all, we need to remember, that at that time I did not have any information to believe that there were scholarly studies linking the date of birth with health benefits and problems, so in my spare time, I did a pilot and very non-professional study of a small population of mostly my students and friends. The study was based on a questionnaire. For a study I used only siblings; soon you will understand why. Also, I was collecting data from same-sex siblings, to exclude confounds I was giving them (usually one of the siblings only) a questionnaire to fill in. From the questionnaire, I was getting information about their date of birth, and plenty of details of their comparative height, weight, bone thickness, head size, eyesight, and any known health problems. “Comparative” means I was getting the information about two (in rare cases three) siblings, such as which of them was taller (without precise measurements of siblings involved), heavier, had thicker bones, larger head, better eyesight, and any known health problems. So collecting the information did not require me to meet all the siblings and making complex professional measurements. So, the data, as imperfect as they were to be expected, poured in.

Why did I select siblings only? My sample was understandably very small, and even if I wanted to, I could not give a sweeping generalization of a large population with precise details. Siblings were giving me a good comparative perspective for two individuals, as they already had 50% shared genes, and there was a better chance to notice any extra factor coming from the environment of the moment of the fetus’s development from their conception to birth.

The crucial factor I proposed as a working hypothesis was based on the activity of the sun during various trimesters of the fetus’s development. The sun,

scholars agree, is probably the only physical body in the universe that has a strong influence on each of us.

My logic was quite simple.

(1) The sun supplies our planet with vitally important solar energy that all living material depends on;

(2) The sun's activity changes tremendously throughout the seasons of the year, from very active in summer, to relatively inactive during the winter;

(3) Plants and animals, as a rule, adjust their life cycles to solar activity, and many of them start their lives aiming toward the most life-supportive season of the year (usually a summer). Some avoid winter by migration or hibernation;

(4) The development of a human fetus, to some degree, would depend on insolation (solar energy received from the Sun);

(5) Human babies are born throughout the year and every fetus undergoes development roughly in three trimesters, each lasting about three months;

(6) A fetus develops not entirely proportionally during the nine months of pregnancy: during the first trimester the growth is much faster, and the head is growing more actively than the skeleton or body mass; during the second-trimester body frame (skeleton) seems to be developing more actively, and during the final, third trimester, body mass seems to be accumulated more actively;

(7) So babies that are born in different seasons of the year have the most active sunlight months (summer months) coinciding with different trimesters;

(8) So it would be natural to expect, that (a) those babies whose first trimester coincides with increased insolation during the summer heat, would have bigger heads, (b) those whose second trimester coincides with the summer insolation, would have more robust bones, and (c) those babies whose gestation coincides with the summer heat with their third-trimester development would have a tendency for increased body mass, or weight.

To look at the proposed idea from another perspective, it seems to me that the solar energy received so unevenly during fetal development must have had at least some effect. How important this impact is difficult to measure before specialized studies of a large population are conducted. I predict that January-February-March born babies have more developed heads but a weaker body, October-November-December babies will have stronger bones, and July-August-September babies will have more weight. April-May June born babies

seem more complex, as their prenatal development went without the most active Sun radiation exposure, but the first months of life occur under intense solar radiation – but this is a different story with other factors to consider, not a prenatal development I am talking about.

Another potentially important factor of the study and predictions can be twin studies, particularly of fraternal (non-identical) twins. I predict that non-identical twins would show closer characteristics to each other than usual siblings, because of the similarly aimed insolation “encouragement” received during the fetus’s development in the same trimester.

Still another prediction: I propose that siblings born in the same month (but different years) should be closer in their comparative characteristics to fraternal twins than siblings born in different seasons. I noticed that in my pilot study still in Georgia. I even coined the phrase “seasonal twins” for those siblings born in different years but in the same month.

Another factor and another prediction: as the seasons and the sun’s activity is very different between southern and northern hemispheres, in countries like Australia, New Zealand, parts of South America, and Africa, we should expect a very different outcome from the same date births. Working with the population from southern hemisphere, we should adjust the season by counting six months from the birth date in northern hemisphere. So, if we count, for example, the southern equivalent of sun activity for babies born in February in the northern hemisphere, we should add six months to February, so August-born south hemisphere babies are expected to have the same characteristics (February + 6 months = August).

By the way, it is often neglected that during the southern hemisphere summer (December-January-February) all the countries here receive much more solar radiation than the northern hemisphere countries receive during their summer (June-July-August). The reason is that the sun is the closest to the Earth in December-January. Therefore, the effects of the seasonal insolation differences in the southern hemisphere should be more dramatic (causing, for example, a well-documented increase in skin cancer cases). The proximity to Antarctica and the hole in the ozone layer are usually cited as the reason for this increase, but the proximity of our planet to the Sun by 6 million km in early January, compared to early July, is possibly the primary reason for the existing imbalance (and possibly even the chief reason behind the ozone layer problems).

I remember how impressed two of my students from Melbourne University were after our discussion of the birth date and possible head development with the bigger possibility for peoples inclined to do scientific work and making discoveries. They both were brilliant students from the science faculty. After explaining the basic proposition they brought the fact that they personally would expect to be born in February or March, but they were both born instead in August. "Were you born in Australia or Europe?" I asked, knowing about their European cultural roots. "We were born in Australia" was the reply. So I explained to them that to be born in August in Australia equals being born in February in Europe and the USA, because of the reversed seasons in Northern and Southern Hemispheres.

Of course, what I am writing in this small case, is not very scientific, it is more of anecdotal evidence supporting an unproven theoretical postulate. But this is exactly how many revolutionary ideas start, first as lunacy that is embarrassing even to share with your friends, then comes the first observations when excitement is difficult to conceal, then dealing with the exceptions that take so much energy, and finally, if you ever reach this stage, publication of your ideas to the dismay or praise from other thinkers.

And finally, I must tell my readers, that I cannot point them to my other publication where these issues are discussed at a greater length. I decided to include this small discussion at the end of the book to encourage my readers to be more open about their own crazy ideas as well.

Conclusions

Finally, we are at the end of our long journey, chasing various aspects of the human story behind scientific discovery. You can find below very short “reminders” of the central points of this book, not real *conclusions*. Mind that these are *reminders* only, so if you are reading these “Conclusions” hoping to understand the main ideas of the book, you might find this challenging. But surely, you are still welcome to read these short “reminders” and if any of them provokes your curiosity you can read about them in the main body of the book.

So here are a few reminders:

- Asking questions seem to be the most natural way for every normal human’s intellectual development from infancy, and might suit a new educational strategy;
- A big part of the current educational system is designed to raise obedient citizens, not free and creative thinkers;
- Most schools (with a few exceptions, e.g. Montessori school) shut down children’s natural curiosity and fill their brains with ready-made answers instead;
- Schools for gifted children, instead of giving them more creative freedom usually use the brilliant brains of their students as a larger hard disk and try to fill all the space with more information;
- The Confucian educational system discourages student’s self-confidence by placing teachers on an unreachable pedestal and creating a cult of the past;
- An IQ test does not measure intelligence and cannot predict the greatness of a scholar;
- The most important psychological features of a true scholar are the deep obsessive interest with the sphere of their research and the sincerity;

- Intellect can only serve emotions, so building a true AI is impossible without endowing the machine with emotions, and by default, life;
- There is a tremendous variety of psychological types of scholars, from a curious child to a tyrant, or a martyr, deeply affecting their creativity, striving for new frontiers, or leading to deep-seated conservatism;
- Any official professional body (including scientific fields) is primarily occupied by an ongoing struggle for more resources from governmental and other funding bodies;
- Any paradigmatic change in a scholarly field shakes the very foundations of the ruling generation of eminent scholars, and therefore any big changes are rejected;
- Scholars who are searching for the tenure positions or lucrative grants, gradually realize that pushing their revolutionary ideas cannot get them to their goal;
- Most publications in the coveted peer-reviewed journals are made to fulfill the requirements of the universities, not to advance the field;
- Most ground-breaking ideas have a long history of rejections from peer-reviewed journals, as these journals avoid new research proposing paradigmatic changes like an environmental disaster;
- The most creative psychological atmosphere for a scholar is not to be directly financially dependent on salaries or grants, as intrinsic motivation works best without any external rewards;
- Popular fascination with professionals who put their emotions on top of their professional obligations has a solid basis in human psychology;
- The volatile “revolutionary period” of the replacement the old paradigm with the new one is easier to see in retrospect, as established scholars never admit that the reigning paradigm needs change, and on the other hand, for critical thinkers, every moment seems suitable for paradigmatic change;
- Any idea critical of the reigning paradigm should be considered as potentially progressive;
- Despite the seemingly stable nature of scholarly consensus we should remember that the existing consensus is virtually always cited to support a conservative argument;

- Generalizations are dangerous but necessary for scholarly progress. Be bold, and at the same time, self-critical;
- Predictions are the most important element of any new idea;
- An exception is the only true friend to a revolutionary scholar who is checking his new exciting idea. It is a window of opportunity to discover a better idea;
- Final Truth is the most dangerous concept in scientific research. To believe that you have found the Final Truth is the shortest way to intellectual death, expressed in militant unwillingness to consider alternatives;
- Behind the use of professional jargon is often the absence of substance. Try to express your idea the simplest possible way;
- If you were asked to review the work of an unknown author, do not judge the idea by insufficient references. Try to see the potential kernel behind even a badly written research text;
- Do not fall under the spell of the “Syndrome of today,” considering that civilization reached its scholarly pinnacle. Future is always greater than past;
- If you consider yourself a scholar, be a skeptic, but be skeptical not only towards new unorthodox ideas, but towards widely established ideas;
- Be careful and do not allow your skepticism to become the overriding factor in your thinking; creativity should always be on the top;
- Contrary to popular belief and an almost sacral image, peer review *“is biased, unjust, unaccountable, incomplete, easily fixed, often insulting, usually ignorant, occasionally foolish, and frequently wrong.”*
- Do not be afraid to make mistakes. Even the most creative geniuses made plenty of mistakes in assessing the work of other scholars, and even when assessing their own work;
- A postulate that seems today a perfect example of axiomatic and self-evident truth might be proved wrong. Remember this and use every exception (known to you) to find a better way to explain the facts around us.

The life of a scholarly idea can be very similar to the life of individuals, and it is sometimes difficult to make a correct prediction, as in the case of a young

fellow who was a clear misfit for his respectable family. He was following various popular hobbies, tried and did not complete any of the serious university undergraduate courses where his influential father enrolled him, and was believed to be simply wasting his life until his father (again!) paid for his big overseas trip. The fellow's name was Charles Darwin.

The life of a scientific discovery might have the same fate – in one case the idea might promise great prospects, but then disappear from the annals of scholarly history; Conversely, in some other cases the idea might seem total lunacy, neglected and ridiculed for decades, and then unexpectedly establish itself as a fruitful winner. You will never know for sure which of your ideas is going to survive you, as we should all remember that we are making our biggest mistakes, not when we are hesitating, but when we are absolutely sure.

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The book by Joseph Jordania, award-winning ethnomusicologist and evolutionary musicologist from the University of Melbourne addresses questions usually neglected in works dedicated to the history of science. How is the existing system of education shaping future scholars? How do the politics of grants and funding science affect scholarly development? Why were some of the brightest figures of scientific progress not academically educated? How do universities influence scientific progress? How does the peer-review process advance or depress scientific discovery? Jordania tackles the thorny issues of scholarly integrity, reputation, and corruption. These topics fundamentally affect the everyday lives of thousands of scholars, both professional and non-professional, and have a profound influence

on the advancement of science.

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