

Interview from the Series "Science in an Emergency."

Ana Proykova

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Many say the pandemic will restore faith in science. But what it has shown so far is rather that society needs functional literacy to upgrade the basic reading, writing, and numeracy skills with the skill to find reliable information, to know where to look for it, how to separate the facts from the opinions of the fact presenters, how to find credible media, etc. In fact, functional literacy determines what science society needs. Is it the science of health, of the environment, of elementary particles, or science of space? Does society need more philosophy or history? I'd like to believe that people who are in isolation have found time to assess their literacy, to figure out how much knowledge they have acquired so far, how to expand the boundaries of this knowledge and find the experts who can help them in doing so.

Is the role of the natural, social and human sciences on a par? One can hardly speak of equivalent roles in this world where humanity has developed into having different sectors of knowledge. Instead, the roles must be well balanced, and now, amid the pandemic, we need to seek a balance between all sectors of knowledge and all human activities. My field, natural sciences and mathematics, is focused on constructs that give accurate answers to the questions asked. Now when humanity is aroused by this contagion, which is unknown to some people, the new point is that the questions asked may not be the correct ones for assessing the human condition. The facts around this pandemic are better known to others, but they fail to explain to the rest of us what is new and what we should be worried about. Along this line of thinking, the humanities must become a navigator for questions of global importance, and the social sciences must be the navigator for questions of local importance.

Unfortunately, the World Health Organization (WHO) has failed to live up to its expected role of controlling the instruments that should have been used to explain which are the plausible scientific data, how the situation should be assessed, what individual countries should do and what is the need for joint action, with the latter being navigated by a single centre. The relationship between politics and science has proven very difficult due to the lack of a global supervisor, as the WHO should have been. It has turned out that some politicians and scientists embarked on local interactions, which in some countries were good and in others less so. And in fact, whether pandemics give an unexpected leadership role to science is something essential. In times of health hazards, medicine becomes a leader for a while, but not for very long. Politicians always regain their place at the driving seat.

But are these politicians elite? It would be pertinent to remind here that the term "political elites" was introduced by Pareto, who as a student in Switzerland in 1896 wrote that in Italy the ownership of 80% of the land is in the hands of 20% of the population. In later years, the 80/20 ratio proved to be valid for many economic areas, and economists now call the 80/20 ratio "Pareto's Law", thereby showing that in all human activities 80% of achievements are made by 20 % of agents. Today's political elites often flirt with scientists, but this is a dangerous dalliance that allows scientists to be scapegoated in the event of a failure and upstaged by political elites when the going is good. This is something we see across the world, especially in countries in a pre-election state.

Journalists have a great deal to live up to, both nationally and globally, when it comes to separating real scientific results from pseudoscience. There is no way that society is controlled by social networks without manipulation. In other words, social networks are an environment, which is both easy to manipulate and easily manipulated, and this creates a great deal of hazard for those who cannot sift the truth from the ubiquitous fallacies across social networks.

The role of the scientist is to show the path of discovering and identifying the scientific facts that we would like to communicate with others. Unfortunately, scientists have proven too slow to report their research results to the public at large. But this is what science is about: it proves the credibility of its achievements through multiple checks and a lot of scepticism – and also through cross-communication with those who are competent enough to say whether a discovery will stand the test of time or will cause a stir with a couple of weeks. The good news is that we have good scientists who have been working in strong teams for years. Even though scientific funding was slow to accommodate the urgent needs not only in this country but across the EU, scientists established the proper communication among themselves. It was only thanks to researchers that the institutions were able to coordinate their activities.

One such example is the sharing of resources between Sofia University's Biology Faculty and the BAS Organic Chemistry Institute-cum-Phytochemistry Centre to quickly find out whether activated carbon derived from natural products can be used in disposable face masks. The Bulgarian government and crisis headquarters made an effort to get an understanding of the reliability of scientific data, but the process was difficult for everyone. Not only here, but everywhere, it was hard to lay store by the processed information individual isolated clinics or laboratories were coming up with, as data collection was

frustrated by the lack of communication among countries. Analyzing data of unknown origin and systematic error is undoubtedly doomed to failure.

The field I am in is known as nanotechnology, but we scientists call it the nanoscale science. I have spent twenty years working in international teams that have tried to understand the peculiarities of what is so small compared to the scales we are used to in our day-to-day living. The members of these teams have had various qualifications in physics, chemistry, electronics, medicine, etc. Recently, a number of philosophers and other experts have been busy assessing the ethics of the whole system of nanomedicine with its use of nanomaterials for treatment.

In my group we are physicists using the methods of theoretical physics and computer technology, so we need the proper hardware and software to get our work done. Thanks to the fact that Sofia University supports our team and also invested in the maintenance of the Sofia Tech Park computer functioning in the high performance computing lab, we were able to join an international team of at least a thousand groups like ours. What we do is to analyze the results of experiments using models that require considerable computing resources and a methodology called artificial intelligence.

The project is called Folding COVID-19, and we are delighted that since March 27 this year we were able to get involved. This allows our country to use the results of these studies and have access to reliable data, which is crucial for researchers in medicine and pharmacy.

E-learning and communications are a valuable asset, and it is now boosted by the fact that that much of the country is currently working and schooling online. Online education methods and practice overcome geographical distances. As long as a nation has well-developed Internet connections, instructors and students can communicate freely, and the public at large can also be involved in this communication process. The problem I see in the current situation is that the general public has less opportunity to participate in the discussion and in the acquisition of new knowledge than if events were held under a single roof. Another big obstacle in online education is the inability of students to use laboratories where they can learn new skills related to the use of complex, heavy equipment and new technologies, which are difficult to master while sitting at home and watching video material. My personal experience shows that online discussions, lessons and seminars work well in groups of 10-15

people, where everyone can participate equally within an hour, and everyone can express their opinion, ask questions and get some clarity.

That is why I believe it is valuable to hear from people working in other disciplines, e.g. the humanities, where the style of speaking can be just as important as the content of what you say. It is so different from our work where we can explain the essence of the subject we teach by putting formulas on the board. In summary, we can say that online education was an excellent way out of a situation like the pandemic.