

## Science and Freedom

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We are living worrying times, and as members of the scientific community, and more widely of the academic community, this should be of great concern to us. It is indeed of paramount importance to think of the basic values that, over history, let the fantastic endeavour Science has been to happen. Freedom is one of them, and there is a long history of struggle by scientists for freedom. We must always remind ourselves of this when we think about what should be our attitude and role in present times.

I would like to address this issue by taking a somewhat historical point of view. Indeed the relationship between intellectuals (in Ancient Times ‘intellectuals’ were called ‘philosophers’, today one would tend to say ‘scientists’, and this is the terminology I will use here) and rulers has drawn attention in many different historical contexts. One can find thoughtful contributions on this matter from many different authors in the course of History. PLATO discusses it explicitly in Book V of the Republic, a reference in human thinking written some 2500 years ago.

Here is what PLATO wrote in a dialogue between SOCRATES and GLAUCON: *"Unless, said I, either philosophers become kings in our states or those whom we now call our kings and rulers take to the pursuit of philosophy seriously and adequately, and there is a conjunction of these two things, political power and philosophical intelligence, while the motley horde of the natures who at present pursue either apart from the other are compulsorily excluded, there can be no cessation of troubles, dear GLAUCON, for our states, nor, I fancy, for the human race either."* I am sure you feel the resonance of these sentences with what we are living through today.

In the same dialog, SOCRATES defines "philosophers" (as I said earlier, I should now say "scientists") as *"those for whom the truth is the spectacle of which they are enamoured"*. What should we do in a time where "fake-news" have become a considerable threat to our activities and more broadly to democracy.

Let me move further in time.

What is often called the Scientific Revolution - spanning roughly the time from the publication of Copernicus's *De revolutionibus orbium coelestium* in 1543 to the publication of Newton's *Principia* in 1687 – was of course a time of great advancement in our understanding of natural phenomena. But these advances

did far more than help us to understand, for example, the movement of planets. They revolutionised nothing less than the vision of the place of Humanity in the Universe. By doing that it ushered in an unprecedented change in every sphere of life from the religious to the economic, from the personal to the political sphere. This could only be achieved thanks to the setting up of a universal foundation on which to make progress – the scientific method.

As you all know, the conception proposed in 1543 by Nicolaus COPERNICUS, a Polish catholic cleric, in his *De Revolutionibus* was radically different: it put the Sun at the centre of the planetary system, and no longer the Earth. Soon after publication, the Dominicans were already considering banning Copernicus' work. John CALVIN in Geneva preached a sermon denouncing those who "*pervert the course of Nature*" by saying that "*the Sun does not move and that it is the Earth that revolves and that it turns*".

In the second part of the 16<sup>th</sup> century, the Danish astronomer, Tycho BRAHE, although he opposed Copernicus' views, insisted on the need to rely more on observations, and, for that purpose, developed more accurate instruments. His findings were fundamental to the major breakthrough made by Johannes KEPLER.

KEPLER, working in Prague with him, could in 1609 and 1619 [propose](#) precise laws stating that planets are moving along ellipses, and not circles, of which the Sun occupies a focus. This gave a solid basis for claiming victory for the heliocentric system.

Another considerable step was taken by Galileo GALILEI who developed instruments, such as the telescope, and laid the foundations for a general theory of Physics. He believed in the critical role of mathematical concepts to describe the Universe as he explained in his famous essay *Il Saggiatore* published in 1623.

Another decisive step was taken by Isaac NEWTON in 1687 with the publication of his *Philosophiae Naturalis Principia Mathematica*. In a single book, on the model of Euclide's Elements, he made three breakthroughs: developing the Differential Calculus; using it, he could formulate the Fundamental Law of Mechanics, his second major achievement; and the third achievement was his Law of Gravitation. This allowed him to propose a coherent and comprehensive theory establishing Kepler's laws on first principles.

All this happened within a period of 150 years with contributions from many diverse European backgrounds, at a time where Europe was a troubled territory and during which scientists did not necessarily have an easy life. They often had to struggle to find patrons, and some of them had to fight prosecution.

The power that religious authorities exert in some societies, sometimes in their own environment, sometimes in direct association with the political power (and

the issue is still with us today), can make them challenge the freedom of thought, that lies at the heart of the scientific endeavour. Developing new knowledge can challenge beliefs viewed as central to the strength of a religion by the clergy.

There are some notorious examples of such conflicting cases in History: in 1600 Giordano BRUNO was burned for his claims by the Inquisition, the Church's judiciary branch. Galileo GALILEI was also prosecuted by the Inquisition, because he propagated Copernicus' discovery. This claim was considered *"foolish and absurd in philosophy, and formally heretical since it explicitly contradicts in many places the sense of Holy Scripture."* He had to renounce his view publicly but still had to live under house arrest.

It would be a mistake to believe that these obvious forms of limitation of freedom are the only ones to be considered here. Some other forms are more implicit, if not insidious, and in recent years there have been a number of situations where such forms were the heart of the matter. Some actors prefer to act in the shadow, and it can take a lot of efforts to uncover the manoeuvres by which some actions are performed.

Industry is definitely a powerful sector whose activity can be affected by some scientific findings. It can activate several different modes of action: from supporting people to challenging the findings they consider offensive to their business (this has been witnessed in a number of cases, e.g. in the context of the damage to human health provoked by smoking or in campaigns to challenge climate change) to more direct attacks on people who produced the knowledge, often through complacent media.

And this brings me to another dimension of my theme today, namely the pillar of freedom represented by the press. Today of course one has to broaden the perspective as one has to take into account the impact of social media. They involve a wide range of people with many different backgrounds, who express themselves quickly, often giving rise to frenetic exchanges that are sometimes difficult to get control over. I am exposed to that almost daily! Still one should be reminded that this is not completely new as, in the past, there have been situations where scientists used public declarations to call for attention, and sometimes not in the best possible way.

A dramatic example of the misuse by scientists of their obligation to speak the truth took place in October 1914, a critical year in History if any.

On 4 October 1914, 93 prominent German scientists, scholars and artists, including the physicist Max PLANCK and the mathematician Felix KLEIN, issued a proclamation now known as the *"Manifesto of the Ninety-Three"*. It was originally titled "Manifesto to the civilised world". It was a protest against what the authors felt were lies being spread about Germany's role in starting the war (now called as the First World War), its reasons for "trespassing" neutral Belgium and the denounced brutality of the actions of its troops there.

Its purpose was to increase support for the war throughout German schools and universities and to win a moral and morale war. Their intervention was clearly meant to be a manifestation of people who are trustworthy in their relation to the truth.

Here are two excerpts: *“The iron mouth of events has proved the untruth of the fictitious German defeats; consequently misrepresentation and calumny are all the more eagerly at work. As heralds of truth we raise our voices against these.”* And *“We cannot wrest the poisonous weapon—the lie—out of the hands of our enemies. All we can do is to proclaim to the whole world that our enemies are giving false witness against us. You, who know us, who with us have protected the most holy possessions of man, we call to you. Have faith in us! Believe, that we shall carry on this war to the end as a civilized nation, to whom the legacy of a Goethe, a Beethoven, and a Kant is just as sacred as its own hearths and homes.”*

Even more interesting is a fact that is little known, namely that one of the signatories, Wilhelm FÖRSTER, soon grew to regret having signed the document. And he, along with the physicist Georg Friedrich NICOLAI, drew up an alternative *Manifesto to the Europeans*. Only Otto BÜK and Albert EINSTEIN agreed to sign it, and it remained unpublished at the time. It was subsequently brought to light by EINSTEIN. I would like to read some of this second manifesto to you now. Because it is an amazingly humane and prescient document.

*“We wish merely to emphasize as a matter of principle that we are firmly convinced that the time has come when Europe must act as one in order to protect her soil, her inhabitants, and her culture. We believe that the will to do this is latently present in many...”*

*To this end, it seems for the time being necessary that all those who hold European civilization dear, in other words, those who in Goethe’s prescient words can be called “good Europeans” join together. After all, we must not give up the hope that their collective voice—even in the din of arms—will not trail off entirely unheard, especially, if among these “good Europeans of tomorrow,” we find all those who enjoy esteem and authority among their educated peers.*

*First, it is necessary, however, that Europeans get together, and if—as we hope—enough Europeans in Europe can be found, that is to say, people for whom Europe is not merely a geographical concept but rather a worthy object of affection, then we shall try to call together a union of Europeans. Such a union shall then speak and decide.”*

Can you imagine that this was written in a moment when the First World War was gaining momentum? And not in some neutral country but in Berlin, i.e. in the heart of Germany, one of the key combatants? And isn’t it wonderful that we have lived to see their dream of a European Union has come true?

There are other instances where scientists interfered negatively with the political power: think of the period of domination of Soviet Biology by Trofim LISSENKO. An agricultural expert, he started doing experiments on plants, and came to challenge the Mendelian theory of cross-fertilisation. His results were disputed, but what gained him respect and power was the support he got from Joseph STALIN, which he reinforced by denouncing the previous theories as “*bourgeois*” and claiming his being “*proletarian*”.

Although, after the Second World War, he was increasingly challenged by scientists even in the Soviet Union, he managed to retain power until the early 1960s. This is an instance where a scientist used his relation to the political power to gain control over the development of a scientific community. Of course this happened in a peculiar political organisation of society, which made this possible.

Actually, one more possible limitation to freedom it would not be appropriate to forget about is the power of the hierarchical structure. Scientists themselves are inserted in a system that makes decisions about people. Of course one should mention the peer review system that decides which articles are published and more precisely when an article is ready to be published after possible revisions. A typical situation where the hierarchy exerts its power is at the time of a promotion or of a nomination.

I have shown the remarkable capacity of some scientists to stand above the political fray and the constant flow of events. At the time of the Enlightenment a set of conditions arose that allowed a transnational community of brilliant thinkers known as the “Republic of Letters” to freely circulate and distribute ideas and writings. And this Republic has shown that it can survive even the harshest climates. We should never forget this at a time where some governments want to strictly orient the work done in the laboratories of their countries, or restrain the freedom of speech and movement of scientists, and more broadly of citizens.

We need to consider the fight for scientific freedom by scientists as a central issue. The interactions between basic research, technological progress and the economy are varied and complicated. It is accepted however that technological progress requires a combination of basic or curiosity-driven research and applied research. Policy-makers have to acknowledge that.

To understand why, we can go back to the foundation of the scientific method in Bacon's *Novum Organum* published in 1620. He argued that “*Nature can only be commanded by obeying her.*” In other words Humanity can govern or direct the work of Nature to produce definite results but this requires understanding how Nature works. In this way, he believed, “*Humanity would be raised above conditions of helplessness, poverty and misery, while coming into a condition of peace, prosperity and security.*” And, compared to his own age, he has been

proven spectacularly right! Let us hope this does not get forgotten by too many people, in particular in political circles, as the present state of the world shows significant departures from the “*condition of peace, prosperity and security*” he referred to.

Let me come back to the way we, scientists, deal with freedom for our own sake. I am convinced that a healthy science system needs diversity. Some of the research with the biggest impact lies outside disciplinary boundaries. We cannot ask for scientific freedom from funders and then be too conservative in our own decisions. The quality of the selection mechanisms in the system is therefore one of the most decisive factors. Reviewers and promotion boards need a wide understanding of scientific developments and of what favours them. They have to be broad-minded and not to adhere to rigid schools of thought. This is the price to pay to have freedom thrive in our community.

Let me come to my conclusion. First, as you understood from what I said, I feel that our community has a great responsibility to stand up for Freedom, as it is a key element for the development of Science, as proved over centuries. Second, we should be careful not to view only threats from outside: we must also worry about our internal limitations of freedom, as our community has its internal power struggles. Third, we must not be naïve and get our act jointly with other sectors of society any time we witness attacks on Freedom, such as personal prosecutions on people exerting their opinions, or the closing of academic institutions. We must be on high alert as times are worrying, as I said right at the start of this speech. No complacency is possible!

I thank you for your attention.