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Physics and Philosophy in Dialogue

/ Troy Vine

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Something is being criticized here: it is not science but some pervasive stories we tend to be told about science. [...] I doubt very much whether science needs to be defended through perpetuating fables and myths cobbled together to pour value over it. To do so would truly be the final denial of the of the cultural legacy of the Scientific Revolution.

- Steven Shapin

With these words, the historian of science Steven Shapin brings to an end his classic book *The Scientific Revolution*. He is responding to the assumption that a critical historical or philosophical investigation of a particular episode in the history of science constitutes a criticism of science in general. I believe that this assumption has also contributed to Goethean science and holistic science being seen by friends and foes alike as an alternative science, or, in the more extreme version, an alternative to science. In discussion, Philip Franses and I kept returning to the question of how such misunderstandings arise, and it is therefore a reflection of our own dialogue that the articles in this special issue address this question, either directly or indirectly.

In my area of research, the reception of Goethe's scientific investigation of colour provides a striking example of just how ingrained this habit of thought is. As Johannes Grebe-Ellis and Oliver Passon show in their article, the myth of Goethe offering an alternative (to) science arises by ignoring not only the contemporary scientific context of Goethe's



scientific work, but even the work itself; for it turns out that many of the influential commentaries on Goethe's *Farbenlehre* were by physicists who had not even read it, much less done the experiments Goethe describes.

This research also brings to the fore the more general problem that science is an evolving thing. Giving a satisfactory account of the evolutionary aspect of science has important implications for understanding Goethean and holistic science. The reason for this evolution is not just the discovery of new facts, but also the creation of new concepts to express the facts. The activity of scientists thus consists in scrutinizing not only the experimental evidence for a new theory, but also the concepts the new theory uses. Louis Kaufman's article on quantum mechanics is an excellent example of this conceptual activity; he does not question the empirical results of Young's famous double slit experiment, but rather the language that should be used to describe them. By doing so, he demonstrates the insights that can be gained by using the language developed by Henri Bortoft to describe phenomena holistically.

While it might seem strange to worry too much about language, debates on language are common in the history of science. Particularly during the seventeenth century, scientific debates were just as much about language as about experimental results. But as the acceptance of Newtonian mechanics grew, it was believed that a solid foundation had finally been found on which the exact sciences could be erected. The need for constant conceptual scrutiny of the foundations of science was thus no longer seen as important, and the first instance of what Thomas Kuhn calls a "scientific paradigm" was born. It was not long before natural philosophy split into science, on the one hand, and philosophy, on the other. Scientists no longer needed to worry about what counted as explanation, what counted as evidence, what counted as refutation, etc. Yet, the scientific idyll was relatively short-lived, and cracks began to appear in the Newtonian foundations which ultimately led to a scientific revolution and the establishment of a new paradigm: general relativity.

It is during such periods of paradigm change that science reengages with its philosophical heritage as the discussion invariably turns to philosophical issues. As Johannes Kühl and Matthias Rang show in their contribution, it is here that we need to locate Goethe's scientific achievement—as a scientist trying to bring about a new paradigm in colour science. Goethe did not want to do away with science, or to inaugurate an alternative science, but to take science further; keep it evolving. He saw clearly that fixed positions and dogmatic claims can only hinder science. Goethe provides a philosophical criticism of those fixed positions and dogmatic claims. However, this criticism was mistaken for an attack on science. The myths about Goethean science are a testament to the extent to which science and philosophy have become estranged. It is only by science and philosophy coming into dialogue that a fuller picture can emerge of Goethean science and holistic science, on the one hand, and science in general, on the other.

This special edition began as a dialogue between Philip and myself, and I am very happy that it has developed into the dialogue between physics and philosophy presented in this issue.

Left: Johann Wolfgang von Goethe on 26 March 1832, four days after his death at the age of 82. Drawn true to life. By Friedrich Preller the Elder.