Letter to the Editor

Response to Tom Vogt

by Eric Scerri

I am very grateful to Thomas Vogt for taking the trouble to review my book and for raising several interesting points, which certainly deserve further explanation (Vogt 2017). I am also grateful to Joachim Schummer for allowing me the opportunity to respond to the review.

Vogt thinks that he has caught me out on a couple of occasions, when I appear to contradict one of the main claims of my book, namely that scientific revolutions do not actually occur contrary to the views of Thomas Kuhn. Vogt mentions that I describe Janet's periodic table as being revolutionary as though I have claimed that nobody should ever use the word 'revolution' when talking about any aspect of science. However, I intended my objection to the notion of revolutions to apply to theories, or paradigms, as a follower of Kuhn might say. When I call Janet's table 'revolutionary' this should be taken as a *façon de parler,* just as when I claim that Main Smith won his fight against the physicists of the time.

Vogt criticizes me for suggesting that it may not matter whether a particular scientist is right or wrong and even suggests that it might be playing into the hands of the deniers of evolution and global warming. The reviewer goes as far as to say that I am advocating an 'anything goes' philosophy, which is certainly not my intention. By denying that a particular scientist is right or wrong I am not denying that science as a whole might have arrived at the best possible description of the world at any particular epoch. On this point I side completely with Popper and certainly not with Feyerabend's 'anything goes' approach.

Whether a scientifically uninformed reader might draw the conclusion that I am really advocating 'anything goes' is a risk I am prepared to take, but since Vogt came away with the wrong impression let me be clearer. Here is a biological analogy to try to express what I mean and one that I mentioned in the book. Let us assume that a certain species of creature develops a new limb over the course of millions of years. My point is that one would not regard such a development as being either right or wrong. What one might say is

HYLE – International Journal for Philosophy of Chemistry, Vol. 24 (2018), 101-104.

that if the limb confers an evolutionary advantage to the species then its members will continue to reproduce and flourish.

Similarly, I propose that new theories, or even small steps within a theory, have essentially the same character. A new idea may be conceived for any number of reasons ranging from pure trial and error, serendipity, or from carefully thought out deductions. The new idea, theory, and so on will then be subjected to experimental tests and will either stand or fall. As I see it the role of the environment in the case of biological growth is now played by the realm of experimentation. This is far from a case of 'anything goes' but more like scientific business as usual. What 'goes' is only whatever passes the usual tests that scientists conduct on theories, models, or even hunches.

The other major disagreement that the reviewer expresses is over the question of scientific revolutions. Whereas I claim that they do not occur in a Kuhnian sense, Vogt seems to fully support the standard Kuhnian line. For example, Vogt seems to believe that the change in the definition of an element that occurred as a result of the work of Van den Broek and the isotope crisis was 'radical' and that it constituted a scientific revolution. He then says,

> The resolution of this 'isotope crisis' during the first 25 years of the 20th century had all the scientific, historical, and political complexities of a scientific revolution and is described in detail by Kragh (2000) […] After this scientific revolution chemists never saw Nature at the microphysical level as before. When asked if we can ever understand quantum mechanics, Niels Bohr suggested yes but this understanding would also change what we call understanding – this is a good definition for a scientific revolution. [Vogt 2017, p. 108]

It is rather unfortunate that Vogt should have chosen this particular source since even a casual reading of Kragh's excellent article shows that its author does not consider the change in the understanding of what constitutes an element to have been a revolution in the Kuhnian sense.

> Great theoretical changes occurred during the period, but these did not lead to a wholesale refutation of older chemical concepts such as the periodic table and the notion of an element. The periodic system survived the revolution and although the chemical element was reconceptualised it occurred in such a way that continuity with the older definition was secured. [Kragh 2000]

Admittedly Kragh uses the word 'revolution' which is presumably why Vogt chose to cite him. However, notice how muted and very un-Kuhnian this change is also described as being. There was no "wholesale refutation of the older chemical concepts", and the reconceptualization occurred in a way that secured "continuity with the older definition" (*ibid*.). Whatever kind of revolution Kragh is referring to it certainly does not seem to resemble a revolution as envisaged by Kuhn. A few lines later Kragh writes,

> Neither quantum mechanics nor the proton-neutron model of the nucleus necessitated further changes. The element and the periodic system are thus examples of conceptually robust chemical entities. Their histories indicate the force of the pragmatic chemical viewpoint and the value of retaining older theoretical notions, at least in a correspondence-like manner and up to a point. The reinterpretation of the element that occurred in the period kept the connection with the older concept through the principle of conservation of the elements in all chemical transformations. [*Ibid*.]

Contrary to Vogt's view of a Kuhnian style revolution in the concept of an element, Kragh seems to be going out of his way to emphasize 'conceptual robustness', 'the value of retaining older theoretical notions', and keeping a connection with the older concept of an element. Kragh also draws support from the work of Mary Jo Nye and agrees with her saying that "chemistry and physics were beginning to share disciplinary terrain" (*ibid*.). This too hardly sounds like a case of Kuhnian incommensurability across a scientific revolution. The very final sentence of Kragh's article emphasizes this point even further,

> To Aston and many of his colleagues, there were no fundamental disagreements between physics and chemistry, only different ways of conceptualisation and presentation. [*Ibid*.]

So much for the occurrence of Kuhnian gestalt switches or anything of the kind. Nor will the cryptic quotation from Bohr that the reviewer has provided serve as a definition, no less, of scientific revolutions. In addition, this quotation is somewhat irrelevant to the redefinition of the concept of an element as Kragh himself has explained in the article that Vogt cites, since quantum mechanics played no role in this reconceptualization.

Finally, Vogt does not seem to be aware that even Kuhn himself abandoned his early views on what constituted a scientific revolution and increasingly advocated an evolutionary epistemology, as Brad Wray (2011) and several other Kuhn scholars have documented in detail.

References

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