Endre Kiss (Hungary):

TACIT KNOWLEDGE AS A CONCEPTION OF TRUTH

(On an Aspect of Michael Polanyi's Theory of Knowledge)

Tacit knowledge was the focus of interest of Polanyi in the second period of his sociology of knowledge. He explained the concept, the mechanism, and the functions of tacit knowledge on the level of description in several studies and with complete persistence. Therefore in this essay I will assume that the most significant qualities of tacit knowledge are already well-known.

I consider 'tacit knowledge' as a coherent concept as long as Polanyi attributes to it also the formation of the meaning of certain perceptions and objects. Polanyi enumerates six examples of this, 1/ none of which seems to be convincing. A test person conditioned by appropriate electroshocks will identify the electroshock with the 'meaning' of the searched syllables, but if the syllables in question otherwise have a meaning, the test person will not obtain this through his shocks. The 'meaning' of the correct bodily movements that execute the task of cycling is, naturally, not to fall of the bicycle, but this meaning can also be interpreted in the context of the cyclist's vital interests. The semantic function of tacit knowledge 2/ is unsuitable for substantiating a semantics of universal validity, though it is indisputable that tacit knowledge can shape meanings in the history, or genealogy, of the subject himself. I will return to this later. Tacit knowledge can be only GENEALOGICALLY suitable for constituting the meaning of individual objects, but Polanyi uses this concept for the process of actual knowing.

Polanyi, however, does not confine himself to attributing all the work of shaping a 'meaning' to the activity of tacit knowledge; he goes farther, in two steps.

The first step is this: while expanding the concept of tacit knowledge, he treats the meaning arising as a conception of truth and even as the ultimate criterion of scientific truth. This conception of truth - and this is the second expanding step in interpreting tacit knowledge as constituting a meaning - is placed in the concept of metaphysical and antimetaphysical analyses of science. Finally, in explaining these two (in my opinion unsuccessful)

1/ See Michael Polanyi, 'The Logic of Tacit Inference', in: **Knowing and Being. Essays by Michael Polanyi.** *Edited byMarjorie Grene. Chicago, 1969, p. 145.*

2/ Ibid. A relevant explicit definition: 'I shall show that to form such a structure (the structure of tacit knowledge - E.K.) is to create meaning.' (Michael Polanyi, 'Sense-Giving and Sense-Reading', in: **Intellect and Hope.** *Durham, 1968, p. 402.*

The Maxwell-Hertz theory (1890). In the empty ether only two fields are independent and thus the wave equation emerges.

Lorentz's theory (1892) used both Maxwell's and Weber's ideas. It is based on the two fundamental assumptions:

- matter is built up of small charged particles, which Lorentz called electrons

- in the empty space (ether) only two fields are needed to describe electromagnetic phenomena.

The macroscopic values for the two other fields result from the electron structure of matter and can be calculated by statistical averaging. In this way macroscopic Maxwell equations can be restored. There is no need to consider any ether movement. The dragging coefficient (Fresnel formula) can be derived.

Let us now concentrate on the analysis made by Lorentz.

Lorentz established the theory which he himself recognized to be more fundamental than Maxwell's. Considering this fact one can arrive at the conclusion that his evaluation of Maxwell's theory was both positive and negative.

It is certain that empirical aspects of science were important to Lorentz. In fact, he started his work on his theory after spending some time trying to explain the optics of moving bodies by considering the properties of ether. For him this was the weakest point of Maxwell's theory. This, however, was neither the only nor the most important argument. In fact, all experiments, including Michelson's earlier experiment of 1881, Lorentz considered inconclusive.

Lorentz must have known about the matter structure of electric currents. This was what Maxwell's theory lacked. Weber's and other theories, however, lacked simplicity and elegance in explaining the phenomenon of induced currents. Moreover, there was no experimental evidence to distinguish between them. That is why Lorentz considered the situation in electromagnetism unsatisfactory. Maxwell's equations were unable to describe the matter constituents. On the other hand, the existing electron theories did not give satisfactory explanations for the field effects, such as induced currents and electromagnetic waves. Each of them was able to answer a particular question but not to explain all the phenomena. Even worse was that, together, they did not constitute a coherent picture.

The most promising seemed to be Maxwell's theory together with the assumptions on the structure of matter. Lorentz, however, considered those assumptions artificial and coming from outside of the theory, which for him were the Maxwell field equations.

The largest influence on Lorentz was the memoire of Hertz, who first mentioned that in the empty ether there is no need to use four fields since only two of them are independent. That is what Lorentz mentions in his paper of 1892:

"It is right to mention that it is only after having read (Hertz's 1890) memoire that I have undertaken the study of bodies in motion. Thus I have the advantage of knowing in advance the necessary results."

The last sentence is very symptomatic. What did Lorentz know in advance?

The answer to this seems to be: it was the shape of the theory underlying both Maxwell's theory and electron theories. This seems clear when one looks at the way Lorentz builds his own theory. He starts from the assumption that in the empty space (ether) there exist only two fields, one electric and one magnetic. Then he introduces pointlike particles that fulfill certain assumptions corresponding to conduction (free) electrons, electric dipoles, and magnetic dipoles built up from moving electrons.

The next step is technical. Imposing conditions needed for the applicability of statistical method Lorentz shows that his model can reproduce the Maxwell equations and gives the formulae for dielectric and magnetic constants.

At this moment the task is fulfilled. Maxwell's theory has been reduced to the more fundamental: electron theory. Evidently Lorentz and his contemporaries considered the Lorentz-Maxwell theory to be the fundamental theory to which Maxwell's theory had been reduced. Even after establishing the Lorentz transformation as the fundamental symmetry transformation in physics, Lorentz did not see any need for recalculating his results in view of this symmetry. No longer did he care about the higher order terms, like electric and magnetic quadrupole momenta, which in general can appear in the expansion. The complete proof of reduction was performed more than seventy years after Lorentz's discovery No3.

Let us now summarize:

The evaluation of theories must have been performed by Lorentz in certain steps. First he carefully examined existing theories. He was a good physicist, so he needed to refer to experimental evidence; but, as has been already mentioned, he found it not conclusive enough to choose which of the theories was the most promising for further development. So he had to use nonempirical criteria. Considering the physical content, there were only two concepts for treating electromagnetism - Maxwell's field theory and Weber's electron theory. Both fulfilled the criterion of coherent treatment of physical reality. Both were based on the fundamental assumption about its structure.

Maxwell's theory, however, did not say anything about thestructure of matter, which was known to consist of particles. So it had to be changed.

The crucial point here was to state that Maxwell's theory means the Maxwell equations, and other assumptions connected with the structure of matter are artificially introduced. I personally think that at this stage Lorentz already had the concept of how the proper theory of electromagnetism should look. It should possess the advantages of both field and electron theory. However, it was not until he had read Hertz's memoire that Lorentz realized that within Maxwell's theory there is a place for introducing structural assumptions instead of using two of the four fields.

IV. CONCLUSIONS

1. The role of tacit knowledge in the evaluation of theories.

Personal or tacit knowledge not only helps us to evaluate exisiting theories but also the "pre-planned" theories; theories which although not verbalized nor formalized (in the sense of mathematical formulation) are in some way present in a scientist's mind as "desired" theories. Starting from such a concept, it is a matter of scientific "craft" to put the "desired" theory into mathematical form ready for empirical testing. Of course this is a very simplified picture. Crafty transformation of what is "desired" into factual form may cause many technical problems that are often solved in the newly discovered way. Another question that arises is the applicability of some technical tricks to the physical problem. The latter, however, can be considered as part of the "particular science standard", which forms not a personal unverbalizable knowledge but rather a kind of "tribe" wisdom recognized as applicable on a tacit basis gained by experience in scientific work. A very adequate example would be the conviction of applicability of power series expansion in physics. No physicist, pr almost none, bothers to check whether the Taylor or other series expansion is convergent or not. The justification for such negligence is that if the theory is all right, the series representing the measurable quantity must be convergent for empirical reasons.

2. The importance of tfie evaluation of theories in the problem of discovery.

The evaluation of theory can be seen as a crucial point in the problem of discovery since:

a) the evaluation of existing theories is the necessary background for seeking a new one, and

b) the evaluation of a new theory is even more important if there is not yet any experimental evidence.

The evaluation of theories practiced by scientists is not described completely in the framework of analytical philosophy. Analysis of the practice of great scientists shows that they use criteria that are not experimental but rather based on either

a) metaphysical images of the world

or

b) personal or "tribe" experience in doing science.

Such knowledge often cannot be verbalized and even if it can, for example, in terms like:

simplicity

uniformity

coherence

and others, it rarely fulfills analytical standards. Therefore it can be recognized as a kind of "tacit" or "personal" knowledge (according toPolanyi).

"Experimental" evidence for the applicability of such knowledge comes from the successful scientific practice of great scientists.

A summarizing conclusion could therefore be the following:

Scientific discovery is not merely the effect of chance accompanied by the scientific knowledge of the discoverer. It is a complex process in science, during which permanent evaluation of existing theories plays a very important and inspiring role. First, it serves to produce an image of the present state of science, by classifying existing theories according to certain criteria that are not necessarily empirical. Second, it permits the picking out of those features carried by present theories that would be desirable in the future theory. Finally, it helps the discoverer to compare the newly created theory to the previous ones and evaluate the progress achieved. In this final step such an evaluation definitely cannot be purely empirical, since there is no evidence for the new effects predicted by the new theory.

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