A comment on Licht und Stoff by Mario Howald-Haller[1]

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Optical polarisation is usually regarded as that area of classical optics in which the transverse structure of the field of light waves can be experimentally demonstrated in a particularly convincing way. This demonstration, although described as experimental, is, strictly speaking, produced mediately and not based on direct observation. This is indeed historically comprehensible, but in the 20th century it is increasingly seen as a fundamental deficiency in physical optics. Thus the assertion that light itself is invisible, yet bestows visibility in its characteristically different ways, has, over the entire field of optics, led to the quest for observation-based formulations of optics as phenomenology.

In his article *Licht und Stoff*, Mario Howald-Haller has drawn attention to the surprisingly simple and immediately perception-related way into the field of optical polarisation offered by the phenomenon of Haidinger's brush. In the context of optics this is the hitherto little known contrast phenomenon, in which the human eye, exposed to linear polarised light, answers with a kind of after-image. For the duration of a few seconds a very delicate, complementary coloured and cruciformly symmetrical pattern is visible whose orientation clearly indicates the direction of polarisation of the incident light. Consequently, through the identification of this phenomenon, called 'Haidinger's brush' after its discoverer, polarisation can be *seen* directly: in the double images of calcite (birefringence), in the mirroring of the surface of still water (Brewster angle) and in the blue of the sky (Rayleigh scattering).

But Howald-Haller's aim goes further than this. In that he presents the conditions under which the aforementioned Haidinger's brush can become a constant companion through observation that is intensified and refined by practice, he makes a characteristic change in the relationship of the knower to the object of knowledge. This leads beyond the usual separation of them that is typical of the objective cognition of physics, yet at the same time does not dispense with the necessary scientific rigour.

2 In the study *Doppelspat und Polarisation* that appeared in the opening volume of this journal (Elemente der Naturwissenschaft 1: 12-24, 1964) Howald-Haller developed a detailed phenomenology of image doubling and polarisation with Iceland spar, and presented his discovery of the so-called 'Lichtspurenvierseits'. This work was resumed and extended by the present author in *Grundzüge einer Phänomenologie der Polarisation*, Berlin: Logos-Verlag, 2005.

The stages of participatory cognition described by Howald-Haller, with the help of the example of optical polarisation, demands of the knower not only exact observation, but also a simultaneous intensification and differentiation of his/her cognitive involvement. The more that the living, self-supporting essence of thinking is consciously experienced as sovereign, the more open is the perspective on an understanding of nature that is not exhausted in the reductionist subjugation routines of objective cognition, but instead is able to grasp the phenomena in a living picture. The evidence and scope of this is understandable and reliable to the extent that it gives sight of a context of the knower, and his/her object of knowledge, that is lost to objective cognition. In this way, the intensely rich, colourful interplay of light and matter in the field of optical polarisation becomes for Howald-Haller a picture of the forces that join together in the configuration of the human soul.