

to the movement is more intense than in the direction of the moving atoms. This phenomenon is one of the facts on which I have based the conclusion that the atoms of the chemical elements have an axial structure and that the emission of light from a single atom is of vortical structure (*Lichtwirbel*) (cf. my monograph "Atomstruktur und Atombindung", Polytechnische Buchhandlung A. Seydel, Berlin, 1928).

Guided by this idea of axiality of atomic structure and emission of light, I have recently discovered an asymmetry in the radiation emitted by atoms in an electric field. Certain lines of the radiation emitted along the axis of a superimposed electric field have different intensities in the two directions of this axis or, more generally, different intensities for the two sides of the plane perpendicular to this axis.

The most important of my observations were made on the hydrogen lines $H\alpha$, $H\beta$, $H\gamma$, and $H\delta$ for the case of the emission along the axis of the superimposed electrical field, and show the following general phenomena.

There are emitted along the axis of the electric field those components of the hydrogen lines which appear electrically normally vibrating to the axis of the field when the axis of vision is normal to the axis of the field. This holds for the components displaced towards the red ('red') and also for the components displaced towards the violet ('violet'); however, the violet components are emitted more intensely in the direction of the field than in the opposite direction, while, on the contrary, the red components are emitted more intensely in the direction opposite to the field than in the direction of the field. This phenomenon explains an observation made independently by Mr. Wierl, that for the line $H\gamma$ in the case in which the axis of vision is opposite to the direction of the field, the violet components appear more intense than the red components.

This asymmetry of radiation of the hydrogen atom in the electric field is incompatible with the Bohr-Epstein-Kramers theory and with the Heisenberg-Schrödinger theory of the intensity of radiation of the hydrogen atom in the electric field, as also with the Sommerfeld theorem, founded on this theory, on the symmetry of the hydrogen atom; for these theories require that the intensity of the radiation should be symmetrical to the plane normal to the axis of the electric field. J. STARK.

Grosshesselohe-München, June 28.

The 'Absolute' and 'Relative'.

It might serve a useful scientific purpose to point out some remarkable anomalies that have resulted from attempts to deduce philosophical conclusions from the findings of pure scientific research. Modern science has as yet no philosophy of its own, but the significance of its great achievements *experimentally* cannot be interpreted legitimately by means of the *speculative* philosophy of the school-men. Much attention has been paid to the general reader by writers who try to explain physical phenomena 'philosophically' without a clearly defined technical vocabulary. That such attempts have been premature and ill-considered is evident by the confusion in the minds of many persons, lay and scientific, as to the future of science.

For example: some statements in NATURE (June 22, p. 954) concerning "Psychological Conceptions in Other Sciences" are so alarming as to cause one to inquire whether it be the intention of workers in pure research to cease work and shut up their laboratories. Even though the conditions that determine quantum 'jumps' cannot be detected by instruments at present

in use, are we entitled to jump to the conclusion that "structure and entities [now under observation are] in themselves unknowable and unimaginable"? Have we, indeed, reached the limit of possible human knowledge? The remark above cited is prefaced by the statement of Dr. Myers that "with the development of knowledge, ideas of the 'absolute' have been gradually replaced by those of the 'relative'". Further *development* of knowledge seems doubtful if individual entities are in fact unknowable! However, conceptions of 'relativity' appear to dominate the field, at present, to such an extent that one almost questions the sincerity of the search for a unitary field theory to synthesise relative conditions. Is it a really serious quest or merely a competition *pour passer le temps*?

While illogical, this attitude is consistent with the spirit of an age that would repudiate the principle of cause and effect physically as morally. Still, the innate tendency of the human mind to seek for a 'cause' cannot be wholly repressed. Some types of mind feel compelled to account for the behaviour of the blind forces of Nature, regardless of the temporary experimental *impasse*; and they have arbitrarily attributed to these forces a power of choice and self-direction supposed to be exercised by human beings. There is no scientific 'cause' behind the electron! Physical phenomena occur as and when a 'decision' is made by a capricious entity or electron which, like a god of popular mythology, has the power, apparently, to act as it 'chooses' or 'prefers', whatever the environmental conditions. Surely this is suspiciously like absolutism in the sense understood by democratic entities?

To speak, however, of having 'ideas about the absolute' is one of the many contemporary illustrations of a contradiction in terms. To conceive it possible to form *any* idea to represent the absolute is the cardinal error of theological and idealist philosophies the absolute deity of which is a decidedly relative individual discarded by science some generations ago.

In the article (NATURE, June 1 and 8), "Einstein's and other Unitary Field Theories: An Explanation for the General Reader", Prof. Piaggio refers to Newton's belief in absolute rotation. As the great Newton cannot have been an illogical thinker, it should be worth while to examine the basis of this belief. We who function in finite, relative matter are unable, obviously, to contact, record, or describe an infinite, absolute energy, if such there be. But, though we cannot imagine a state of rotation *per se*, physics, to be logical, must postulate a perpetual, self-generating motion as the uncreated, causeless cause of known and knowable material velocities. *In-finite* (without end or beginning), *when ascribed to energy, means ceaseless*, that is *without intervals*—a state that cannot be conceived mentally but, nevertheless, a logical and necessary hypothesis. For, if there be no such absolute perpetuity or infinity, how do relative conditions come into existence and how are they maintained in their interrelated activities?

While research is inducing a greater respect for the scientific knowledge of former ages, no investigation has been made by science into the philosophical rationale of the ancient arts of alchemy, astronomy, medicine, psychology, etc. Consequently, we attribute ideas of popular religions to the ancient scientific philosophers whose only deity was absolute motion. "Everything is full of gods," Thales said, because 'gods' and 'atoms' were synonymous terms. It is possible that there may be renewed appreciation of Newton's science when his philosophy is understood.

W. W. L.

June 23.