V. G. Veselago. *Photomagnetism*. Photomagnetism is a relatively new subject and is concerned with the dependence of the macroscopic magnetic characteristics of strongly magnetic materials on illumination. There are now many known magnetically ordered materials in which the magnetic permeability, coercive force, magnetic anisotropy, and other properties are very dependent on illumination. Most of these materials, although not all, are magnetic semiconductors in which there are two interacting systems, namely, the mobile collectivized current-carriers that are responsible for conductivity and localized electron spins responsible for magnetic ordering. The interaction between these two subsystems is responsible for photomagnetism. It is important to note that the specific microscopic mechanism responsible for photomagnetic phenomena may be very different in different cases. However, the two most common models of photomagnetic phenomena are the s-d model and the central model.

The development of the s-d model of photomagnetism began in Refs. 1 and 2, where it was noted that photoexcitation of carriers in magnetic semiconductors could be accompanied by a change in the phase transition temperature due to the s-d interaction between photoexcited carriers and the system of localized spins. However, the estimate reported in Ref. 3 shows that an appreciable change in T_c would require a very large ($\sim\Delta n = 10^{21}$ cm^{-3}) change in the carrier density. At present, there is only one series of published papers[4,5] in which it is shown experimentally that the Curie point shifts under illumination by an amount of the order of 0.1 K in the magnetic semiconductor EuS. The s-d exchange energy was first taken into account in Refs. 6 and 7, where a determination was made of the equilibrium domain structure, and the change in this structure due to the change in s-d exchange under illumination was demonstrated experimentally.

The central model, which has now reached a semiquantitative state, can be used to explain a much greater range of photomagnetic phenomena. It accounts for the photomagnetic phenomena in magnetic semiconductors such as $CdCr_2Se_4$ (Refs. 8 and 9) and in iron-yttruium garnet.[10,11] The photomagnetism of these material is now well established and most extensively investigated. It can be explained by the light-induced formation of anisotropic centers (Cr^{2+} in $CdCr_2Se_4$ and Fe^{2+} in iron-yttrium garnet), the appearance of which is responsible for a substantial reduction in the mobility of domain walls. This is reflected in the light-induced reduction in magnetic permeability,[9] increased coercive force,[12] and a considerable change in the nature of Barkhausen noise.[13] The spectral and temporal characteristics of photomagnetic phenomena in $CdCr_2Se_4$ and similar compounds are very dependent on their energy spectrum. The detailed structure of this spectrum is still unclear in many respects, but photomagnetism, which is the foundation of an essentially spectroscopic method, has already made an undoubted contribution to the interpretation of the energy spectra of magnetic semiconductors such as $CdCr_2Se_4$.

The anisotropic ions Cr^{2+} are formed in $CdCr_2Se_4$ as a result of the transport of a photoelectron from the valence band to the trivalent chromium ion:

$$Cr^{3+} + e \longrightarrow Cr^{2+} \quad .$$

We are thus dealing with a central model, in which there is a change in the valence of the ion forming the anisotropic cener. There are, however, photomagnetic phenomena that can be explained within the framework of the central model without a change in valence. For example, Golovenchits *et al.*[14] have observed a change in the magnetic structure of $EuCrO_3$ when the ion Eu^{3+} was exposed to an optical pump that altered its magnetic state.

Recent results of experiments with $FeBO_3$ reveal unusual behavior:[15] the banded domain structure is found to move when the specimen is illuminated. $FeBO_3$ is a dielectric and its photomagnetism is undoubtedly explained by the central model. Incident light gives rise to an anisotropy in the $FeBO_3$ specimen, the axis of which is perpendicular to the magnetic moment. This produces a rotational moment in the spin system and a wave motion in the domain structure. The process appears to be a variant of autowave processes.

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Translated by S. Chomet