in connecting facts and in leading to the discovery of new facts; and my objection to the conception of *entelechy* is not that it is idealistic, but that it is barren.

Prof. Driesch now candidly admits that if he had only eggs like those of Ascidians and Ctenophores to deal with the theory of organ-forming substances might suffice, but that in order to account for what he calls a "harmonious-equipotential system," and for what I call an undifferentiated type of egg (or bud) an entelechy must be postulated. Now if the inversion of the two-celled stage in the development of the frog's egg will produce such a rearrangement of materials that *two* embryos and not *one* result, is it not just possible that the closing up of a fragment of a blastula of Echinus may lead, under the stress of forces which we may picture to ourselves as surface tension, &c., to such a rearrangement of materials as may issue in a perfect larva of reduced size instead of in a half larva? That organ-forming substances limited to special regions do exist in the later embryo of Echinus Prof. Driesch has himself shown in one of the most exquisite of his earlier researches. At any rate, if we adopt this hypothesis we shall be urged on to further researches as to the conditions of this rearrangement, whereas if we adopt the theory of an entelechy about the ideas or methods of working of which we know nothing, all future research is stopped.

The eggs of Asteroids and Echinoids show great resemblances in their earlier stages of development coupled with subsequent divergences. On Prof. Driesch's theory these divergences are due to differences in the indwelling types of entelechy, and no further explanation is possible. But when Prof. Driesch's friend and colleague, Prof. Herbst, shows that an Asteroid egg can be made to develop into something like the Echinoid blastula by immersing it in a solution of KCNS, then we are led to speculate as to the nature and origin of the chemical differences between these two types of egg, which cause the differences in their development.

Prof. Driesch refers to the case of the physicist who selects "pure material" for his experiments. I may reply by citing the case of the physiologist who in investigating nervous phenomena, chooses clearly differentiated nerve for his material, and would never dream of beginning by examining the phenomena of conduction in Amœba. I contend that eggs with organ-forming substances definitely localised are far "purer material" for the analysis of the forces of development than the undifferentiated eggs of Echinus.

E. W. MACBRIDE.

Imperial College of Science, November 15.

The Kathode Spectrum of Helium.

A NUMBER of articles have recently appeared in scientific journals dealing with a spectrum frequently associated with the spectrum of helium and by some attributed to impurities in the helium. A few words relative to this interesting and very beautiful spectrum will, I think, clear up the question of the source of the spectrum.

If a helium tube be prepared with *disc* electrodes, carefully freed from impurities, and operated on a transformer or continuous current (*not* on an induction-coil discharge), the region about the kathode will be filled with a bright pink glow. The spectrum of this kathode glow is the spectrum in question. It is simply the kathode spectrum of pure helium. If care be taken to avoid stray light from the anode column it may be obtained quite free from the ordinary (anode) spectrum of helium. When the disruptive discharge from an induction coil is used to excite the tube or the tube is viewed end on through a cylindrical electrode, the two spectra appear mixed in various proportions.

During the writer's several years of work at the Bureau of Standards on the helium tube as a primary light standard, scores of helium tubes were prepared and operated as above described. It was noted that the kathode glow was pale and greyish until the last traces of impurities has disappeared, when it turned to a bright pink. In fact, the appearance of the kathode glow is an infallible criterion for the purity of the helium, a spectroscope being unnecessary. The kathode spectrum of helium, viewed with a large, high intensity spectroscope, will be recalled by many who have visited the bureau during the last four years. Goldstein's spectrogram reproduced in the *Physikalische Zeitschrift,* July 15, 1913, is a very good one considering the photographic difficulties.

It is well known that most gases exhibit two and a few three quite distinct spectra. These are the anode (primary) and kathode spectra, and the secondary spectrum obtained with a disruptive discharge. Nitrogen is a familiar example of a gas having all three spectra. Helium is one of the few gases and vapours the primary and secondary spectra of which are alike, but the anode and kathode spectra of which are quite different.

P. G. NUTTING.

Rochester, N.Y., November 7.

Observation of the Separation of Spectral Lines by an Electric Field.

THE effect of the electric field upon spectral lines is a problem which has caused much discussion without being solved by experiment until to-day. Applying a very intense electric field in an incandescent gas, and using suitable optical arrangements, I succeeded in separating several spectral lines into components. These are polarised rectilinearly in relation to the axis of the electric field in the transversal effect (radius of vision normal to the electric field). With the dispersion used, the hydrogen lines $H\beta$ and $H\gamma$ are resolved by the electric field into five components. The three located in the middle are in electric oscillation normally to the electric field, the two outer ones parallel to it. My first paper on the new phenomenon will soon be published in the *Berichte der Berliner Akademie der Wissenschaften.*

J. STARK.

Aachen, Technischen Hochschule, November 21.

Phosphorescence of Mercury Vapour.

LAST July I published in the Proceedings of the Royal Society an account of a persistent fluorescence of mercury vapour produced by excitation of "2536" light, obtained from a quartz-mercury arc lamp. I have recently placed the fluorescent vapour in a strong magnetic field, and find that when the mercury lamp is cooled and consequently the "2536" line is sharp, the magnetic field increases the intensity of the fluorescence several times. If the lamp is allowed to warm up so that the "2536" line becomes broadened and reversed, the opposite effect is obtained, *i.e.* the phosphorescence decreases in intensity with the field. In this latter case the field strength that produces the greatest diminution in intensity increases with the temperature of the quartz-mercury lamp. The ordinary fluorescence produced by the light from the cadmium spark is not affected by the magnetic field. I am at present working with the idea of obtaining a satisfactory explanation of the persistent fluorescence and the various phenomena connected with it.

F. S. PHILLIPS.

Imperial College of Science and Technology, November 24.