is in such a direction as to force the electrons from the copper into the copper oxide, some of the electrons in the copper oxide are removed and the diffusion pressure of the electrons in the copper is then in such direction as to help the flow of the current. The electron current, therefore, flows freely from the copper to the oxide. The minute spacing between the electrodes, the comparatively large areas and possibly the dielectric constant of the copper oxide all contribute to make the impedance in this direction low.

When the applied potential difference is reversed so that the electrons are driven back into the copper, another condition of equilibrium is established in which the diffusion of the highest speed electrons against the applied potential difference maintains a smaller number of excess electrons in the copper oxide. These electrons occupy a thin layer very close to the junction between the copper and the copper oxide so that in the high resistance direction the whole potential gradient is concentrated in this thin layer. This agrees with the experimental fact that in the high resistance direction the potential drop is all at or very near the junction between the two materials. It is probably also in agreement with the fact that the high resistance decreases rapidly with rise in temperature, since at higher temperatures the conductivity of the oxide increases and this may correspond to a greater number of free electrons and a smaller difference between the free electron concentrations in the oxide and the copper.

The above is admittedly only the skeleton of a theory, but it seems to be consistent with the voltage and the temperature characteristics of the junction rectifier.

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EXPERIMENTAL MODIFICATION OF POLARITY IN MARINE OVA

IN their experimental studies on ova of the sea urchin *Lytechinus variegatus,* Taylor and Tennent (1924)[1] found that each half of an unfertilized ovum which had been bisected by the micromanipulation method either through the poles or through the equator would, upon subsequent fertilization, divide in both first and second cleavages at right angles to the plane of section.

These results suggested to us a similar problem on ova of the starfish *Patiria miniata* which abounds along the shore of Monterey Bay near the Hopkins Marine Station of Stanford University. This species is actively spawning during the months of April and May, when our experiments were performed. Several animals were brought into the laboratory each morning and placed upon clean glass plates. Usually within an hour or so sperm or eggs (fully matured) were freely extruding through the gonopores. These were carefully pipetted into thoroughly clean finger bowls containing fresh sea water. The eggs were well washed with one or two changes of sea water before the experiments were begun.

The polarity of the beautifully clear, matured ova of *Patiria miniata* can readily be recognized by the position of the conspicuous polar bodies. The first and second cleavage planes normally intersect at right angles near the polar bodies. In about sixteen hours after cleavage begins, that side of the blastula diametrically opposite the polar bodies shows a distinct thickening. This thickening represents the vegetal pole where invagination occurs some twenty-eight hours after fertilization.

The merotomy experiments were performed with the aid of quartz micro-needles which were operated in a moist chamber by means of a Taylor micromanipulator. Upon placing from one to several ova on a coverslip which had been scrupulously cleaned by the aqua regia-alcohol method (Taylor, 1920),[2] a suitable amount of the water was drawn off just sufficient to slightly compress the ova and thus hold them nicely in position for cutting.

More than eight hundred ova of this species *P. miniata* have thus been operated upon. These were bisected through various planes—some through the poles, others through the equator and still others (the majority) through planes making practically all angles with the polar axis.

The two fragments thus resulting were thereupon transferred by means of a mouth pipette to fresh sea water contained in inch size watch glasses, to which a drop of light sperm suspension was, a few minutes later, added. Fertilization membranes appeared usually, within three to five minutes after insemination. After three or four hours the fragments were transferred to fresh sea water. Careful observations were made on each fertilized fragment. Full notes were recorded on 653 fragments.

The results of our experiments appear to be conclusive in demonstrating that without exception the first and second cleavage planes passed through the fragment at right angles to the plane of section.

Immediately upon transection, the two fragments tend to be elongated parallel to the plane of cutting—

[1] Taylor, C. V., and Tennent, D. H., "Development of Egg Fragments," Carnegie Institution Year Book, No. 23, pp. 201–206, 1924.

[2] Taylor, C. V., "An Accurately Controllable Micropipette," SCIENCE, n. s., 51, 617–618.

although within a few minutes they may assume a nearly rounded or quite rounded form. Accordingly, we at first thought that our consistent results might be interpreted in terms of the Hertwig hypothesis that the cleavage spindle tends to orient itself with its long axis parallel to the long axis of the egg (or fragment). We then devised means of testing this hypothesis. Matured but unfertilized ova were siphoned by capillarity through a thoroughly clean glass capillary of size precisely adequate to induce an elongation of the ova about one and one half times their normal diameter. These elongated ova, upon passing out of the capillary into fresh sea water, retained quite conspicuously a longer axis, even though their resilience tended to bring back their former roundness.

With rare exceptions several dozen ova thus elongated readily formed, upon insemination, clear, full-sized fertilization membranes. The first and second cleavages which ensued without noticeable delay occurred in planes intersecting near the polar bodies, precisely as in the controls, irrespective of the induced longer axis.

We further demonstrated that fragments which were allowed to round up before insemination cleaved likewise at right angles to the plane of section.

In about fifty-three recorded cases of merotomized ova of the two sea urchins *Strongylocentrotus purpuratus* and *S. franciscanus,* we have more recently obtained results which agree with those recorded above for the ova of the starfish *P. miniata.*

Our results, therefore, tend to substantiate the findings of Taylor and Tennent (1924) in similar experiments on the ova of *Lytechinus variegatus.*

Our experiments go further, however, in showing that the planes of the first two cleavages are at right angles to the cut surface of the fragments, whether the plane of section passes through the poles, through the equator or *through any other plane of the ovum.* Furthermore, this rule holds for the two fragments of unequal size as well as for those of equal size.

We have further evidence, which is as yet hardly complete, that supports the conclusions of the above investigators that "the original polarity of the egg does not necessarily persist in the fragment" (Taylor and Tennent, 1924). Of the number of clear-cut cases, including the ova of both *Patiria miniata* and *Strongylocentrotus purpuratus,* invagination of the blastulae arising from fertilized fragments *occurred on the cut surface.* The number of such cases is twenty-four. We have thus far failed to find any exception to this tendency.

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THE ANNIVERSARY MEETING OF THE AMERICAN CHEMICAL SOCIETY

THE fiftieth anniversary meeting of the American Chemical Society, being its seventy-second general meeting, was held at Philadelphia, Pennsylvania, from Monday, September 6, to Friday, September 10, inclusive.

Preceding the meeting in Philadelphia, a special pilgrimage was made to the grave of Joseph Priestley at Northumberland, Pennsylvania, where exercises were held, as reported in SCIENCE. The council meeting was held on the morning of the sixth; general meetings on the afternoon of Monday, September 6, and on the afternoon of Wednesday, September 8. Regular divisional meetings were held all day Tuesday, Thursday and Friday and on Wednesday morning. At the general meeting on Monday afternoon, September 6, the following addresses were given: "The Development of Chemical Industry in Italy," by Prince P. Ginori Conti; "The Dyestuff Industry, Forerunner of What?" by Irénée Du Pont; "La Chimie Modern et Marcelin Bertholet," by Paul Sabatier.

On Wednesday afternoon, September 8, diplomas of honorary membership were presented in person to Ernst Cohen, James C. Irvine, W. Lash Miller, Ira Remsen, Theodore W. Richards, Paul Sabatier, Edgar Fahs Smith and Frederic Swarts. A certificate of honorary membership for Joji Sakurai was presented to his proxy, Professor Koichi Matsubara, and a certificate of honorary membership for Charles Moureu was presented through his proxy, Paul Sabatier. Professor Bohuslav Brauner, Professor Giuseppe Bruni, Professor Frederick G. Donnan and Professor Ame Pictet, not being able to be present and having designated no official proxy, their certificates were forwarded to them through other channels.

On the afternoon of Wednesday, September 8, the following addresses were given: "Flames of Atomic Hydrogen," by Irving Langmuir; "Chemical Reaction of Atomic Hydrogen," by Hugh S. Taylor; "Caricature in Science," by Ernst Cohen. After the addresses, a special cash award was presented to Paul Sabatier in the name of the Procter and Gamble Company of Cincinnati in appreciation of his important scientific researches, especially in contact catalysis, which have been so fruitful in making possible successful industrial developments in the soap and fat industries.

On Tuesday evening, September 7, President Norris addressed the society on the subject "A Look Ahead." This address will be printed in the October issue of *Industrial and Engineering Chemistry.* On the same evening the Priestley Medal was awarded to Edgar