Comments and Communications

On the Discovery of the Action of Colchicine on Mitosis in 1889

The description of the effects of colchicine on mitosis by A. P. Dustin (*Bull. Acad. roy. Med. Belg.*, 1934, **14**, 487) and F. Lits (*C. R. Soc. Biol.*, 1934, **115**, 1421) marked the beginning of a period of active investigation. During the next 15 years, publications dealing with this alkaloid averaged about 100 titles per year. The first study of the action of colchicine on mitosis, we now believe, is the one published by B. Pernice (*Sicilia Med.*, 1889, **1**, 265). Several papers since 1934 have credited W. E. Dixon and W. J. Malden (*A manual of pharmacology*. London: Arnold, 1906, and *Physiol.*, 1908, 37, 50) with the original observations on colchicine mitosis. They mentioned that after repeated injection in mammals, "plentiful mitotic figures can occasionally be observed" in smears of bone marrow. However, they did not give details or illustrations. On the other hand, the figures and text of Pernice make it clear that he observed in considerable detail the cytological action of this drug.

We have been interested in colchicine bibliography (*Lloydia*, 1947, **10**, 65) for the past ten years, and a work now in press (*Lloydia*) includes a reference to this work of Pernice. Through the service afforded by the U. S. Army Surgeon General's Index, and the cooperation of the Library of the U. S. War Department, Washington, D. C., we have been able to study this document. Greater details, as well as presentation of figures, will be published when suitable arrangements can be completed. However, at the moment, certain sentences are so appropriate that a few of Pernice's observations are included, with our comments.

In his paper, entitled: "On the karyokineses of the epithelial and endothelial cells in the mucosa of stomach and intestine, in experimental gastroenteritis following colchicum poisoning," Pernice studied with great care the gastrointestinal mitoses in two dogs given, respectively, 10 and 15 g tincture of bulbs of colchicum, and dying 24 and 48 hr later. In the stomach were to be found "an extraordinary great number of dividing cells." Furthermore, he stated that within the Lieberkühn glands of the intestine, "nearly all cells are engaged in indirect division." Endothelial mitoses can be seen "nearly in all vessels." Moreover, it is "rare to see the latest stages of division." Pernice considered that "the cellular elements may have been directly excited and stimulated by the tincture of colchicum." He noticed that some of the mitotic figures apparently underwent destruction and added: "Perhaps this is a necrosis of the cells, giving rise to some sort of pseudo-karyokinetic forms." He firmly stated, however, the relation of the observed images to true mitosis. The illustrations show gastric and Lieberkühn glands, one with "*quasi tutti gli elementi in cariocinesi*," and divided equatorial plates, but no true anaphases or telophases are represented.

Pernice deserves due credit for his discovery; thus the action of colchicine on mitosis has been known since 1889. While many physiological studies of the intestine in chochicinized animals were published in the interval from 1889 to 1934, the mitotic abnormalities were not described again until 45 years later. The year 1949 marks the 60th anniversary of the discovery of colchicine mitosis.

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A Nomination for the ISCC

My hearty approval of the article on Ridgway's color standards (*Science*, June 17).

You will find that I have been active in the past in an attempt to produce color standards which will be both permanent and reproducible. Inorganic ions and compounds were found to be permanent and could be accurately reproduced from known formulas; ferric chloride and cobalt chloride were the compounds employed. The nickel ion would probably have been the next, had I been able to continue the study.

The American Society for Testing Materials, neighbors of mine on Race Street, Philadelphia, have already done excellent studies on the color problem and know much of its intricacy. They might be the best available organization for the purpose mentioned in Dr. Middleton's letter (*Science*, June 17).

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Solar Rotation and Kepler's Laws

H. W. Babcock, of Pasadena, recently announced discovery of some significant correlations between the magnetic fields and the rotation of several astronomical bodies. P. M. S. Blackett, distinguished English physicist, found that Babcock's constant $Q/mr^2\omega$, or magnetic moment/angular momentum, is proportional to $G^{\frac{1}{2}}/c$, or square root of gravitation constant/velocity of light.

In calculating angular velocity, Prof. Blackett took the sun's equatorial time of rotation, about 25 days. But the sun does not rotate uniformly like a solid sphere and different values are found when the average time of rotation is used (i.e., mean of observed latitudes). This is a little more than 29 days, or about 2,510,000 seconds.

Substituting for m the equivalent term v^2r/G, angular momentum would be given by $v^2r^3\omega/G = 2.4 \times 10^{49}$ in c.g.s. units and $\frac{Q}{v^2r^3\omega/G}$ would be $8.9 \times 10^{33}/2.4 \times 10^{49} = 1/2.6 \times 10^{15}$. This would be proportional to $1/G(2\pi c)^2$ (i.e., approximately $1/2.4 \times 10^{15}$).

One of the factors abstracted from the equations, $r^3\omega$,