Comments and Communications

International Depot of Microscopic Preparations of Cytology

In 1939 the International Union of Biological Sciences requested Prof. P. Martens, director of the J. B. Carnoy Institute, Louvain, Belgium, to take up again the project of an International Depot of Microscopic Preparations of Cytology, animal and vegetable. This plan had previously been submitted by the Union to the late Prof. V. Gregoire, but owing to poor health he was unable to realize the practical side of this plan. Various circumstances have delayed until now the announcement of the creation of this organization.

Preparations obtained from numerous research centers which have already been used as a basis for previously published work will therefore be grouped together in an easily accessible center—the Laboratory of Cytology of the Carnoy Institute at Louvain, Belgium. Each worker interested in a definite problem may thus compare with his own documentation the original microscopic documentation of other authors relative to the same matter. It is hardly necessary to underline the considerable interest that a depot of this kind will acquire and, also, how much it will favor good understanding among workers and smooth out many difficulties and vain contestations which are inclined to permeate scientific literature.

This result can be obtained only with the greatest comprehension and collaboration of the greatest possible number of cytologists. The IUBS therefore invites them, from now on, to send their reprints to the Laboratory, enclosing with them preparations already used as a basis for published work, and to bring such deposits up to date in the future. It is desirable that the fields considered by authors as particularly demonstrative or used as published illustrations should be specially noted as clearly as possible on the preparations. It is also requested that a sample of the published work should be attached when these are sent.

Every biologist known for his publications, and any other person possessing authorized recommendation, will be able to consult and study as much as he likes all preparations which have been entrusted to the Depot; consultants will have the Laboratory and necessary optical instruments at their disposition. All work must be done within the Depot unless written permission to withdraw material is granted by the depositor.

The preparations will always remain the *property solely of the depositors,* who can at any time have them sent back to them. The cost of postage would then be paid by the administration of the Depot.

P. VAYSSIÈRE (Paris)
Secretary General, IUBS
P. MARTENS (Louvain)
Administrator of the Depot

On the Properties of Gelatin-Dye Phosphors and the Continuum Theory of Szent-Gyorgyi

In his recent book entitled *Chemistry of muscular contraction* (New York: Academic Press, 1947), Szent-Györgyi presents a theory and some preliminary experiments which attempt to relate luminescence phenomena of gelatin-dye phosphors with the fundamental mechanisms of energy exchange in biological systems. Although the present writer has no intention of quenching Szent-Györgyi's enthusiasm for this new approach, he is inclined to make a few criticisms of the theory. This seems necessary, since the "Continuum Theory" has already been heralded as an important new principle in theoretical biology by one reviewer, whereas the phenomena on which it is based seem to have a simpler and more tangible interpretation in terms of spectroscopic research on the luminescence of complex molecules.

Szent-Györgyi's basic premise is that the electronic transitions involved in the luminescence of gelatin-dye phosphors are closely related in character to the electronic processes in mineral "impurity" phosphors. He regards the dye as taking the role of the impurity, and the luminescence as a property of the system rather than of the dye or the gelatin. He then attempts to deduce the electronic energy levels of a protein as a "fusion" of the spectroscopic terms of the component atoms.

A careful study of the experiments described and the interpretations presented indicates that the latter are in direct conflict with theoretically secure ideas previously established to account for such phenomena. The interpretations of complex molecule luminescences made here by the late G. N. Lewis and his co-workers have been along the lines of straightforward π-electron spectroscopy. The phenomena observed by Szent-Györgyi and his associates appear to be due simply to the optical properties of the dye molecules. Most of the experiments reported may be interpreted in terms of the general theory of luminescence of complex molecules; this theory has been reviewed and expanded in a recent paper by the present writer (*Chem. Rev.*, 1947, **41**, 401).

In his discussion, Szent-Györgyi does not distinguish between fluorescence and phosphorescence, using the terms interchangeably. It is noteworthy that in several cases reported by him the appearance or disappearance of luminescence coincides with an increase or decrease in the viscosity of the system, respectively. It is suggested that a careful spectroscopic study of the phosphorescence spectra of adsorbed dyes and of the same dyes in rigid glassy media (*Chem. Rev.*, 1947, **41**, 401) would clear up many of the ambiguities. This would require careful attention to purity of the sample, to possible photochemical changes induced by the exciting light, and resolution of the fluorescence and phosphorescence spectra by means of a phosphoroscope.

In discussing the photoconductivity experiments of Boros, Szent-Györgyi does not include a description of the light source used, and while it may be assumed to have been considered, it cannot be ascertained from the presentation whether the differential absorption of the

various dyes was taken into account. The possibility of photochemical changes was not checked. The results of these difficult experiments on photoconductivity are easily vitiated by small disturbances.

The electronic systems of proteins may very well be unique and deserve careful study, but it is first necessary to demonstrate that the phenomena observed may not be interpreted on the basis of appropriate extant theories. In the present case, it seems more reasonable to apply principles established for the electronic energy levels of complex molecules rather than for the energy levels of the metallic or crystal lattice.

MICHAEL KASHA

University of California, Berkeley

Water at −72°

Dr. Earl C McCracken recently reported (*Science*, November 7, 1947, p. 453) some interesting examples of water undercooled to −10° which he observed accidentally when testing home freezers. A systematic investigation of the causes and conditions of undercooling, which may partly explain Dr. McCracken's observations, was undertaken a few years ago in Germany by Dr. Walter Rau in the laboratory of Prof. Erich Regener (*Schriften der deutschen Akademie fuer Luftfahrtforschung*, 1944, Vol. 8, Pt. 2). This proved that it is possible, by adequate treatment, to keep water liquid as far down as −72°.

Dr. Rau came to the following conclusions: Freezing is initiated by "freezing nuclei," foreign particles, just as condensation of water into clouds is initiated by condensation nuclei. Not all these nuclei respond at the same temperature. Only a few are active at zero; most of them, between 10° and 12°. If the nuclei are kept resting for a long time in water or in moist air, they lose their activity but regain it by drying. If an individual drop is allowed to freeze and melt again repeatedly, it will first freeze several times at the same temperature, but then it suddenly drops to a lower temperature before refreezing. In this way the freezing could be gradually driven down to −72°.

When the water solidified at this low temperature, it crystallized around "germs"—that is, the smallest accumulation of the molecules of the new phase, without the assistance of foreign bodies; in this case the ice no longer appeared in the well-known hexagonal crystals, but in a new modification, forming cubes, octahedrons, or tetrahedrons.

GABRIELE RABEL

49 Lensfield Road, Cambridge, England

Surface Tension and Conductivity of Penicillin Salts

Hauser, Phillips, and Phillips (*Science*, December 19, 1947, p. 616) recently reported that solutions of sodium penicillin are highly capillary active and concluded that sodium penicillin in water exists as a colloidal sol and not as a true solution. They obtained a surface tension of 31.7 dynes/cm for a solution containing 10,000 units of penicillin sodium salt (Abbott)/cc. On the other hand, Woodbury and Rosenblum (*J. biol. Chem.*, 1947, 171, 447) report from conductivity measurements that sodium penicillin in water behaves as a normal, completely dissociated electrolyte. These two findings are difficult to reconcile unless the measurements were made at widely different concentrations. This, however, is not the case. The concentration of 10,000 units/cc used in the surface tension measurements corresponds to 0.6% or to 0.017 moles/liter, which falls about in the middle of the range, 0.0007–0.0477 moles/liter, employed in the conductivity measurements.

We have carried out surface tension measurements on crystalline sodium penicillin G (Cutter Lot HB–88; potency, 1,600 μ/mg) and crystalline potassium penicillin G (Cutter Special Lot; potency, 1,570 μ/mg), using the du Noüy Precision Tensiometer and the capillary rise method. The results given in Table 1 show that these solutions have surface tensions differing but little from

TABLE 1

Solution	Surface tension Dynes /cm	Conc. (%)	Temp.	Method
Sodium penicillin G	70.8	0.6	23°	du Noüy Tensiometer
Water	71.1		23°	" " "
Sodium penicillin G	70.3	0.6	21°	Capillary rise
Potassium penicillin G	68.7	0.6	19°	du Noüy Tensiometer
Water	73.2		19°	" " "
Potassium penicillin G	70.1	0.5	21°	Capillary rise

that of pure water. The solutions therefore are not capillary active and behave as true solutions, not as colloidal sols.

Conductivity measurements carried out on crystalline potassium penicillin G gave a Λ_o value of 99.5 at 25°. A Λ_o value of 77.8 at 30° for sodium penicillin G was obtained by extrapolating Woodbury and Rosenblum's data to zero concentration. Taking into account the difference in ionic conductance between Na^+ (50.1 at 25°) and K^+ (73.5 at 25°), a value of 76.1 is obtained for the conductance of sodium penicillin G at 25° from our data on potassium penicillin. This is in good agreement with the above value of 77.8 at 30°. Thus, the conductivity measurements on potassium penicillin G are in agreement with those made on sodium penicillin G by other workers (*J. biol. Chem.*, 1947, 171, 447), and both these and our surface tension measurements indicate that sodium and potassium penicillin salts in water behave as true solutions and not as colloidal electrolytes.

We wish to thank the Cutter Laboratories for a grant and Profs. T. C. Daniels and Frank M. Goyan for helpful discussions.

W. D. KUMLER and EDWARD L. ALPEN

College of Pharmacy,
University of California, San Francisco