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.

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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 Akademia 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.

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

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

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.

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