preparation of a substantive text giving effect to the numerous changes which have now been agreed upon, the Congress, on the advice of the Commission, has decided that this task shall be entrusted to jurists before whom the decisions of the Congress will be laid. The text prepared by the jurists will be submitted to the members of the Commission for final approval, and the task of considering any drafting points which may emerge from the foregoing consultation has been entrusted to a special committee of three consisting of: Francis Hemming (United Kingdom), secretary to the Commission, Dr. van Straelen (Belgium), and Prof. Robert E. Usinger (U. S. A.).

Contrasted provisions for dealing with old names and new names. The *Règles* in their amended form will come into operation immediately they are promulgated. Meanwhile, arrangements are being made for the publication as soon as possible of the *Procès Verbaux* of the Commission during its Paris meeting in the Commission's *Bulletin of Zoological Nomenclature.* In general, it will be found that, in order to ward against the risks involved in retroactive legislation, the provisions relating to names already published are simpler and less rigorous than those to be applied to names to be published in the future. From now on workers giving new names will have at their disposal rules which are simple, clear, and easy to operate. The position with respect to names already published—and especially names published before the introduction of the *Règles* 50 years ago—will necessarily be rather more complicated. It is hoped, however, that, with regard to generic names, these difficulties will be largely overcome by a rapid and substantial extension of the "Official List of Generic Names in Zoology," for under the arrangements now agreed upon, a name once placed on this List is not to be changed for any purely nomenclatorial (as contrasted with taxonomic) reason without the prior approval of the International Commission. A similar provision has been made with regard to the trivial names of species, and for these also there has now been established an "Official List" of names which are not in the future to be changed for purely nomenclatorial reasons without the prior approval of the Commission. The establishment of these two "Official Lists" makes it possible for specialists in any group to concert proposals for submission to the Commission for the insertion on these "Official Lists" of the names of the genera and species in their group and thereby to protect those names from changes for any reason other than taxonomic considerations.

The value of preliminary studies on particular problems. The work of the present meetings was greatly assisted on two important matters by the decision taken at the previous Congress (held at Lisbon in 1935), that before the present meeting a detailed study should be made on two important questions of nomenclature which had been a cause of difficulty for many years. In each case the reports so submitted to the Paris meeting provided the basis for an agreed settlement. The first of these reports was concerned with the meaning of the expression "nomenclature Binaire" as used in the *Règles.* In this case the Commission and the Congress have agreed to substitute the expression "nomenclature binominale" for the expression referred to above, subject to the incorporation of safeguards for generic names published by "binary" though not binominal authors. The second of these reports was concerned with the problem of the nomenclature of forms of less than subspecific rank, a matter on which no provision had hitherto been made in the *Règles.* In this case also the report submitted provided the basis for an agreed settlement. The Commission and the Congress have been so much impressed by the value of this procedure that they have now agreed that similar Reports should be prepared for consideration at the next Congress in regard to other difficult problems, including (1) the treatment of Family names, (2) the nomenclature of Orders and higher groups, (3) the rules which should govern the emendation of names, and (4) the problems presented by the demand for the recognition of "neotypes."

Settlement of outstanding individual cases. Owing to the war and other causes the Commission, at the beginning of its Paris meeting, was confronted with heavy arrears of work in connection with individual applications submitted to it by specialists in different parts of the world. During the recent meeting decisions were taken on almost all of these cases, and these decisions will be promulgated in the near future.

The future outlook. The effect of the reforms in the *Règles* instituted during the Paris meeting will be to provide zoologists with a system of law which will be much easier to operate and will ensure stability and uniformity in the nomenclature. At the same time the reforms in the constitution of the Commission and its procedure will assure to zoologists a central authority with regard to all matters relating to zoological nomenclature far more representative and international than ever before and, as such, capable of providing a service more extensive and of much greater value than has been possible at any previous time.

FRANCIS HEMMING, *Secretary*

Water at – 72° C

Reports by McCracken (*Science,* November 7, 1947, p. 453) and Rabel (*Science,* May 28, p. 567) prompt the writer to describe a demonstration experiment which he has been using for some years to illustrate the undercooling of water. A freezing mixture of shaved ice and alcohol is prepared, the temperature of which is carefully measured to be between – 5° and – 7° C, and placed in a wide-mouthed, 500-cc vacuum bottle. A 7- to 10-cc test tube three-quarters full of tap water is placed in the freezing mixture and agitated, with a thermometer as a stirring rod, until the temperature is just below + 4° C. Agitation is then stopped, and almost invariably the water temperature falls to the subzero temperature of the freezing mixture. The test tube is then removed from the freezing mixture and shown to the class; a single rapid shake of the test tube suffices to initiate freezing with the attendant rise in temperature to 0° C—which the experiment is primarily intended to demonstrate.

If the freezing mixture is lower than $-7°$ C, freezing usually sets in at 0° C, and if the mixture is warmer than about $-5°$ C, the water in the test tube undercools, but usually does not freeze when agitated, and will remain in the undercooled condition indefinitely.

The thermometer used in this experiment is a pair of copper-constantan junctions in a thin-walled glass tube, with a wall galvanometer indicating the current, which is roughly proportional to the relatively small temperature differences.

Rabel's suggestion that the "freezing nuclei" are "active . . . between 10° and 12°" seems to be borne out by this experiment. If the "10° and 12°" means $+10°$ C and $+12°$ C, then the agitation probably inhibits the action of the nuclei; if $-10°$ C and $-12°$ C is meant, then freezing does not take place, because this range of temperature is avoided by keeping the freezing mixture substantially warmer.

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In a recent communication under this same title (*Science*, May 28, p. 567), Gabriele Rabel called attention to an important paper by Walter Rau (*Schriften der deutschen Akademie fuer Luftfahrtforschung*, 1944, Vol. 8, Pt. 2, pp. 65–84) in which is reported the supercooling of water to $-72°$ C. Two striking and very pertinent observations made by Rau were, however, not mentioned.

Rau reported that the ice that formed at $-72°$ C melts near $-70°$ C, and that occasionally he had observed freezing near $-55°$ C, yielding ice that melted below $-40°$ C. Obviously, neither of those ices is ordinary ice (Ice-I). He gives reasons for inferring that the $-72°$ C ice is Bridgman's Ice-VI and thinks that the $-55°$ C ice is one of the other ices that have been observed under pressure.

His observations indicate that, in the absence of motes of some kind in the water, ordinary ice never forms spontaneously. That accords with the conclusion drawn by the writer 10 years ago in a preliminary report (*J. Res. nat. Bur. Stand.*, 1938, **20**, 799–808 (RP1105)) in which it was shown that the observations are consistent with the idea that the size of the mote is a very important factor. Much additional data—none lower than $-22°$ C—confirming that conclusion have been obtained since then. They and a new theory of the initiation of freezing are given in a forthcoming paper (*Trans. Amer. phil. Soc.*, 38, Pt. 3).

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Gabriele Rabel's note on "Water at $-72°$" (*Science* May 28, p. 567) summarizes Walter Rau's work on undercooled water. It should be noted that Dr. Rau's work has been severely criticized by B. M. Cwilong in "Observations on the Incidence of Supercooled Water in Expansion Chambers and on Cooled Solid Surfaces" (*J. Glaciology*, 1, 53–57). Cwilong points out that Rau's phenomena are not reproducible unless some contaminant such as ether or acetone is present in the system.

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Low-Temperature Spectroscopy of Biological Compounds

Scott, Sinsheimer, and Loofbourow (*Science*, March 19, p. 302) have given a method of rendering more characteristic absorption spectra of polar organic compounds by cooling. Aqueous solutions of such compounds naturally cannot be investigated below 0° C. The new method involves cooling of thin solid films consisting of the pure substances.

It may be useful to draw attention to an alternative method (Broda and Goodeve. *Proc. roy. Soc.*, 1941, A179, 151), which was successfully applied to the optical and photochemical investigation of the polar compound (conjugated protein), visual purple, at the temperature of solid CO_2. Visual purple, like many other polar compounds, is soluble in glycerol. The solution, when chilled, vitrifies without crystallizing and therefore remains homogeneous and clear. The absorption spectrum of the visual purple sharpened very considerably. The glycerol method would no doubt prove valuable with other polar bodies.

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On the Purification of Rabies Vaccine

Rabies vaccine made from the brain and cord of rabbits is a mixture of inert and of antibody-producing fractions. The effect of removal of an inert portion upon the immunizing value of the residual has been studied, and the result warrants a brief report.

Fats and lipoids, extracted from desiccated vaccine (*J. inf. Dis.*, 1912, **10**, 369–377; 1913, **13**, 155–164) with various solvents and injected into mice, do not confer protection or provoke evidence of toxic response when given subdurally or intraperitoneally. Lipids may be removed with ether, chloroform, acetone, or xylol, but in the process much or all of the living virus may be killed. But when the extraction is made at a low temperature ($-65°$ C) with a petroleum ether of low boiling point (20°–40° C), the virus is not destroyed nor is its antigenic value impaired. Tests of the residue made one year after the extraction show the amount of living virus to be as large as in an untreated sample of the same lot.

Comparative tests also show there is no significant loss in immunizing value. The results justify the conclusion that immunity is effectively established earlier with this fraction than with the whole. A single intraperitoneal injection has resulted in the protection of Swiss mice against a challenge of 1,000,000 times the LD for unprotected mice.

Experiments to determine accurately the value of the lipid-free fraction under variation of time and temperature are continuing and will be the subject of a later report.

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