

vey has been largely confined to the extension of control to cover the entire country with large arcs or circuits of precise work. Much of this work is being extended over areas already topographically mapped, and such work as the Coast Survey has done in recent years for immediate use in mapping has been actually paid for by transfer of funds from the Geological Survey. While much duplication of effort of the two bureaus has been eliminated through the cordial cooperation that exists, still there is considerable divergence of policies and plans and there is not that degree of coordination which must exist in order that a comprehensive program may be prepared and executed in the most effective way.

Publication of geographic positions and spirit level elevations should be standardized in one organization. The geodetic work should be planned to meet the immediate needs of the mapping program, and often the same geodetic field party should do the precise work and follow immediately with the secondary control now executed by the Geological Survey. A substantial saving of overhead expense in field and office operation and in the procurement and use of equipment would be effected if the transfer were made.

GEO. OTIS SMITH,
Director

UNSTABILITY AT THE ABSOLUTE ZERO OF TEMPERATURE

It has been shown by the writer (*J. Phy. Chem.*, 31, 747-756 (1927)) that a substance or mixture in the condensed state under its vapor pressure at the absolute zero of temperature T has zero controllable internal energy and entropy. With this as basis the writer has calculated the internal energies of a large number of the elements, which are given in a paper just published (*J. Phy. Chem.*, 31, 1669-1673, 1927). The largest and smallest values obtained were 1,535 and 1,037 cal./mol. for lead and iron respectively. Since G. N. Lewis has already calculated the entropies of these elements, it was possible to calculate also their free energies, the largest and smallest values being -2,791 and -750 for lead and chromium respectively.

An interesting point presented itself in these investigations. If a substance is lowered in temperature to the absolute zero it may not finally be in a condensed and vaporous phase at zero pressure. A further change at $T=0$ will therefore have to take place before its internal energy is zero. Now it has also been shown by the writer (*J. Phy. Chem.*, 31, 940, (1927)) that the adiabatic of zero entropy corresponds to $T=0$. It follows from this that a change in internal energy at $T=0$ appears as external work. Hence under these conditions a substance will become

unstable at $T=0$ and exert a pressure. On allowing the substance to expand doing external work it will finally end in the condensed state under zero vapor pressure, when its internal energy is zero. It was shown in the paper mentioned that white tin should behave in this manner at $T=0$, and develop while expanding to become stable an average pressure of about 3,000 atmos. Thus certain substances may act like an explosive at or near the absolute zero of temperature.

This result has an interesting astronomical aspect. Dark bodies in interstellar space which are losing more heat than they receive eventually sink in temperature to near the absolute zero, and then may possibly get unstable and explode. This may conceivably happen to our moon some day if it radiates more heat than it receives, and has compounds in its composition possessing this property.

R. D. KLEEMAN

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THE THEORY OF "VISIBLE RADIATION FROM AN EXCITED NERVE FIBER"

IN a recent article in *SCIENCE*,¹ Mrs. Christine Ladd-Franklin gave an exposition of the phenomenon of the reddish-blue arcs and of her interpretation in terms of visible radiation from the excited nerve fiber. A foot-note in this article gives a reference to a paper of mine, and in the same foot-note Mrs. Ladd-Franklin describes an observation of her own and gives her interpretation. To the casual reader it might easily appear that the observation and opinion are quoted from my article. To avoid any such misinterpretation I wish to go on record as disagreeing absolutely with Mrs. Ladd-Franklin's interpretation of the reddish-blue arcs and the other phenomena which she cites. I do not believe that the evidence compels us to assume visible radiation from excited nerve fibers. The explanation set forth by Amberson² and others, based on secondary excitation by the action currents of the nerve fibers, seems quite adequate and requires less violent efforts of the imagination.

Mrs. Ladd-Franklin's point concerning the "place coefficient" of the sensation is sound, and we must agree that the secondary excitation is in rod, cone, bipolar cell or ganglia—not in the nerve fiber; but her argument against electrical excitation of one of these elements is unconvincing. Electric stimuli applied to the eye externally may give the sensation of light without a residual image, and this we may

¹ Christine Ladd-Franklin, 1927. *SCIENCE*, lxi, 239.

² Amberson, W. R., 1924. *Am. Journ. Physiol.*, lxi, 354.

interpret as direct excitation of nerve fibers. This does not prove that an electrical disturbance *localized in the retina*, like a nerve action current, might not stimulate the photosensory mechanism directly.

It is worth noting that the phenomena reported by Nodon³ of photographic effects from organic substances, which he interprets as due to "radiations" and which Mrs. Ladd-Franklin cites in support of her theory, have long been familiar. The subject has been reviewed by Keenan⁴ and the weight of evidence points to the evolution of traces of hydrogen peroxide as the explanation.

HALLOWELL DAVIS

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THE ANTIQUITY OF THE DEPOSITS IN JACOBS CAVERN

NELS C. NELSON in *SCIENCE*, for September 16, 1927, criticizes the article by me on "The Antiquity of the Deposits in Jacobs Cavern," printed in *Am. Mus. Nat. Hist.*, Vol. XIX, Part VI.

Admittedly *not* found in undisturbed strata, the Jacobs Cavern carved "Mastodon" bone must stand or fall upon its own merits. X-ray photographs and specific gravity determinations show this bone to be mineralized; inspection shows that mineralization occurred *after* the carving. Comparative photographs under six definite wave-lengths of light indicate that the bone is old and likewise the carving. Chemical and physical analyses (by experts in these fields) of samples taken in the presence of Mr. Nelson (and their position recorded photographically) show the presence of a second, lower, inhabited layer not examined by Mr. Nelson. The perforation of the carved bone was from both sides; these two holes taper and meet at a slight angle—the shortness and taper of these holes are characteristic of stone drills. The head of the elk-like effigy on the reverse apparently takes advantage of a crack, while the wavy marks on the same side ignore several cracks.

Against these definite data stands the sincere guess of an eminent archeologist.

VERNON C. ALLISON

THE MISPRONUNCIATION OF "DATA"

APROPOS of the controversy concerning the singular and plural usage of "data," may attention be called to the fact that this word is mispronounced much more commonly and with less justification than it is incorrectly used in writings. Probably no other word in the vocabulary of the average scientist is mispronounced more generally. Merely as an example of this fact, the incident mentioned below is noted from

the last annual meeting of the Pacific Division of the American Association for the Advancement of Science. The pronunciations "dāta" and "dāta" were used by two different persons on the program at one of the general meetings. In a meeting of the section on entomology one speaker pronounced the word "dāta" another pronounced it "dāta" and a third said "dāta." The leading dictionaries including Funk & Wagnall's New Standard and Webster's New International give only one pronunciation, namely, dāta.

In some respects this matter may seem too trivial to be mentioned. However, the student in high school, college and university, and Mr. Average Citizen have come to regard the scientist as one who is peculiarly exact and correct, and this ideal is not enhanced when scientists, in classroom instruction and in public addresses, are careless to the extent of mispronouncing a word that is used so commonly by scientists in general.

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SCIENTIFIC BOOKS

Les problèmes de la physiologie normale et pathologique de l'os. R. Leriche et A. Policard. Masson et Cie, Paris, 1927.

THIS book of 229 pages, including 23 text figures and an extensive bibliography of 219 titles, is dedicated to the memory of Leopold Ollier, "originator of modern bone physiology." The book represents the fruit of a collaboration extending over a period of ten years. It assembles in a convenient and logical unit much of what had been scattered under separate and joint authorship through various journals since 1909. A new theory of osteogenesis is here developed and firmly based on a large body of data, histological, experimental and radiographic. This theory furnishes a consistent interpretative key for the explanation of certain apparently contradictory facts in normal bone development and regeneration. It explains, moreover, diverse and obscure pathologic condition of bone formation. It reconciles the paradoxical aspects of the current view of osteogenesis which regards the so-called osteoblast, when operating alone, as a bone builder, and when fused in masses, as a bone destroyer or osteoclast.

Osteogenesis is interpreted in essence as a condition of osseous metaplasia of fibrous connective tissue. This is shown to occur in four stages, whether the connective tissue be embryonal, or mature fibrous: a, edematous infiltration; b, multiplication of fibrils; c, conversion of the interstitial fluid into a gelatinous

³ Nodon, A., 1924. *Comptes Rendus*, clxxviii, 1101.

⁴ Keenan, G. L., 1926. *Chemical Reviews*, iii, 95.