the conservation of hearing and of eyesight, the general biology of the human body and a complete duplicate of the nutrition exhibit "Food for Health."

THE Ordnance Distinguished Service Award has been granted to the Case School of Applied Science. The presentation took place at an all-college convocation, on October 20, and the presentation address was given by Brigadier General A. B. Quinton, Jr., chief of the Detroit Ordnance District Office, representing Major General G. M. Barnes, chief of the Research and Development Service of the U. S. Ordnance Department. This award is in recognition of the work of the department of metallurgical engineering, particularly for the work carried forward by Dr. George Sachs, professor of physical metallurgy, as technical supervisor. His work and that of a group of graduate assistants was carried out with the cooperation of the Frankford Arsenal. At the convocation an address was made on "Metals in War and in Peace," by Dr. Clyde Williams, director of the Battelle Memorial Institute and chairman of the War Metallurgy Committee.

Nature writes: "At the beginning of the war, a number of scientific men in England and France became conscious of the lack of close knowledge and contact between the science and scientific workers of the two countries. As a result, they founded in April 1940 an Anglo-French Society of Sciences to assist the removal of this lack of mutual knowledge. The society was organized in two groups, under the presidencies of Professor P. A. M. Dirac and Professor F. Joliot. The occupation of France interrupted normal proceedings, but during the occupation some members became very prominent in the French resistance movement. The liberation of France has enabled the society to hold its first conference, which was on the topic of 'The Solid State,' and was held in London on January 20 at the Society for Visiting Scientists. Professor Joliot and Mme. Irene Curie-Joliot traveled from France to take part in the proceedings, and were accompanied by Professor Wyart, Dr. J. Laval and Dr. Mathieu."

RECOGNIZING the increasing importance of the communications field, the French Government has decided to establish a modern National School of Telecommunications. Its specific function will be to connect all scientific research on this subject directly with the working industry. Modern and specialized laboratories have already been built, and it is expected that regular courses will be opened soon.

ACCORDING to *Current Science* the Council of Scientific and Industrial Research of India will divide the Laboratories of the Board of Scientific and Industrial Research into two sections—a chemical laboratory and a physical laboratory—with a view to facilitating their amalgamation, respectively, with the National Chemical and the National Physical Laboratories, the plans for which have already been drawn up. Dr. S. Siddiqui will be placed in charge of the chemical section, and Dr. Lal C. Verman will be responsible for directing the work of the physical section.

DISCUSSION

SIR ISAAC NEWTON AND THE SENSITIVE RADIOMETER

IN "Contributions from the Mount Wilson Observatory," *Astrophysical Journal,* Vol. LXIX, pp. 293–311, 1929, I described a tiny radiometer with triple vanes cut from house-fly's wings. It was used with some success to measure the distribution of energy in the spectra of the brighter stars, with the aid of the 100-inch reflector.

As first set up, in a sealed quartz tube filled to 0.2 millimeters mercury pressure with hydrogen gas, the tiny suspension, whose weight was 0.94 milligram and total moment of inertia was 290×10^{-9} gram centimeters^2, had a time of single swing of 12 seconds. But in an ill-advised moment I cleaned the outside of the quartz tube. It became electrified. The time of single swing dropped below one second and never recovered beyond 1.5 seconds thereafter, despite all attempts to discharge the electric field of force.

We have made several fruitless subsequent attempts to overcome this difficulty. My colleagues, Messrs. Hoover and Clark, used a tube painted with colloidal graphite, leaving only a small aperture clear to admit radiation. But this clear spot was sufficient to bring ruinous electric influences.

I have recently read Dr. Cajori's exhaustive historical treatment of the circumstances which led Sir Isaac Newton to defer his announcement of the law of gravitation from 1666 to 1686. He shows that Newton must have been aware in 1666 of several fairly accurate determinations of the length of 1° of the earth's circumference. Hence the generally accepted explanation of the delay, namely, that he failed to get good agreement on the moon's motion until Picard's results became known, is inadmissible. Cajori agrees with Adams, Glaisher and Turner that the real reason for Newton's delay was one of exact accuracy which might not have weighed with lesser men. The moon is so far away that any error in assigning the position of the seat of the attractive center within the earth would be negligible. But when one announces as a law that every particle of matter attracts every other particle with a force proportional to the product of their masses, and inversely to the square of their distances apart, and applies it to the attraction of bodies near the earth, then it makes a difference where within the earth the seat of attraction lies.

So it was not until about 1685 when Newton demonstrated the beautiful propositions related to attractions within and without the earth, including that of the zero force of attraction of a homogeneous shell upon any point within the shell, that he could locate the earth's seat of attraction definitely at its center. Then he was able to announce his law of gravitation.

When all our attempts to free the radiometer of the pernicious effects of electrostatic fields had failed, I bethought me of this beautiful theorem and its electrical analogue that the force within a closed conductor is zero. I suggested to my colleagues that we insert a brass tube, of rather small radius, centrally within the quartz tube which contains the radiometer. Small holes are bored through the brass tube to admit radiation and the viewing of the vanes, and another opposite the reflecting mirror. We feared, indeed, that the holes might introduce disturbance, because the shielding would be not quite complete.

To our great delight this device works favorably. No electrostatic fields we can create on the outer quartz tube seem to greatly modify the time of swing of the radiometer suspended within the brass shield. Thus Sir Isaac Newton's beautiful theorem has saved the day for the radiometer of highest sensitiveness.

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A 2,3-BUTANEDIOL-GLYCEROL FERMENTATION[1]

FORD'S strain of *Bacillus subtilis* (A.T.C.C. 2586) produces 2,3-butanediol and glycerol as the main products when grown at 30° C. on a glucose solution (3 per cent. glucose, 1 per cent. yeast extract, 1 per cent. $CaCO_3$) at pH 6.0–6.8 under anaerobic conditions. For each 100 mols of glucose fermented 57 mols of 2,3 butanediol, 40 mols of glycerol, 20 mols of lactic acid, 13 mols of ethanol and 5 mols of formic acid were found. The glycerol was isolated and identified as the tribenzoate and tri-*p*-nitrobenzoate; in each case a mixed melting point determination was made with an authentic sample. Ethanol was similarly identified as the *p*-nitro benzoate. Lactic acid was isolated as lithium lactate and identified by quantitative oxidation to acetaldehyde in boiling, dilute permanganate solution. The 2,3-butanediol was purified by distillation. Judging from its physical properties it is a mixture of the *levo* and *meso* isomers in approximately equal amounts. It was identified by bromine oxidation to diacetyl, the latter being identified by the melting point of its *bis*-phenyl-hydrazone. To the best of our knowledge this is the first time any species of bacteria has been shown to yield glycerol as a product of carbohydrate dissimilation.

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[1] This work will be described more fully in the *Canadian Journal of Research.*

IS CASTE DIFFERENTIATION IN ANTS A FUNCTION OF THE RATE OF EGG DEPOSITION?

THE problem of caste differentiation in ants has been a moot question for many years. William Morton Wheeler, in a posthumously published book,[1] describes the situation as follows:

> It must be admitted—that the brood relationship in ants is so elaborate, the difficulties of submitting it to controlled experimental investigation so great, and observations of it so conducive to conflicting "explanations" that the controversy concerning the determination of castes in these insects has persisted with little change for years. This is shown by the attitudes of the two very eminent myrmecologists, Emery and Forel. Although both were thoroughly conversant with all the relevant facts established during their lifetimes, Emery, nevertheless, remained an intransigent trophogenist throughout his career, and Forel—was as thoroughly convinced that the castes are determined in the egg.

In view of this situation it is not surprising that it is through studies of non-social groups of Hymenoptera closely related to the ants that a possible answer to the problem of caste determination has been revealed, an answer that appears to reconcile the views of Emery and Forel.

Recently several students of the Hymenoptera have made observations which suggest that the castes are determined in the egg by trophogenic means.[2,3,4]

The amount of nutriment in a normal hymenopterous egg may be either sufficient or insufficient for the complete development of the embryo. The eggs of certain endoparasitic species appear to be devoid of nutriment. In the case of the chalcidoid *Coccophagus capensis* the egg contains enough nutriment for the development of the male embryo but not enough for the development of the female embryo. The female embryo obtains the necessary additional nutriment from the host by means of a trophic membrane.[5]

[1] William Morton Wheeler, "Mosaics and Other Anomalies Among Ants." 95 pp. Cambridge: Harvard University Press. 1937.
[2] W. Goetsch, *Naturwissenschaften*, 25: 803–808, 1937.
[3] Rudolf G. Schmieder, *Ent. News*, 50: 125–131, 1939.
[4] P. W. Whiting, *Jour. Hered.*, 29: 189–193, 1938.
[5] Stanley E. Flanders, *Jour. Econ. Ent.*, 35: 108, 1942.