body weight of the vitamin D deficient group is approximately 60 per cent. of that of the normal group, the average weight of the gall bladders of the former is slightly more than twice that of the latter.

Whether the enlarged gall bladder is characteristic of the vitamin D deficient condition or whether it is found in chicks deprived of other dietary factors is not known.

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A TREMATODE FROM THE CLOACA OF THE GULL

RECENT experiments at the Marine Biological Laboratory, Woods Hole, Massachusetts, have shown that the oyster drill, *Urosalpinx cinereus,* is the snail host of *Parorchis avitus* (Linton 1914),[1] the adult trematode having been originally described from the herring gull, *Larus argentatus.* The cercaria was found by Stunkard in the summer of 1930 and a complete description of it has been submitted for publication. On account of the resemblance of this larva to *Cercaria purpurae*[2] which has been reported by Lebour and Elmhirst[3] to be the cercaria of *Parorchis acanthus* (Nicoll),[4] it was suggested that the present species might be the cercaria of *Parorchis avitus.*

Most of the larvae encyst on the bottom of the dish within forty-eight hours after escaping from the snail. They have not been found to encyst in the mantle of *Mytilus edulis,* as reported by Lebour and Elmhirst for the cercariae of *Parorchis acanthus.* This gives another specific difference between *Parorchis avitus*

and *Parorchis acanthus.* The cysts were fed to tern nestlings which were brought into the laboratory shortly after hatching. Twelve flukes were obtained from the cloaca of a single bird which was killed ten days after the infestation was established. Although the worms recovered were not sexually mature, they were readily identified as *Parorchis avitus,* and this identification has been confirmed by Dr. Edwin Linton. Experiments are now being made in order to obtain mature worms and to complete the life history by infesting the snail. A detailed account of this work will appear at a later date.

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HYBRID WORDS

"SHAPOMETER" is a good expressive word, and Messrs. Tester and Bell are to be commended for disregarding pedantic conventions to secure a good word that suits their purpose. If such words are "obvious hybrids, interdicted by good usage," as stated by Mr. Dayton in the issue of June 26 (73: 704), it is time for scientists, who live in the present and face the future, to change the usage. Our language contains far too many words like "morphometer" or "psephometer" formed with undue consideration of a dead language and too little consideration of the needs of a living language and a progressive people. The English language would be in better shape if some people knew less Greek and Latin.

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REPORTS

GRAVITATIONAL AND ELECTROMAGNETIC FIELDS

PROFESSOR ALBERT EINSTEIN has recently completed a part of his work (in collaboration with Dr. Walter Mayer) on the "Unitary Theory of Gravitation and Electricity." It will be published in the near future probably in Pasadena in connection with Professor Einstein's investigations of last winter. Meanwhile Professor Einstein has prepared a preliminary announcement for the Josiah Macy, Jr., Foundation, under a grant from which the work was done. The statement was prepared by Professor Einstein in German, and the publication in English has been authorized by him. It reads:

Ever since the formulation of the general relativity theory in 1915, it has been the persistent effort of theoreticians to reduce the laws of the gravitational and electromagnetic fields to a single basis. It could not be believed that these fields correspond to two spatial structures which have no conceptual relation to each other. Thus arose the theories of Weyl and Eddington, which, however, have been abandoned by their authors, the theory of Kaluza and also the theory of distant parallelism. After we both had worked more than a year on the further development of the last theory, we reached the conclusion that we were striving in the wrong direction and that the theory of Kaluza, while not acceptable, was nevertheless nearer the truth than the other theoretical approaches.

Kaluza's theory rests on the assumption that the

[1] *Proc. U. S. Nat. Mus.,* 46: 551–555, 1914.
[2] *Trans. Nat. Hist. Soc.,* Newcastle, n. s., 1: 437–454, 1907.
[3] *Jour. Mar. Biol. Ass'n,* Plymouth, n. s., 12: 829–832, 1922.
[4] *Quart. Jour. Mic. Sci.,* 51: 345–355, 1907.

physical space-time continuum is five dimensional (instead of, as formerly, four dimensional) in which the empiric four-dimensionality of the physical continuum can be accounted for by the hypothesis that the physical variables are independent of the coordinate $\times 5$. By postulating a Riemann metric in five dimensions, Kaluza reaches field laws which agree in first approximation with the known field laws of gravitation and electricity.

Among the considerations which question this theory stands in the first place: It is anomalous to replace the four-dimensional continuum by a five-dimensional one and then subsequently to tie up artificially one of these five dimensions in order to account for the fact that it does not manifest itself.

We have succeeded in formulating a theory which formally approximates Kaluza's theory without being exposed to the objection just stated. This is accomplished by the introduction of an entirely new mathematical concept which may be described as follows:

Until now it has been believed that one can introduce into a space of n dimensions only vectors or vector-fields of which the number of components agrees with the number of dimensions of that space. It appears, however, that this restriction is not necessary. It has its origin in the "anschauliche" significance of those vectors responsible for the formulation of the vector concept. We have been successful in introducing into space R_n of n dimensions, vectors $a^i (i = 1 \ldots m)$ of m components and in deriving a calculus of such vectors and tensors which is essentially no more complicated than the well-known absolute calculus.

Our theory arises quite readily from consideration of five-vectors (five components) in the four-dimensional continuum. There follows from that a "five-curvature" of space which is analogous to the Riemannian curvature, and which bears a similar relationship to the laws of the unitary field that the Riemannian curvature does to the relativistic equations of the gravitational field alone.

This theory does not yet contain the conclusions of the quantum theory. It furnishes, however, clues to a natural development, from which we may anticipate further results in this direction. In any event, the results thus far obtained represent a definitive advance in knowledge of the structure of physical space.

SCIENTIFIC APPARATUS AND LABORATORY METHODS

PROTECTIVE COATINGS FOR MINERAL AND ROCK SPECIMENS[1]

A LARGE number of density determinations are made in this laboratory on rock specimens, many of which are very porous and some quite friable. The method used was described by Gealy[2] and consists of measuring the volume of the specimen by noting the displacement of mercury in a Russell tube, the weight of the mass and the volume of the grains. In 1920, Melcher[3] described a method for determining pore space of oil and gas sands in which he coated the specimens with paraffin to prevent loss of material and penetration of the immersion liquid. The amount and volume and density of this paraffin had to be determined and account taken of these factors in computing the pore space of the sand. Furthermore, great care had to be exercised in the application of the paraffin to keep it from penetrating too deeply into the specimen and to prevent or eliminate air bubbles in the paraffin itself which would vitiate volume measurements. Gealy substituted mercury for acetylene tetrachloride in the Russell apparatus in order to eliminate the use of paraffin. However, it was found that even mercury has a tendency to penetrate the very large pores of a rock and often erroneous volume measurements were obtained.

This difficulty has now been overcome by the use of a new protective coating consisting of a solution of ordinary photographic film in butyl acetate. The emulsion is thoroughly cleaned off of used film by digestion in hydrochloric acid. Just enough butyl acetate is used to cover the film and it is set aside in a closed vessel to dissolve. Solution takes place quite slowly. It is necessary to filter, using a suction filter, to obtain a product that is free from strings. When applying the coating of film scrap to a specimen it may be diluted with acetone if necessary. The solvent evaporates very rapidly and seems to leave a plug of film in the outer pores that effectually prevents penetration of a non-solvent liquid. No readily discernible coating is left on the specimen. By trial it has been shown that the volume of the coating can be ignored for all practical purposes since it affects the percentage pore space volume only in the third decimal place.

Another very important and possibly extensive use for film scrap solution, once it is known to scientific men, is in the preservation of museum specimens. A specimen of sandstone that was so friable it could not be touched without considerable loss of material was covered with film scrap applied with a camel's hair brush. In a few moments it was dry and in appearance the coated specimen could not be distinguished from an uncoated one. However, it can now

[1] Published by permission of The Gulf Companies.

[2] W. B. Gealy, Bull Amer. Assoc. Pet. Geol., Vol. XIII, 1929, Part 1, p. 677.

[3] A. A. Melcher, Trans. Amer. Inst. Min. Met. Eng., Vol. LXV, p. 469.