ments in both plants and animals have been discovered, and the proper corrective measures applied. A quickly devised procedure for combating mites has saved many tons of tomatoes for processing; an accurate method for determining butterfat content of milk has greatly advanced the dairy industry and inaugurated new research projects; disease control has made livestock concentration possible and stabilized financial investments therein; the amount of labor required to produce crops and improve quality has been reduced through labor-saving machinery; and a more accurate knowledge of the labor requirement of various crops has provided essential data on their relative desirability for food production during periods of stress. In projects of this sort the worker has been closely in touch with the needs of the industry.

The Hatch Act of 1887, in establishing agricultural experiment stations, defines their purpose as follows: "To aid in acquiring and diffusing among the people of the United States useful and practical information on subjects connected with agriculture, and to promote scientific investigation and experiment respecting the principles and applications of agricultural science." Vital research is the purpose of this act. The early agricultural studies indicated a desire to solve vital problems affecting the food security and health of our citizens and thus to increase our agricultural wealth. This point of view predominated for some time. With the increase of staff members, there gradually developed at some stations a group primarily interested in more indirect applications or in merely widening our horizon of knowledge. The value of much of their work and training has been proved repeatedly, but most vividly when the war suddenly focused our attention on providing food, shelter and clothing. For the first time in many years, workers in other sciences were striving with agricultural personnel towards a common goal. The constructive gains made through this cooperation must be preserved. Vital research needs the cooperation of all workers.

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THE ACTION OF AMINO ACIDS ON COLOR CHANGE IN FUNDULUS

IN the course of some work on Fundulus it was noticed that those fish that were injected intraperitoneally with a mixture of amino acids turned dark in a few minutes if they were light or if they were dark and removed to a light environment they remained dark.

The fish were injected with a mixture of amino acids[1] in 15 per cent. solution containing amino acids as derived from the acid hydrolysis of casein fortified with tryptophane. The approximate analysis as furnished by the manufacturer is: Total nitrogen 2 per cent., alpha amino nitrogen, approximately 75 per cent. of total nitrogen, tryptophane 1 per cent. of amino acids, calcium 0.01 per cent. to 0.02 per cent., sulfates 0.01 per cent., phosphates, iron and magnesium a trace. pH approximately 4.0.

The fundulus were removed from the aquarium and immediately injected intraperitoneally through a 27-gauge needle with doses ranging from 0.05 cc to 1 cc of the mixture of amino acids. They were placed in containers of either aerated or running sea water, some of which were over light backgrounds and others over dark.

With doses of 0.5 cc and 1 cc none of the fish turned light and those that were light before injection turned dark in about five minutes. Controls uninjected and injected intraperitoneally with 1 cc of sea water turned light when placed over a light background. The controls injected with 1 cc sea water survived, as did those injected with 0.5 cc amino acid mixture. Those injected with 1 cc of the amino acid in the morning died during the night; their abdomens were very red and swollen.

This information is published for the benefit of those interested in color changes in fish, as the writer has no intention of pursuing this problem.

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A STRANGE COINCIDENCE OF ERRORS

IN clearing out old papers I am reminded of a most curious coincidence of errors which hitherto has never been fully published. My late colleague, F. E. Fowle, and I determined the dispersion of rock salt, as published by Langley in Volume I of the *Annals of the Smithsonian Astrophysical Observatory* in the year 1900. Our values of wave-length and refractive index were fitted by a least squares solution to the 5-constant formula of Ketteler, by the late Professor H. H. Kimball, of the Weather Bureau. I have his original manuscript before me. Kimball computed from his constants, derived entirely from our work, the indices of refraction corresponding to the wave-lengths 13.96 microns and 22.3 microns, which had shortly before been observed by Rubens and Nichols, and by Rubens and Trowbridge.[1] The following are

[1] Marketed by Frederick Stearns and Company, Detroit, Mich., under the name of Parenamine. I am indebted to the manufacturers for a supply of this substance.

[1] *Ann. der Phys. u. Chemie,* Bd. 60, 1897, pp. 454 and 733.

the computed results of Kimball and observed by these authors, respectively:

Wave-length λ	Computed n_1	Observed n	$n - n_1$
13.96	1.436526	1.4373	+ 0.000774
22.3	1.339977	1.340	+ 0.000323 [sic] corr. + 0.000023

In *Annalen der Physik*, 6, 1901, pp. 624, 625, F. F. Martens states in footnotes that for the wave-length 13.96 the German authors had made a correction,[2] giving $n = 1.4627$. He also points out that Kimball's constants should give for this wave-length the value 1.4635, and says: "Dieser Fehler ist . . . höchst befremdend." He then goes on to quote our values of *n*, cutting off from them the fifth and sixth places of decimals which had been published in Volume I.

In 1901, immediately after seeing Martens' article, I checked Kimball's work. I found that all his logarithms were correct, but that in setting down the number corresponding to the final logarithm he had erroneously transposed the figures 3 and 6, so that his value as published in the *Annals* should have read $n = 1.463526$. The corrected $n - n_1 = -0.000826$.

Later, Dr. F. Paschen made a beautiful determination of the dispersion of rock salt,[3] carrying on to much longer wave-lengths than we had done. He disagrees sharply with Martens, who thought the fifth and sixth places of decimals in *n* in our work should be thrown away, saying that he finds it up to 2.3 microns "von bewundernswerter Präzision." Up to and including the wave-length 4.12 his values and our values of *n* differ only a few units in the sixth decimal place, as shown by Table 394, p. 360, Smithsonian Physical Tables, 8th Revised Edition. I wrote to Dr. Paschen expressing my gratification and telling him the nature of Kimball's error as related above. I received a very kind reply.

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[2] *Ann. der Phys. u. Chemie*, Bd. 61, 1897, p. 224.
[3] *Ann. der Phys.* Bd. 26, 1908. See pp. 120, 121, 132.

RECENT HIGH MORTALITY AMONG GEOLOGISTS

IN the issue of SCIENCE for December 29 Dr. Sidney D. Townley offers a criticism of my note in the issue of May 26 under the caption "Unusual Mortality among Geologists." I there drew attention to the very high mortality, sixteen fellows of the Geological Society, for the period between November 15, 1943, and April 18, 1944, slightly more than five months.

To quote Dr. Townley, "Only two of these deaths occurred in 1943, so if we stick to annual totals it is quite probable that 1943 will show nothing unusual. . . ." The figures were available to Dr. Townley, and he could have known that the death losses for the year 1943 (15) were the highest in the society's half-century of existence up to that time, with exception of the years 1934 and 1935, when they were 19.

We entered the war a few weeks only before 1942 and the society's losses by death for the three-year war period 1942 to 1944 have been 51, the greatest for any three-year period in the 56 years of its history. This figure was approached only once; in the period 1933 to 1935, when the losses were 47 (a fraction of one per cent. higher if membership increase is taken into account). The next highest loss for a three-year period was 31.

I hold no brief for my suggestion that the latest high mortality may in part be due to the war. It was offered as a suggestion only, and I have no suggestion even to offer for the high death losses of the period 1933 to 1935. Dr. Townley tries to explain the sixteen deceased fellows of November 15, 1943, to April 18, 1944, by the large number of geologists who were drawn into the profession by LeConte, Branner and Chamberlin at the time when the sixteen must have been undergoing their training. Unfortunately for this hypothesis no one of the sixteen came under the training of any one of the three, as reference to "Who's Who" would have shown.

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SCIENTIFIC BOOKS

PHYSICS FOR THE GENERAL READER

Physics Tells Why. By OVERTON LUHR. Illustrated by Ruth C. Schmidt. ix + 318 pp. Lancaster, Pa.: The Jaques Cattell Press. 1943. $3.50.

THE modest subtitle of this book is "An Explanation of Some Common Physical Phenomena." Actually the book does more than this implies since, in addition to explaining many phenomena, it also gives a systematic development of the elementary principles of physics, grouped in nearly the usual manner under mechanics, electricity, light, heat and sound, with a concluding chapter on radiation and atomic physics. Thus the basic framework is not far from that of the traditional text-book of general physics.

There is, however, a marked difference from the usual text, aside from the omission of numerical problems and all but a few of the most elementary equations. This difference, which incidentally justifies the subtitle, is that the reader is led to basic principles, not by laboratory experiments designed to illustrate them, but by ordinary experiences of household, street and field. A certain degree of precision