Where was this factory, and who was the manager? It was the United States Government or any large museum or university in the land! Here is some recent evidence:

"I have two important papers that probably will not see the light for a year or more. Sooner or later we will have to come to the rationing method and apportion to each department so many pages per year."—Letter from one of the most distinguished workers in a large museum, December, 1924.

The United States Printing Office can not or does not nearly meet the requirements of the U. S. National Museum. It is true that the actual printed output is large, but it is not nearly what it would be if all the work done, or capable of being done, were fully utilized.

The *Nautilus,* the American journal dealing with the Mollusca, reporting in the main work done by the National Museum, Philadelphia Academy, etc., has to be subsidized out of the pockets of the editors, and will have to suspend if the support given to it is not increased. (England supports two such journals.)

There is a much older and more famous American scientific journal which is heavily subsidized by the editor, but I am not at liberty to cite the name.

Entomological News, another leading scientific journal, is finding it impossible to continue on the present basis.

Writers of monographs have to split them up and publish the fragments, in order to get any publication at all.

Museums contain valuable materials which are not studied because the results could not be published.

All this is happening in the richest country in the world. Why? Because men of science do not see things in a large way, and do not stand together. Because many, who should be supporting science and education, are absorbed in the pursuit of wealth. Because the results of scientific work have not been presented in a sufficiently intelligible way, and this is partly due to the condensation necessary on account of the conditions described. Democracy can not succeed without publicity, and no one knows what might be done if men of science would unite in the effort to place their goods on the markets of the world. As it is, the hungry public, deprived of the bread of life, tries to find nourishment in cross-word puzzles.

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ATTENDANCE AT COUNCIL MEETINGS OF THE AMERICAN ASSOCIATION

FROM Professor Henry B. Ward has been received the following justly pointed note: "In the issue of SCIENCE for February 6 I find a list of the Association Council with a supposed record of attendance at the council meetings in Washington. I am reported as having been present at one meeting only, whereas I was present at all meetings and was late at one meeting only. I should not call attention to this matter and request the correction of the record if it were not that the comments in connection with the roll so directly criticize the absentees that I am unwilling to have the error in this case stand uncorrected."

It is unfortunate indeed that such an error as this should have occurred with reference to a council member whose record of attendance and active interest is so uniformly high as is that of Professor Ward. It is of course impossible to explain or excuse the falsification, which has, however, now been corrected in the official records of the permanent secretary's office. Experience demonstrates that the securing of an attendance record for the council meetings is, under the circumstances, not nearly so easy of accomplishment as might be supposed, and when errors do occur it is very fine indeed to have them promptly reported, as in the present instance. The method employed in securing these supposed records of attendance will be still further improved for future meetings and there is hope that errors therein may ultimately be wholly prevented. Errors should be reported to the secretary of the council.

Adverse criticism of absence from the council sessions (see pages 131 and 132 of SCIENCE for February 6) is generally just, and that there should be necessity for such criticism is naturally greatly regretted by the members of the association. The permanent secretary has been more than once instructed by the executive committee of the council to emphasize strongly the great desirability of full attendance at the council sessions. The affairs of the association are always greatly in need of the active interest of all council members.

We are very thankful to Professor Ward for his cooperation.

SAM F. TRELEASE,
Secretary of the Council
BURTON E. LIVINGSTON,
Permanent Secretary.

SCIENTIFIC BOOKS

Studies in Human Biology. By RAYMOND PEARL. Baltimore, Md., Williams and Wilkins Co., 1924, 653 pp.

DR. PEARL'S volume, "Studies in Human Biology," consists of a collection of articles which are in most

cases reprinted, with only minor modifications or corrections, from the journals in which they originally appeared. The articles deal with a wide range of subject-matter, but in general they are concerned with problems of vital statistics which have been investigated by the mathematical methods of the biometrician. The first two contributions deal with the weight of the human brain and the relation between intelligence and head size, the author's results on the latter topic confirming the conclusions of Pearson that there is a slight but "no marked correlation between intelligence and the size of the head."

The next chapter on "Race crossing and the sex ratio" is based on data obtained from the city of Buenos Aires between 1896 and 1905. Comparing the sex ratios of offspring from pure and mixed matings, it was found that "the proportion of males to females is in every case greater when the parents are of different racial stock than when they are of the same." "This preponderance of males," it is stated, "appears not to be capable of explanation as the result of environmental or demographic influences," although Dr. Pearl does not consider his results as absolutely conclusive. It is not improbable, *a priori*, that the sex ratio in man is influenced by crossing. But it seems to us that Pearl's data, which have frequently been referred to in discussions of the subject, are quite inadequate to establish this fact. Reported sex ratios are liable to considerable fluctuation owing to peculiarities of social environment, as is illustrated in the next chapter on "The sex ratio among the Jews." After quoting some extraordinary sex ratios among the Jews of various countries—ratios such as 119.1, 129.5, 115.4, 133.1, 145.9 and even 177.4—and after comparing these with other and apparently more reliable data, Pearl has concluded, and we think rightly, that these high ratios are untrustworthy. In the light of these results, it might be thought that Pearl would have been led to regard with suspicion the result of his previous findings with data from Buenos Aires, but he has republished the original paper with little change. The sex ratios of the products of interracial crosses in Argentine are no higher than one might expect to find in any pure-bred stock. The difference in question is due to the fact that the sex ratios of the Argentine, 103.26 ± 0.69, and of the Italians, 100.77 ± 0.41, are unusually low. The Italian ratio, 100.77 ± 0.41, should inspire the student of vital statistics with extreme caution, especially since the sex ratio of Italians in Italy is essentially like that of most other peoples. In fact, as Gini has remarked, the sex ratio is one of the most constant characters of the human species. Nevertheless, we find that, for some reason, reported ratios are sometimes exceptionally high or low, but owing to the many circumstances that cause sex ratios, as reported, to vary, these records are for the most part unreliable.

Chapter five, on "Congenital malformations," represents the author's first paper on vital statistics. The mean age at death from congenital malformations was found to be about the same for men as for women, but "the variation in the age at death from such malformations, as measured by the standard deviation, is significantly greater in women than in men." Hence Pearl concludes that "in intensity or degree of the malformations woman is more variable than man." The character chosen as a measure of the degree of the malformation is duration of life, which is the only measure the statistics afford. But is it legitimate to argue that because women show a greater standard deviation than men as regards the *time* at which they die, the degree of malformation is more variable in the female sex? Men die much more frequently from malformations than women. This may be due in part to their greater weakness in their first years of life, when most of such deaths occur, although it might reasonably be held to indicate a greater extent of malformation in the male sex since the wider departures from the normal are naturally more apt to prove fatal. It is, we think, quite futile to attempt to gage the degree of malformation in the two sexes by the standard deviation in the ages of the two sexes at death. Pearl has shown in the next chapter on "Centering infant mortality" that the standard deviation in the age at death of infants dying in the first year is much greater for legitimate infants than for those which are illegitimate. As the latter, like the male sex, have a higher death-rate, this fact has, we think, an important bearing on the interpretation of the peculiar sex ratio of deaths from malformations.

Chapter seven, on "Mortality and evolution," begins with a criticism of the international classification of the causes of death, the author developing for the purpose in hand "an entirely different general classification of the causes of death on a reasonably consistent biological basis." This consists essentially in grouping causes of death under the organ systems whose breakdown leads to fatal results. A good deal of space is devoted to discussing the relation of the various categories of the international classification to the organological groupings, but this is preliminary to obtaining a numerical tabulation of the mortality rates due to diseases attacking the various organ systems. Having arranged the causes of death according to systems of organs, Pearl goes on to group dis-

eases on the basis of the germ layers from which the organ systems are derived. The chief offender among the germ layers is the entoderm; the mesoderm is next in order, and the ectoderm is the least liable to disease of all. The reader who may have been wondering what all these facts have to do with evolution is now given the evolutionary interpretation. "The ectoderm has changed most in the course of evolution, having differentiated an elaborate nervous system and sense organs as well as a specialized, adaptive outer covering." Hence the ectodermic organs "break down and lead to death less frequently than any others." The entoderm, on the other hand, is "a very old-fashioned and out-of-date ancestral relic," relatively little differentiated and hence a prey to frequent infirmities. The mesoderm with more differentiation meets with somewhat less frequent misfortunes. I can not but think that Pearl's evolutionary interpretations are somewhat forced. It seems more reasonable to interpret the results simply in terms of physiology. The entoderm with its moist surface exposed to an abundance of bacterial and protozoal infections, to say nothing of the attacks of other parasites, and subjected to the irritations due to dietary indiscretions and bibulous habits, offers a natural point of attack, and it is not surprising that it is afflicted by frequent ailments. Our poor entoderm may be old-fashioned and relatively undifferentiated, but there are more obvious explanations for its often infirmities.

The two following chapters on "The vitality of the peoples of America" and "Trends of vital indices" represent more important contributions. Both are based on compilations of recent statistics on births, marriages and deaths, and they endeavor to set forth the recent trend of vitality in the American people. Several important conclusions are drawn, many interesting questions are raised and, perhaps most valuable of all, attention is called to the shortcomings in our data needed for the final solution of many problems.

In the chapter on "The influence of physical activity upon mortality" Dr. Pearl presents evidence that high mortality after age 40 to 45 tends to be increased by hard physical labor. This is an important conclusion if it can be definitely established and evidence is cited to prove that the association between hard labor and high mortality, which Pearl finds to occur only *after* age 40 to 45, is not a secondary one, but due to the fact that hard labor is a frequent cause of physical breakdown.

Perhaps the topic of most general interest in Pearl's volume is his forecast of the future growth of populations. He has fitted the facts of population growth in several countries to curves expressed in a generalized equation and then made estimates of future population growth from the course of the curves. These curves, which are sigmoid in form, approach an upper horizontal line representing the theoretical upper limit of population growth. Some such curve, of course, had to be selected if predictions based on extrapolation do not lead to absurd conclusions. The date at which populations approach uncomfortably near the upper limit is for most countries not more than two or three generations in the future. The estimates would have been modified somewhat had Pearl considered various changes in boundaries which have occurred in several countries during the periods covered by the data. The United States in the period under consideration has really been a succession of countries, having added, through the Louisiana Purchase, the accession of Oregon and Washington, and the territories acquired after the Mexican war, a vast area, and several hundred thousand inhabitants. A curve of population growth under these conditions obviously differs considerably from what it would have been had the United States been confined to its original limits. The causes determining the rate of population growth are as yet very imperfectly understood, and the significance of the fact that such growth may be fitted to segments of curves is at present not apparent. We shall have to wait for some decades before we can safely formulate any general laws of population growth which have any biological significance. Pearl's curves have at least this much in their favor, that they represent population increase, after it has passed a certain point, as gradually approaching a fixed upper limit, and they harmonize fairly well with several predictions of population limits based on the probable capacity of the earth to supply food. All these predictions, as Pearl has pointed out, are made with the proviso that nothing unforeseen happens essentially different from the events which have influenced the history of population in this world up to date.

We can only mention various other contributions on other topics, such as the relation of heredity to tuberculosis; the biological factors in the epidemiology of influenza; biology and war; epidemic encephalitis; national food consumption and the interesting parallels between the mortality curves of Drosophila, Proales and man. Dr. Pearl's critical knowledge of biometric methods and his appreciation of the broader biological bearing of the problems he attacks give his contributions on these topics a unique value. Dr. Pearl is, as it were, breaking ground in the use of exact methods in fields to which their application is relatively new. They are fields in which there are many pitfalls, and if Dr. Pearl has not always succeeded in avoiding them he is much more wary than most of those who have ventured to draw many deductions from vital statistics. One discerns the in-

fluence of Professor Karl Pearson both in the matter and the manner of Dr. Pearl's productions. Although several of the articles are severely technical, they are written in an attractive style and the general reader who is interested in his own species, but who knows nothing of mathematics and little of biology will find in them material of interest. The serious student of human biology can not afford to neglect this volume.

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SPECIAL ARTICLES

UNICRYSTALLINE PALLADIUM WIRES

VARIOUS metals have within recent years been obtained in the form of "single crystal" wires, or wires in which the entire cross-section, save at exceptional points, is occupied by one crystal. The first metal to be so obtained appears to have been tungsten, and most of the subsequent studies of unicrystalline material have related to this metal. Other metals which have been prepared in unicrystalline form include molybdenum, aluminium, bismuth, lead, tin, zinc and cadmium, the work of Czochralski, of Polanyi and of Carpenter being particularly noteworthy in this connection.

Since the unicrystalline condition is the one in which a metal best lends itself to the investigation of many of its properties, experiments have been made by the writers with the purpose of producing unicrystalline wires of palladium. The palladium employed was a metal of exceptional purity, secured from the Bureau of Standards.[1] The treatment to which it was subjected consisted in causing the wire, after it had been drawn down to a diameter of approximately 0.05 mm (2 mils) and slightly annealed, to pass at a rate of 9.4 mm per hour past two mercury contacts, 25 mm distant from each other, while a current of from 550 to 600 milliamperes entered the wire through the lower, water-cooled contact, and left through the upper contact, which was not thus cooled. A considerable temperature gradient was in this way maintained in the portion of the wire included between the contacts, of which the hottest part was at a "yellow red." An asbestos enclosure served to protect the heated wire from draughts of air, in order that the variations of temperature might be as small as possible.

[1] The palladium was from that prepared in the recent investigations of the Bureau of Standards upon the platinum metals and came from a particular lot reported by the bureau in April, 1924, to be "nearly spectroscopically pure, containing a trace of calcium, but purer than any other palladium made or procured by the bureau."

Short pieces of the wires which had been thus treated were embedded in blocks of a 50 per cent. lead-tin alloy, which proved to have a convenient degree of hardness, and were then polished and simultaneously ground flat, with the finest grade of French emery paper. These specimens were etched by a three-minute immersion in a 1-normal solution of potassium bromide, saturated with bromine, or by a thirty-second treatment with aqua regia (3 HCl:1 HNO_3). Upon microscopic examination with vertical illumination, at a magnification of 200 diameters, they displayed clearly the appearances which Mark, Polanyi and Schmid[2] have described as characteristic of unicrystalline wires. Grain boundaries, while still to be found, occurred only at infrequent intervals; parallel etching lines marked the surface of the wire, and were unaltered in position by repeated etchings; and a system of ellipses, in planes which were parallel to each other but not to that of the etching lines, indicated points of incipient slip. In regions where the wire had been subjected to more than the average longitudinal stress it was seen to be constricted in one axial plane, but not in the plane normal to this, so that a ribbon had resulted. The fractured ends of treated wires which had been loaded to the breaking point exhibited a smooth plane of fracture, which formed an acute angle with the axis of the wire, instead of showing the irregular or cupped fracture of microcrystalline or untreated wire.

Rough measurements of the ductility of the wires, made by gradually increasing the tension upon lengths of from 80 to 159 mm, until rupture occurred, gave elongations which ranged from 0.7 to nearly 4.0 per cent. for three treated wires, while for two pieces of the untreated wire the elongations were too small to be measured by the method employed, being less than 0.2 per cent.

While no Roentgenographic examination has been made, it is therefore evident that palladium wires treated in the manner indicated are unicrystalline, and it is intended to study them further in respect to their occlusion of hydrogen, and to certain of their electrical and magnetic properties.

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GEOLOGICAL OBSERVATIONS ON THE ISLAND OF MAUI, HAWAII

THE island of Maui, the second largest of the Hawaiian group, is the principal section of a great vol-

[2] Mark, Polanyi and Schmid, *Zeit. Physik.*, 12 (1923), 58–72; 78–110; 111–116.