der the name of Pavlov's students; only occasionally does Pavlov's own name appear on a title.

The reader who is familiar with Pavlov's earlier researches on the digestive glands, for which he received the first Nobel prize awarded in the medical sciences, will be impressed with the continued high quality of mental activity disclosed in the present volume by the eighty-year-old investigator. The reader will also be impressed with the fact that Pavlov has become more speculative with advancing years. While Pavlov, on almost every page, emphasizes the necessity and importance of strict objectiveness in science, he almost as frequently disregards it, especially in the interpretations of sleep, and inhibitions and in the extension of data from dog to man. It is to be remembered that nearly all the objective experiments on conditioned reflexes reported from Pavlov's school have been done on the dog and mainly in connection with the feeding behavior. The philosophical aura permeating the present volumes adds more interest in the work on the part of the general reader than it contributes to the progress of science. As an instance in point might be mentioned the two short chapters in Gantt's translation headed: "Reflexes of Purpose," and "The Reflexes of Freedom." In the chapter on "Reflexes of Purpose" occurs the following paragraph:

> When the negative features of the Russian character—laziness, lack of enterprise, and even slovenly relations to every vital work—provoke melancholy moods, I say to myself, No, these are not real qualities, they are only the veneering, the damning inheritance of slavery. It made a parasite of the master, freeing him, through the unpaid work of others, from the practice of natural and normal striving to obtain his daily bread for himself and family, from the necessity of making his way in life; and it left the reflex of purpose without exercise in the fundamental habits of living.

Under the heading of "The Reflexes of Freedom" after a brief description of a kind of behavior of only one dog out of many hundreds of dogs investigated, Pavlov ends with the following story from fiction:

> In Kuprin's story, "River of Life," there is described the suicide of a student who was tormented by his conscience after having betrayed his companions to the police. From a letter of the suicide it was evident that he was made a victim of the reflex of slavery inherited from his mother, who was a *prijivalka*.[1] If he had had an insight into his condition, he would first have understood his limitation, and secondly he might by systematic measures have developed control and successful suppression of this reflex.
>
> [1] A parasitic servant of the nobility.

Gantt's translation contains some needless repetitions and, occasionally, interpretations that are abandoned in subsequent addresses. Neither volume contains any references to or accounts of investigations in the same field in laboratories other than Pavlov's. These investigations have frequently confirmed, but sometimes disagreed with Pavlov's actual findings or interpretations. It would have been interesting and valuable to have had the aged investigator's review of and reaction to the entire aspect of conditioned reflexes up to the year 1928. But we must be grateful to have at least the main body of contributions from Pavlov's own laboratory accessible in English. These volumes are of compelling interest to every educated man and woman. They are opening preludes in a problem as baffling as it is important. Pavlov himself would be the last man to describe them as a scientific finale. But we do actually seem to be making progress in the analysis of behavior on the basis of chain reflexes, conditioned by experience, memory and hormones. The reader will forget the minor defects in the books in contemplating, as Professor Cannon says, "the splendid example of industry and devotion to science which the first explorer in the field of conditioned reflexes has given during his long life." It is the unanimous hope of American physiologists that nothing may prevent Professor Pavlov's stimulating presence at the International Physiological Congress in Boston in August this year.

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The Story of the Moon. By GARRETT P. SERVISS. Appleton and Co. xii + 248 pp. 1928.

THIS is a book for the amateur astronomer and for the general reader, written in a simple manner and scientifically sound. It is divided into five main parts. The introduction contains a non-technical explanation of fundamental facts about the moon. Among these are described the origin and the orbit of the moon, its effect on terrestrial tides and the causes of lunar and solar eclipses.

The next three sections are devoted to a very thorough topographic study of the moon, which is made more intelligible by a series of fine photographs, obtained in 1903 and 1904 by Professor G. W. Ritchey and Mr. James Wallace at the Yerkes Observatory. The age of the moon, as pictured in these photographs, varies from 3.85 to 26.89 days, and all the points of interest are mentioned in the descriptions. Each important object is usually mentioned several times in connection with each photograph upon which it appears, under the changing conditions

of sunlight. The regions of unusual craters such as Tycho, Copernicus, Theophilus and those around Mare Serenitatis and Mare Imbrium are described more fully in the final chapter of the book. The whole text is in the form of a dialog between the author and a friend who starts with no knowledge of the subject.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

THE DISSECTION OF THE SPIRAL VALVE OF SQUALUS ACANTHIAS

A SATISFACTORY dissection of the spiral valve of *Squalus acanthias* usually proves to be a difficult task for students of comparative anatomy. In order to expose enough of the valve to make its analysis possible, a considerable portion of the intestinal wall must be removed. If the method of dissection employed involves the removal of a single longitudinal strip of the intestinal wall extending the length of the intestine, it follows that the spiral valve must suffer serious mutilation.

Fortunately, the lines of attachment of the spiral valve are approximately indicated at the surface of the intestine by branches of the anterior mesenteric artery. This anatomical arrangement makes it possible to remove portions of the intestinal wall without danger of damage to the spiral valve. There follows a brief description of one method of dissection which has proved quite satisfactory.

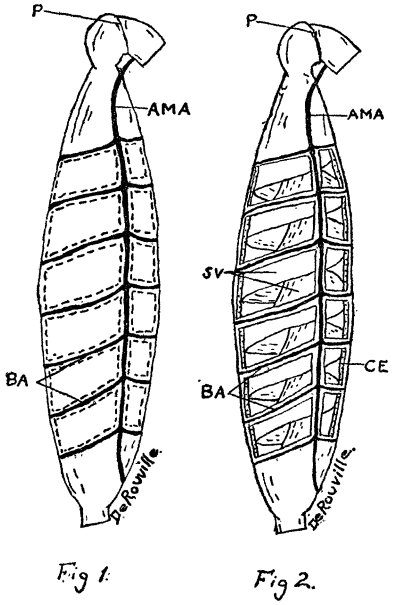

Fig 1. Fig 2.

AMA, anterior mesenteric artery; BA, branch arteries; CE, cut edge of the spiral valve; SV, spiral valve; P, pylorus.

Fig. 1 shows an undissected intestine with broken lines outlining portions of the intestinal wall to be excised. Fig. 2 shows the appearance of the intestine after dissection. By this method of dissection the intestinal wall is reduced to a mere skeletal support for the spiral valve which is left intact and sufficiently exposed so that its structure can be easily studied.

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SPECIAL ARTICLES

X-RAYS AND MUTATIONS

ONE of the paragraphs in the article entitled "Biological Effects of X-rays," by H. K. Svenson in SCIENCE 69: 361, March 29, 1929, may lead to a misunderstanding of the experiments to which reference is made. The results of the experiments were published jointly by the present writer and H. K. Svenson in three papers: "An Effect of X-rays on the Linkage of Mendelian Characters in the Second Chromosome of *Drosophila Melanogaster*,"[1] "Crossing over in the Second Chromosome of *Drosophila Melanogaster* in the F_1 Generation of X-rayed Females"[2] and "A Comparison of the Effects of X-Rays and Temperature on Linkage and Fertility in *Drosophila*."[3] The aims of the experiments are correctly expressed in the above titles of the papers describing them. Mutations were, of course, not to be ignored if they were found; on the other hand the experiments were not planned with a view to testing the possiblity of producing mutations by X-ray treatment. Nor were the experiments as carried out particularly favorable to the discovery of mutations.

Records of the four experiments referred to are given in two papers.[1, 3] In these experiments the female parent only was X-rayed, and the experiments were followed only to the F_1. In these F_1 only one, that from the mother, of any two homologous genes could have been exposed to X-rays except in the rare cases of non-disjunction. A recessive mutation if produced by the X-rays could, therefore, be observed only in the males and then only if it occurred in the X-chromosome. Dominant mutations, although on the whole rarer than recessive mutations, could be observed in either the male or the female F_1. The records of the experiments given in the papers referred to showed that there was observed a total of 49,360 F_1 males, of which 20,069 were the offspring of X-rayed mothers; of these 20,069 males, 5,513 came

[1] *Genetics*, 9:70–89. 1923.
[2] *American Naturalist*, 58: 311–315. 1924.
[3] *Genetics*, 9: 588–608. 1924.