$l \cos\alpha = h$, where $h$ is the vertical distance between the suspension point of the pendulum and its center of gravity. This results in

$$(2)\quad g = h\omega^2 = 4\pi^2 n^2 h$$

All that is necessary to perform the experiment is a motor with adjustable speed with the turning axis in vertical position. From the axis a little weight is suspended by a string. Furthermore, a revolution counter has to be attached to the axis. The speed of the motor is adjusted so that the weight swings in a predetermined height $h$, which can be observed through a telescope, and which is kept constant. Then only the number of revolutions has to be determined over a given period of time. Even with a rather crude set-up reasonable accuracy is readily attainable. If a kathetometer is used for the height determination and a revolution count made over a longer period of time a rather good approximation of $g$ may be obtained.

The method can be refined by controlling the height of the weight and the speed of the motor by a photoelectric cell and by placing the arrangement in a vacuum.

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## FOREIGN JOURNALS IN THE U.S.S.R.

IN a note in your issue of December 6, 1935, I compared the numbers of three British journals going to the U.S.A. and the U.S.S.R., respectively. In spite of the reiterated claim that scientific persons are treated more liberally in the U.S.S.R. than in any other country, and that the Soviet Union leads the world in its expenditure on and attachment to science, it appeared that in the United States *government and private effort together* obtained nine times as many copies of three important foreign scientific journals as in the Soviet Union.

It is possible that this comment did some good, for in the meantime the ratio has fallen from 9 to 4. Improvement is still necessary, for science can not be prosecuted without knowledge of what other people are doing, and the Soviet Union should need at least as many foreign journals as the U.S.A., since personal contact of its workers with foreign scientists is impossible. If the ratio (purchases by U.S.S.R.)/(purchases by U.S.A.) rises uniformly with time, it will become unity in about 1956. By then also it may be possible for scientific research workers in the U.S.S.R. to visit their colleagues in other countries. At present apparently it is not possible, for in spite of the evident attachment of the Soviet Union to physiology—not one physiologist was permitted to attend the International Congress of Physiologists last summer, nor even to answer the invitation.

Table 1, however, gives one hope of better things:

TABLE 1

| | U.S.S.R. | U.S.A. | Ratio: per cent. |
|---|---|---|---|
| *November, 1935* | | | |
| *Journal of Physiology* | 27 | 241 | 11.2 |
| *Journal of Experimental Biology* | 7 | 130 | 5.4 |
| *Biochemical Journal* | 47 | 374 | 12.6 |
| Total | **81** | **745** | **11.9** |
| *February, 1939* | | | |
| *Journal of Physiology* | 52 | 268 | 19.4 |
| *Journal of Experimental Biology* | 27 | 136 | 19.9 |
| *Biochemical Journal* | 126 | 390 | 32.3 |
| *Proceedings of the Royal Society A* | 25 | 191 | 13.1 |
| *Proceedings of the Royal Society B* | 15 | 146 | 10.3 |
| Total | **245** | **1,131** | **21.6** |

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## THE MANIFESTO BY A PHYSICIST

NO one can read Professor Bridgman's "Manifesto by a Physicist" in the February 24 issue of SCIENCE without being profoundly impressed by the sincerity and high purpose of the author. Nor will any one doubt that his decision to close his laboratory to citizens of totalitarian states was taken "only after the gravest consideration."

One hesitates to call in question the carefully considered action of one of the most distinguished ornaments of American science, a man internationally known not only for his contributions to physics but also for his writings on the philosophy of science. Nevertheless, I venture to express the hope that few scientists in America and other democratic countries will follow Professor Bridgman's lead. I do this because of serious doubts respecting the efficacy of the procedure, its propriety, its justice and its wisdom.

It is difficult to see how such demonstration of hostility to the totalitarian conception of the state and the place of science in the state can be effective of great good. The detestation of democratic peoples for totalitarian ideas has long been proclaimed from the housetop. To express it in the laboratory can not add greatly to the weight of public opinion marshalled against the totalitarian régimes. Humiliation of visiting scientists, especially when it is visited upon the innocent as well as the guilty, must breed resentment against the behavior of scientists in the democracies.

Would not envy of them be more productive of action in the direction we wish? The scientist from Germany, Italy, Russia or Japan who visits our laboratories and observes the freedom in which we work can not but compare our liberty of action with the strait-jacket into which his government has put him, his colleagues and his students. Will not such visitor return to his land a more effective missionary for human liberty than one who has encountered only humiliating rebuffs?

The propriety of excluding visitors from scientific laboratories and other spheres of scientific activity, solely on the ground of citizenship in a totalitarian

state, seems open to question. It is not in the tradition of science to make political, economic or religious beliefs and behavior a test for entrance into scientific cooperation. One of our chief indictments against the totalitarian states is that they have degraded science by subordinating their laboratories and their lecture halls to political control and to political uses. Can we then with propriety open or close our laboratories and our lecture halls for political purposes, even when those purposes to us seem meritorious? Is there not, on the contrary, a fundamental impropriety in mixing politics with science, whether this be done in a totalitarian or a democratic state?

It is difficult to see how visitors can be excluded from our scientific laboratories, *solely on the basis of citizenship in a totalitarian state,* without perpetrating frequent and serious injustice. It will be noted that the views of the individual visitor are not the subject of attack. It is the policies of his country that are to be punished in his person. From personal acquaintance with scientists in all the totalitarian states I can testify that by no means all of them are active exponents or even willing victims of totalitarian ideologies. Some I know, and many more I believe, both hate and fear the governments they are forced to serve. Not all can emigrate, and when home and family may be involved in ruin, it is not easy to avow one's beliefs and become a martyr to one's principles.

To exclude such men from the fraternity of science solely on the basis of their citizenship is to punish the innocent for the crimes of the guilty. The plea that only thus can we bring pressure to bear upon the guilty does not sufficiently commend the procedure. When Germany delivered innocent Jews to massacre and pillage because some Jew in a foreign land had been guilty of assassinating a German official, the civilized world cried out in horror. Comparison between such inhuman slaughter and spoliation, and the relatively mild action of excluding citizens of totalitarian states from scientific laboratories, is admittedly remote. But the fundamental principle underlying both procedures was avowedly the same: to bring pressure upon those otherwise beyond effective reach, by punishing, regardless of their individual innocence or guilt, those whom circumstances place within our power.

There would be more justice in such action were the circumstances reversed and were scientists in the totalitarian states to exclude American visitors from their laboratories because the American government had adopted policies harmful to science. For in a democracy the citizens are responsible for the government they place in power. But who will pretend that citizens of the totalitarian states are responsible for the acts of their governments? When bullets replace ballots in government, the responsibility as well as the freedom of the citizen is extinguished.

Even were there a measure of justice in the proposal under discussion, the wisdom of such action would still remain in question. If it be right for scientists to close their laboratories to citizens of totalitarian states, it is right for editors of scientific journals to close their columns to contributors from such states. It is not easy to see why exclusion from the lecture-room and the seminar should not follow. This would put not only science but also our universities and other centers of research and teaching into the political arena for the purpose of combatting a system of government harmful to science. The object in view seems to me commendable; but is the method wise?

It may be argued that the act of exclusion is intended to keep politics, and particularly a bad political philosophy, out of science and out of the university: and Professor Bridgman was careful to say that his statement regarding exclusion was made in his capacity as an individual and that it had "no connection whatever with any policy of the university." As to the first point, publication of the exclusion policy in this country and abroad will almost certainly make the action a factor in international politics, especially if scientists generally follow Professor Bridgman's lead. Indeed, the essential reason for the action is to accomplish a political purpose: to help "make the citizens of the totalitarian states realize as vividly and as speedily as possible how the philosophy of their states impresses and affects the rest of the world." Surely science will find itself involved in a peculiarly angry type of international politics if scientists in large numbers restrict access to their laboratories, observation of their apparatus and discussion of their experiments, for the express purpose of accomplishing the objective quoted.

Such action must inevitably involve the university as well, unless the laboratory is the personal property of the scientist and located outside university grounds. The individual professor can not use university property (whether it be laboratory, lecture hall, stationery or official title) for political or other purposes without involving the university in his activities. This fact has long been recognized by university authorities, and is a common cause of restrictive administrative regulations. A given university may for various reasons approve a specific act of the kind under discussion, or may grant its officers wide latitude in the exercise of discretion. But the question remains: Is it wise for the university, the traditional home of intellectual liberty and untrammeled search for truth, to become involved in acts of exclusion designed to effect political ends?

To the writer it seems most unwise, even dangerous, to make university halls and scientific laboratories in any degree the base for political action. For sound reasons a scientist may bar this or that obnoxious individual from his classroom or his laboratory. But

the reasons should apply to the individual, not to a nation; and they should be such as would cause him to exclude an American as quickly as a German, an Italian or a Russian. Science itself is imperilled far more than is any hateful political system when those engaged in the search for truth utilize courses of scientific instruction, scientific laboratories or scientific journals as weapons in political warfare.

In closing let me emphasize the fact that what I have written is in no sense a plea for toleration of totalitarian ideology. I am not among those who believe that it is a Christian duty to regard with toleration things which are utterly intolerable. And surely nothing could be more intolerable than the enslavement of the human spirit practiced under the totalitarian form of government! What I have done is to record my plea that scientists fight political battles with political weapons, and that they do all within their power to keep our academic halls and research laboratories sheltered from political storms, safe havens of intellectual sanity, calm judgment and free search for truth in a world gone mad.

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# SCIENTIFIC BOOKS

## INSULIN

*Insulin. Its Chemistry and Physiology.* By HANS F. JENSEN. New York: The Commonwealth Fund. London: Oxford University Press. 1938. Pp. 252.

IT may be stated immediately that Dr. Jensen's book is an excellent one. More than ten thousand reports on insulin have been published since 1922, and an adequate study of this subject now touches upon many aspects of physiology and of protein chemistry. For this reason it is extremely difficult for one author adequately to cover all aspects of the subject, but Dr. Jensen has enlisted the aid of experts in physiological matters, and he, himself, is admirably suited to discuss the problem from the chemical view-point. By the same token, it is expedient for the reviewer to secure opinions from his colleagues who have worked along lines on which he is less competent to comment. One is happy to find that the chemists who have been consulted and who have first-hand knowledge in this field are very enthusiastic about Dr. Jensen's contribution.

In the first chapter an accurate and concise account of the history of insulin is given. In the second, the various methods for the preparation of the hormone are described, and a table showing the yields of insulin secured by the various procedures is given. Here it may be remarked that, as many of the reports express the yield in terms of some absolute unit, results can not be accepted at their face value. The general trend, however, is clear. The preparation and chemistry of crystalline insulin is then discussed. What would appear to be a mistake in a date will be found in the preface, where it is stated that crystalline insulin was prepared in the year 1922. The report of this work was, of course, published in 1926. The fourth chapter deals with the standardization of insulin and is very well handled; the fifth deals with its administration, and the sixth with substitutes for insulin. Here the author gives more prominence to "Duodenin" and "Incrétine" than the reviewer would be prepared to do. The author remarks that it is probable that "all these workers were dealing with the same substance in spite of differences noted in the effect on depancreatized animals." An equally probable interpretation is that none of the workers were dealing with any active substance. The last chapter deals with the physiological action of insulin and provides a very useful review of this phase of the subject.

It has not been possible in the space available in this book to discuss in a comprehensive manner all the aspects of the situation. One feels that this volume should provide an excellent text for students and that lectures on the chemistry and physiology of insulin could well be based on it. For some courses the book would be adequate, for others it would have to be supplemented by more detailed comments.

There are a few places in which the author has made an interpretation of the results which differs from that which the reviewer feels is correct. This merely means that there are still many problems associated with insulin which have not as yet been settled.

The book is well written, the pages are of a convenient size and the type is good. The bibliography and the author index have been, with a few exceptions, carefully prepared and add greatly to the value of the publication.

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## MATHEMATICAL SNAPSHOTS

*Mathematical Snapshots.* By H. STEINHAUS. G. E. Stechert and Co., New York[1] (printed in Poland; profusely illustrated), $2.50.

THE only way to review this beautifully made book is to describe its rich and extraordinarily varied content in some detail. It is mathematical recreations at a new level of simplicity, interest and unusualness, somewhat reminiscent of Lucas at his best, but less formal. Each page has one or more excellent illustra-

[1] The Polish copyright date, pasted over, appears to be 1936.