that their war effort was futile and that Japan was doomed. As a result, all of us were hated and treated poorly. Those who had been educated in the United States realized our love for books or relaxation in a game of bridge and tried all the more to deny these to us. At a hospital in Osaka, near Umeda Railroad Station, where we were occasionally taken for treatment about one and one-half years before the B-29's began raiding Japan, the civilian doctors, biochemists, and bacteriologists on the staff laughed at us, sneered, and only reluctantly gave very poor treatment. Their optometrist, with facilities available, for spite refused to correct for astigmatism in prescriptions for glasses. Thus it went on in this and other hospitals throughout Japan.

This is the picture of Japanese intellectuals taken from inside Japan. Of course, when the end of the war came, they did a complete about-face. This is undoubtedly what Lt. Gressitt found when he went to Japan.

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Two Kinds of Neutrons?

The present concept of the structure of the neutron is generally given as a negative electron in close association with a proton. Among many others, Harkins (*Science*, 1946, **103**, 298) has indicated that the neutron is converted into a proton with the emission of a β-particle,

$$n_0^1 \rightarrow p_{+1}^1 + e_{-1}^0$$

causing an increase of one unit in the atomic number of the nucleus of the atom in which this process takes place. The neutron has been predicted by Wang (*Nature, Lond.*, 1945, **155**, 574) to be β-radioactive, with a half-life of about three hours.

With increasing emphasis on the existence of the negative proton, especially in connection with cosmic ray studies, theory apparently requires a second kind of neutron. Employing the designation An_0^1 for the usual neutron, the second kind can be distinguished as follows:

$$Bn_0^1 \rightarrow p_{-1}^1 + e_{+1}^0.$$

The new neutron would be comprised of a positive electron or positron in association with a negative proton and would likewise be radioactive, assuming the validity of Wang's study.

The possible existence of a second kind of neutron, having the same mass and lack of charge as the usual variety, gives rise to a number of interesting concepts for nuclear physics. For example, Harkins (*ibid.*) states that a positron is given off when a proton changes into a neutron (An_0^1):

$$p_{+1}^1 \rightarrow An_0^1 + e_{+1}^0.$$

Or, interpreted in terms of the Bn_0^1,

$$p_{-1}^1 \rightarrow Bn_0^1 + e_{-1}^0,$$

this would mean that a negative proton may change into a Bn_0^1 when a negative electron is released. Other interesting features of this concept will be evident to those in the field.

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Quantification of Micronutrients

Quantities of vitamins in rations have been reported in a variety of ways, such as International Units, micrograms per gram, milligrams per 100 grams, or milligrams per cent.

Some of the authors who use metric units in their reports in biological journals are also writing for trade journals and reporting the vitamin contents of the rations in milligrams per pound—a mixture of the metric and the English system of weights and, in our opinion, a very unhandy system. In the same trade journals the quantities of trace minerals in rations are frequently reported in "parts per million" (ppm). An article in one journal reports some of the ingredients of a ration in per cent of ration, other ingredients in parts per million, and still others in milligrams per pound.

Would it not be much simpler if the micronutrients (vitamins and trace minerals) were reported in the scientific journals in micrograms per gram? These data could be translated directly into trade journals as "parts per million," because the number of micrograms per gram is also the number of parts per million. The advantage of doing this in the trade journals (such as *Feedstuffs*) is that both the minerals and the vitamins would be reported in the same units (ppm), and the reference in the technical journals, reporting in micrograms per gram, would require no recalculations.

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Complement Fixation in Rats' Blood Sera

The purpose of this letter is to report that we have found that blood sera from rats captured at Nuevo Laredo, Mexico, fixed the complement only with Rickettsia antigens from classic typhus.

The titers of these sera were up to 1:40, and weak crossed fixation appeared in two of them at 1:10—with Rickettsia antigens of murine typhus. H. Plotz has informed us that he has recently obtained the same data with sera of rats from Manila.

The results of our examinations of blood sera from rats captured in Nuevo Laredo were: positive murines, 49 per cent; positive classics, 5 per cent.

Complement fixation with classic antigen in rats' blood sera leads us to believe in natural infection of these rodents with this variety of typhus.

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A Relativistic Misconception

It is evident, from many recent writings on the atomic bomb, that a serious misconception still persists, not only in the popular press but also in the minds of some scientists. The idea that matter and energy are interconvertible is due to a misunderstanding of Einstein's equation, $E = mc^2$. This equation does not state that a mass, *m*, can be converted into an energy, E, but that an object of mass m contains simultaneously an energy, E.

In nuclear reactions there is never any actual change in the total mass content of the universe. For example, the fission of a nucleus of mass M into two equal fragments, each of rest mass m_0, sets free an energy of

$$E = (M - 2m_0)c^2 \tag{1}$$

which gives a velocity, v, to each fission fragment. The kinetic energy of each fragment at this velocity is given by the Lorentz equations as

$$\tfrac{1}{2}E = m_0c^2\left(\frac{1}{\sqrt{1 - v^2/c^2}} - 1\right). \tag{2}$$

Now the mass of a particle at velocity v is

$$m = \frac{m_0}{\sqrt{1 - v^2/c^2}}. \tag{3}$$

Therefore, equation (2) becomes

$$\tfrac{1}{2}E = mc^2 - m_0c^2. \tag{4}$$

Combining equations (1) and (4) gives:

$$(M - 2m_0)c^2 = 2mc^2 - 2m_0c^2, \tag{5}$$

from which, by cancellation of terms,

$$M = 2m. \tag{6}$$

The final total mass is thus exactly equal to the initial mass. The system does not lose any mass until collisions with other particles gradually remove kinetic energy and mass from the fission fragments, and then the mass gained by the other particles is exactly equal to the mass lost by the fission fragments. Mass is not detroyed but merely dispersed, just as the potential energy originally contained in the fissionable nucleus is dispersed as kinetic energy of the particles struck by the fission fragments.

In the preceding derivation, M is the mass of the fissionable nucleus plus the neutron added to trigger it off. Also, it was assumed that M is essentially at rest, that two exactly equal fission fragments are produced, and that no extra neutrons are released. If it is assumed that both the fissionable nucleus and its triggering neutron are originally in motion, that unequal fission fragments are produced, and that several neutrons are liberated at high velocities, the equations are more involved, but the same result is obtained, namely, that the sum of all masses before the reaction is exactly equal to the sum of all masses after the reaction. In calculating the kinetic energy released or consumed by nuclear reactions from the formula, $E = (\Delta m)c^2$, the rest masses and not the actual masses must be used in computing Δm.

Likewise, in the "annihilation" of a positron and electron, it can be shown (remembering that the mass of a photon is $h\nu/c^2$) that the total mass of the photon or photons produced is exactly equal to the combined mass of the electron and positron "annihilated."

The law of conservation of mass still holds.

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Book Reviews

Scientific, medical and technical books published in the United States of America, 1930–1944: a selected list of titles in print with annotations. **R. R. Hawkins. (Ed.) (Prepared under the direction of the National Research Council's Committee on Bibliography of American Scientific and Technical Books.) Washington, D. C.: 1946. Pp. xv + 1114. $20.00. (Distributed by R. R. Bowker Co., 62 West 45th Street, New York City 19.)**

In 1943 the American publisher's mission to South America brought to the attention of the State Department the need for a comprehensive selected bibliography of recent American publications in science, medicine, and technology. In 1944 the National Research Council appointed a committe to direct the project and R. R. Hawkins, chief of the Science and Technology Room, New York Public Library, was chosen as editor. This book is the result of the committee's work.

The bibliography is designed as a list not of best books but rather of important and useful books, with primary emphasis on availability. Titles of 5,193 books published between 1930 and January 1945 by citizens of the United States and Canada and still in print at the time of publication of the list are included. Thus, this bibliography will be of value not only to librarians and scholars abroad, especially those in war-devastated areas charged with the task of reconstructing libraries, but also to those in this country who may wish reliable and accurate information on American scientific, medical, and technical books of the past 15 years.

The titles are classified in broad categories with appropriate subdivisions. Thus, the first section is headed "Science" and carries the following subheads: general, dictionaries, history, methodology, popular works, textbooks, tables, annuals, and scientific expeditions. Mathematics, astronomy, physics, meteorology, chemistry, geology, oceanography, natural history, biology, botany, zoology, etc. are similarly classified, in many cases with more detailed subheads. The price of each item is included together with the table of contents and a descriptive note. These notes are especially useful, since they indicate the character of the book, give special information about its contents not obvious from the title, and suggest the type of reader for whom the book is intended. An appendix provides a directory of state agencies in the United States issuing publications in geology, engineering, and agriculture. There is also a useful directory of publishers. Finally, there is an author index, with certain title entries included, and a detailed subject index.

The social sciences in general have been omitted, as were also trade publications and elementary and high