Solvent "C." If the solution prepared for use contains more than 25 per cent. of Skelly Solvent "C" it tends to cause creeping of the carbon on the paper; and if the concentration of Skelly Solvent "C" is less than 15 per cent., the solution tends to cloud or deposit an amorphous precipitate. Solutions of 5 to 10 per cent. of Norelac and up to 25 per cent. of Skelly Solvent "C" tend to jell when stored at 5° C., but remain fluid at 20° C.

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DISCUSSION

BREAD "ENRICHMENT"

THE appearance of an article under the above title by Dr. E. V. McCollum[1] calls for a reply in view of Dr. McCollum's long-established eminence in the field of nutrition. We do not differ from Dr. McCollum in nutritional principles. We do differ strongly with him on the practical efficacy of his proposed approach to the problem of our bread (and flour) supply. The practical problems, as well as the nutritional aspects related to them, have been the subject of extended discussions in the Food and Nutritional Board ever since its oganization in November, 1940. Dr. McCollum has been present at many of these discussions, often as a silent listener, but this is the first time he has come out publicly in opposition to the judgment of the majority of the board.

Dr. McCollum's position on bread "enrichment" is unrealistic in respect to feasibility of achievement. He treats of bread with little recognition of the fact that there are several million Americans who do not regularly use bakery bread but homemade bread. There is a notably high incidence of deficiency disease in the "hot bread belt" of our South. This fact his article ignores. No adequate national program can be based on a consideration of bakers' bread only.

Dr. McCollum "would prefer to see bread improvement achieved by a legal requirement concerning the minimum skim milk solids to be included in bread." He does not say how he would apply it to homemade bread. This is a serious omission in view of the fact that the "hot bread belt" is also an area of low milk supply. The Food and Nutrition Board always has and continues to favor strongly the continuation and extension of the use of milk solids in baker's bread, a practise which was already widely in use before enrichment was inaugurated and which we confidently believe will continue in the future. Addition of milk to bread, however, does not significantly liberalize the supply of thiamine and niacin in the dietaries of low income groups, especially not in the South.

He says "'The bread program of Canada and England seems to me to be superior to our own." That of England is a war program born of the threat of a food blockade. It sought to stretch the supply of wheat which it might be possible to import and to use home-grown foods as far as possible. A reflection of this is the fact that Britain has prohibited the sale of any bread within 24 hours after it comes from the oven. To so limit the available supply of bread to a somewhat stale quality facilitated the nationally necessary substitution of potatoes for bread. No such condition applied in the United States and it is reasonable to suppose that it will not continue to apply in England. Will England's "long extraction" program survive in peacetime? Switzerland's very similar program of 1936–1937 failed within a year.

Canada's program was undertaken nearly simultaneously with our own and like our own was on a voluntary basis. Conditions of wheat supply also were similar to our own. Extent of success is measured by the comparative volumes of bread and flour affected, namely, about 7 per cent. of Canada's consumption versus 70 per cent. or more which had been affected by enrichment in the United States before January, 1943.[2] Dr. McCollum at a later point in his article admits by clear implication the present infeasibility of the Canadian program. He says "If the milling industry were decentralized and mills were located in the vicinity of all centers of population . . . the manufacture of . . . Canada Approved Flour . . . would be practicable." Does he feel that an impracticable program is "superior to our own"?

Dr. McCollum recommends the use of wheat germs, corn germs, yeast and soyflour as bread improvers. Their use has been advocated before and the products have their merits, but in no sense are they presently available as popularly acceptable substitutes for enrichment nor in significant quantities of adequately controlled quality. To advocate their use in lieu of enrichment would postpone indefinitely any effective action. Any systematic program of bread and flour improvement based on the use of these ingredients would be even more difficult to introduce than a general substitution of whole wheat flour for white flour. Either expedient is for reasons of custom and present business organization a generation or more away as a general remedy.

Dr. McCollum objects that "the name 'enriched' connotes a higher quality than the enriching ingredients confer upon white flour. . . . The term 'improved'

[1] *Bulletin of the Maryland State Health Department*, 17, No. 1, March, 1945.

[2] In January, 1943, War Food Order Number One made enrichment of all white pan bakers' bread mandatory for the duration of the war.

would more nearly express the facts." We trust, however, that Dr. McCollum will not base his opposition on the choice of a word. The word "enriched" was not the present writer's original preference and indeed it was received at first with disfavor by many of the early proponents of the program for flour and bread improvement. However, in public affairs one must make his choice on the basis of overall considerations, not upon some minor departure from his preference. That is essential to the democratic process.

The word "enriched" was the choice of the Federal Security Agency which is charged by law with the enforcement of the Food, Drug and Cosmetic Act. Under accepted terminology of the trade, "flour" is synonymous with "white flour" and the improvement of white flour by addition of the important specified ingredients was judged sufficient to justify the term "enriched." The term is now so well known that it has acquired a meaning which is well understood.

One may fully subscribe to Dr. McCollum's nutritional ideals and yet without disrespect to his scientific opinion decide to support an instrument for an "improved" flour and bread which has been forged in the hot fires of prolonged and often tedious public hearings, which has been submitted to the test of trial in the Supreme Court and has commanded the support of the industries concerned, as well as that of a large body of able and disinterested nutritionists. Although it might formulate proposals which would better conform to its scientific opinions, no purely scientific body, working alone, could hope to forge an instrument as effective as this has been in enlisting the cooperation of scientists, industrialists, government administrators and the consuming public. None of these factors of society can be neglected in framing a public health measure. Effective action must be taken in the light of custom and existing legal precedent as well as in the light of scientific principles. It is the social, industrial and legal background which Dr. McCollum has failed to appreciate in offering his criticisms.

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DR. WILLIAMS'S statement that my article in the *Bulletin of the Maryland State Health Department* was the first public expression of disapproval of the bread enrichment program requires correction. I was not a member of the Food and Nutrition Board until after the bread enrichment program had been adopted as a policy of the board. When, about February first, 1941, I was requested to lend my signature to a press release announcing the approval of the program by most of the members of the board, I declined to do so. At that time I made my position concerning the enrichment proposal clear. On November 3, 1944, I participated in a conference in Detroit under the sponsorship of the Research Laboratory of the Children's Fund of Michigan. My paper was published in the Proceedings of the Conference.[1] I voiced much the same criticism of the bread enrichment program as was contained in the paper Dr. Williams referred to. I feel certain that every member of the board has long known of my objections to it.

In the manufacture of refined wheat flour a score or more of essential nutrients present in significant amounts in the wheat kernel are removed. To give such flour, supplemented with three vitamins and iron, so good a name as "enriched" is misleading. It overstates the value of the flour in the mind of the consumer who lacks technical knowledge concerning foods. The proposed legislation requires the addition of three vitamins and iron, but does not require the inclusion of such ingredients as skim milk powder, wheat or corn germs, or dried yeast, all of which could be used, and if included in suitable amounts would make bread nutritionally superior to that containing only the required enriching ingredients.

In normal times there is a great abundance of skim milk for the manufacture of milk powder for baker's use. I am informed that there is presently filtered out of beer annually the equivalent of about thirty million pounds of dry yeast. Only about three million pounds of dry brewer's yeast was prepared because there was no market for the rest, which was discarded as waste. At the request of governmental agencies the brewing companies dried about twenty million pounds of beer yeast in 1944, but representatives of the brewing industry have assured me that they have no expectation that they will have a market for much of the yeast they make after the war is over. The distilling industries make much more yeast than do brewers, and most of this is wasted, not even being used for animal feed. There is now manufactured about one hundred million pounds of wheat germs having not more than 10 per cent. of non-germ substances; and about four hundred million pounds of corn germs. Doubtless more of each of these germs would be manufactured if there were an outlet for them. These suggested additions to the bread mix are precious sources of nutrients. It seems folly for us to enforce by law an ineffectual supplementing of white flour when a much more sound policy for improving bread seems entirely practicable if promoted with effective leadership.

The writer has examined loaves made with 6 per cent. of skim milk powder and in addition dried yeast, wheat and corn germs in amounts up to 3 per cent. of the dry matter of the bread mix. Eleven combinations of the three last-named ingredients were

[1] "Implications of Nutrition and Public Health in the Postwar Period." Detroit, Michigan, 1944.

used. There was small reduction in loaf volume and the loaves were darker in color as compared with the loaves without the yeast or germs. The texture was not such as would be rated highest by any expert scorer, but all were attractive and had excellent flavors. It should be pointed out that every criterion of quality upon which commercial breads are judged, such as loaf volume, oven break, external and internal color, crumb, etc., represent fictitious standards having no relation whatever to nutritive value of the bread.

Bread is a low-cost food. It is a basic staple. Nothing more effective in safeguarding the nutritional status of the poor can be done then to encourage the making and consumption of bread of the highest possible nutritive value. It should be so nutritious that it can make good most of the deficiencies of any other foods included in a simple and monotonous diet. The inclusion of the ingredients recommended would go a long way toward accomplishing this objective. This can not be said of the presently promoted "enriched" bread.

Dr. Williams is correct in stating that I have ignored sociological, industrial and legal precedent in my recommendations concerning bread improvement. It has long been my belief that eventually industry must adjust itself in matters involving foods to the physiological needs of consumers. For this reason I have offered suggestions concerning what bread should be composed of with no other objective than to acquaint the public with facts which are supported by scientific investigations. Success in putting into effect such a bread program would seem to be no difficult undertaking, provided the plan has the support of scientific and industrial leaders whose primary interest is safeguarding the nutrition of the people.

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ONE-PARENT PROGENY OF TUBIFICID WORMS

IN a five-years' study of the activities of tubificid worms (*Tubifex* and *Limnodrilus*) it is indicated that these hermaphroditic forms are apparently able to effect self-fertilization and to produce young. Supporting this statement are the results from nine one-worm cultures, each treated as follows:

(1) The worm was isolated shortly after birth, when about one week old. (2) Was placed in a shell vial with 0.5 cc or less of mud examined under ×20 (approximately) to make sure that no additional worms or their eggs were present. (3) Was fed weekly by adding autoclaved sewage solids, in suspension. (4) When young worms appeared, they were removed from the culture.

The worms become sexually mature in three or four months after birth. Six of the above one-worm cultures, now about seven months old, have to date (late March, 1945) produced 208 young. Another worm, isolated as above and now more than two years old, produced 19 young during its first year and 148 during its second year.

My first observation of the above phenomenon occurred on August 11, 1943.

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SCIENTIFIC BOOKS

RELATIVITY

The Meaning of Relativity. By ALBERT EINSTEIN. 135 pp. Princeton, N. J.: Princeton University Press. 1945. $2.00.

THE book is a reissue of a book first presented in lecture form at Princeton University in 1921, and published by Methuen and Company in Great Britain and by the Princeton University Press in the United States. In this edition an appendix extending the theory of relativity to the "Cosmologic Problem" is added. Attention is also called to other developments, among them the solution of the fundamental problem—so long delayed—in which the law of the "geodesic," which, in the classical treatment, is superposed upon the law of the field equations, is shown to be the analytical equivalent of the restriction placed upon the motions of the singularities by the fact that the equations are non-linear.

The main text is divided into four chapters—"Space and Time in Pre-Relativity Physics"—"The Theory of Special Relativity"—"The General Theory of Relativity"—"The General Theory of Relativity (Continued)."

The treatment follows what may be called normal lines and, coming from the "Father of Relativity," is naturally authoritative and interesting in approach. It is, moreover, concise and to the point.

As to how far the book fulfils the promise of its title is to some extent an open question. It is often characteristic of one outstanding in originality that the concepts which are real and which form the workable elements of his thinking are, to a considerable extent, individualistic. They are apt to be strong and occupy positions of very positive conviction. Indeed, is it not the strength of these convictions which provide the stimulus for discovery? Sometimes, how-