the hydrogen isotope of mass 2, HH^2O would indicate water one half of the hydrogen of which contained the isotope of mass 2, the other half having mass 1, and H_2O standing for water containing only the isotope of mass 1. While these designations appear to be satisfactory for simple compounds, the use of superscripts introduces difficulties when the formulae of complex organic molecules are involved, particularly so if one desires to write graphic formulae. There is also an appreciable increase in printing cost to be considered.

I would like to suggest a further alternative. Hydrogen of mass 2 is already extensively referred to as "heavy hydrogen." This could be designated in typesetting by a bold-faced letter "**H**." Thus, we can have $\mathbf{H}_2O$, **H**HO, and H_2O, indicating, respectively, water containing only heavy hydrogen, water containing one-half heavy hydrogen and water containing no heavy hydrogen. Similarly, we can write organic formulae in exactly the same way that we write them at the present time, excepting that all the hydrogens or particular hydrogens are printed, using the bold-faced type to indicate that these hydrogens have mass 2.

If hydrogen of mass 3 is ever produced in sufficient quantities to be used in preparing chemical compounds of known structure, its presence can be indicated by a bold-faced Old English letter "H."

Similarly, oxygen of mass 18 can be indicated by a bold-faced letter "O" and oxygen of mass 17 (which appears to be the rarer of the oxygen isotopes) can be indicated by a bold-faced Old English letter "O."

Such designation of the hydrogen and oxygen isotopes will make possible the use of graphic formulae of organic compounds which differ in no way from the present formulae, excepting that particular hydrogens or oxygens will be designated as for a special mass, differing from the mass of other hydrogens or oxygens which may be united to form similar compounds, but compounds which have different physical (and perhaps chemical) properties. Thus, for example, we may have mono-**H**-benzene, *o.* (or *m.* or *p.*) di-**H**-benzene, 1.2.3. (or sym.) tri-**H**-benzene, etc., for all the known organic compounds, without introducing any ambiguity into the nomenclature.

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PARA-ORTHO CONVERSION OF DEUTERIUM[1]

USING thermo conductivity method we have succeeded in showing the para-ortho conversion of deuterium at 78°, 53°, 20.4° Kelvin changes in readings relative to normal deuterium being in ratio 3 to 11 to 30, respectively. This agrees with the Bose-Einstein statistics if the nuclear spin of the deutron [deuton?] is the one which gives excess concentration of 3.3, 11.1 and 31.2 per cent., respectively, of orthodeuterium at these temperatures relative to normal deuterium. Velocity constant of reconversion of orthodeuterium by oxygen at room temperature is sixteen times smaller than that of parahydrogen, being 0.57 liters per mol, per min.

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[1] Received by cable.

GOVERNMENT RESEARCH

IN a recent number of SCIENCE (January 26) attention was called to the reduced appropriations to the U. S. Department of Agriculture, which have necessitated drastic cuts in experiment and scientific research, including the dismissal of 567 workers in scientific projects. It is rather difficult to understand the necessity for so much retrenchment in established activities when the government is at the same time spending vast sums (stated to be over $200 per second) on its national recovery program. An explanation attributed to Assistant Secretary Tugwell is given in an editorial review in the current number of *The Reader's Digest.* This statement repeats the basic idea of the New Deal, that the purchasing power of the farmers and factory workers must be restored, for which at least 5 billions of dollars was needed. It then adds: "Meantime ordinary government expense had to go on *and this expense had to be kept down and carefully watched.* To take care of the extraordinary expense there had to be also an extraordinary budget. . . . A business man may borrow large sums to modernize his plant or find new markets."

Probably no one will deny the advisability of a business man borrowing, under certain conditions, to modernize his plant or to find new markets, but his wisdom might well be questioned if, in making these improvements, he allowed his existing efficient machinery to deteriorate so that it would have to be replaced, resulting not only in additional cost but also in delay in getting into effective production on the new scale. Similarly, even though we may be in sympathy with the government's recovery program and appreciate the need of efficiency and economy in ordinary government operations, nevertheless we may question whether wisdom is being shown in drastic budget reductions which mean actual elimination of many lines of investigation and consequent interruption of fact-finding activities vital to the efficient administration of many government functions.

By way of illustration I should like to cite some of the work of the Bureau of Biological Survey. Let it be granted that all possible economies should be made and it is also possible that some reorganization or shift of emphasis may be desirable in the Biological Survey as elsewhere; but such economics and reorganization should be undertaken intelligently, with due regard to the importance and balance of the activities concerned. Unfortunately the evidence, as indicated in the reductions of last year and the present proposed budget, gives little indication of such a study of the situation having been made. In the case of the Biological Survey, for example, the policy appears to have been to continue the regulatory functions and to cut out completely the fact-finding activities on which all sound regulation policies must be based. This action would appear to have been inspired by the recently promulgated fallacy that science has already produced more results than the economic system has been able to absorb and therefore science should take a vacation and allow the social order to catch up.

In the budget now before Congress the appropriations for investigations on migratory birds, the food habits of birds, and diseases and other problems of fur-bearing animals, are not merely reduced, they are completely eliminated. Let us take the case of the migration studies as an example and see what the consequences would be. The Migratory Bird Act and the broad problems of bird refuges, the use of submarginal lands and the like, depend for their intelligent administration on knowledge of the abundance, distribution, migrations and other habits of birds. For many years the Biological Survey has been accumulating information on these points, but no matter how complete such information may be at one time it will not answer future needs any more than economic remedies of to-day can be based on the census of 1900. But even more important, by means of cooperative banding of birds on a large scale, the survey has in recent years built up an agency for gaining definite information on the movements and life histories of birds which is producing results of the greatest scientific and practical value. Approximately 1,900 persons, scattered all over the country, are cooperating voluntarily in this work. Since 1920 at least one and a half million birds have been banded and "returns" have been obtained on at least 90,000 of them. If the voluntary work that has gone into the obtaining of these invaluable records had to be paid for it would certainly run up into the hundreds of thousands of dollars. It should be pointed out that the large function of the Biological Survey in this work is to act as a repository and clearing house for the records that are accumulated through the efforts of these hundreds of voluntary collaborators. If the directive and coordinating work of the survey should stop, not only would it result in a complete paralysis of the banding operations, but records of inestimable value on birds already banded would be lost, and a smoothly functioning machinery would be destroyed which would require years to replace. Furthermore, the present highly skilled direction and supervision would be dissipated and could not be reassembled without much delay in time and effort, if at all.

The success of bird-banding as a method of gaining definite information has stimulated many special studies by individuals, by colleges and by state conservation bodies. The Biological Survey has cooperated by supplying bands and acting as a central repository for all records of recovery. Termination of this service would place a great handicap on such studies since, if each were to issue its own series of bands, inefficiency and hopeless confusion would result. To continue this particular activity of the survey on at least a functional basis would require $12,000 to $15,000 annually, while $20,000 to $25,000 would enable it to do its work effectively and well. It may be necessary in these times to reduce the work to a minimum effective operating level; but if the New Deal produces the results that are hoped for it, it is surely consistent with sensible economy to see that essential parts of the government's research program are not allowed to disintegrate.

What has been said with regard to the bird-banding work would apply with equal force to other fundamental research and "clearing-house" activities, not only in the Biological Survey but in the Department of Agriculture as a whole and in other government branches. If, in the zeal to speed recovery, research activities fundamental to government administration and regulation are in danger of neglect, to the point where they are seriously crippled or completely disorganized, it is a matter of grave concern not only to persons interested in the welfare of science, but to the general public as well. It is greatly to be hoped that some system of government budget-making may be devised whereby the needs of different activities may be evaluated and coordinated on a basis of logic and reason, rather than to be left largely to the whims of chance or to pressure exerted by specially interested or political groups.

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THE LAW OF MULTIPLE PROPORTIONS

IN the January 5, 1934, issue of SCIENCE, Professor E. A. Vuilleumier points out that the law of multiple proportions (as ordinarily stated in text-books) does not hold true, even for some standard text-book prob-