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THE USE OF ISOTOPES AS INDICATORS IN BIOLOGICAL RESEARCH[1]

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WHILE it is undoubtedly true that the chief tool and weapon in research is thought and ideas and that a large amount of experimental work in biology is more or less wasted for lack of thought, it is not less true that progress depends to a very large extent upon methods and that new methods may open up new and fruitful fields.

It is my task to-day to present some thoughts about a new and, as I believe, extremely powerful tool for biological and biochemical research: A small number of isotopes which can be readily distinguished and quantitatively determined by relatively simple physical means.

Isotopes are atomic species which differ in weight, but have the same nuclear charge and as a consequence of this last-named property they are practically identical chemically and will behave in the same way in organisms. Isotopes of lead are available in nature which can be recognized and quantitatively determined physically by their radioactivity, and recent progress is making available radioactive isotopes of a number of elements, including some of those which are of special importance in living organisms.

The methods for recognizing and estimating radioactive substances are highly developed and easy of application.

Hevesy, himself a pioneer in the chemical and physical study of isotopes, was the first to see the possibilities offered in biology by recognizable isotopes and made the classical and fundamental experiments with radioactive lead in 1921.

Attempts over several years to separate radium D from lead by chemical means had thoroughly convinced him of their identity, but the atoms of the one carried a label, so to speak, in their radioactivity. When a plant is grown in a solution containing lead, this ele-

[1] Address given at the Harvard Tercentenary Conference of Arts and Sciences, September 10.