Letters to the Editor

Degradation of Streptomycin and the Structure of Streptidine and Streptamine

Recently the degradation of streptomycin to a diguanido base (streptidine) and the corresponding diamino compound (streptamine) was described, and evidence was presented that streptamine is either a 1,3- or 1,4-diaminotetrahydroxycyclohexane (*Science*, 1946, **103**, 53–54). Convincing data have now been obtained supporting the former structure. Oxidation of N,N-dibenzoylstreptamine with periodate yields a substituted five-carbon dialdehyde (I) (m.p. 130–131° C.) which appears to exist in a hydrated cyclic form (1,3,5-trihydroxy-2,4-dibenzoylaminotetrahydropyran). The triacetyl derivative of I is a beautifully crystalline substance (m.p. 217° C.). Oxidation of I with bromine water yields a dibenzoylaminohydroxyblutaric acid (m.p. 197–198° C.). These products are to be expected from 1,3-diaminotetrahydroxycyclohexane but not from the 1,4-diamino isomer. Hence, these data, in conjunction with the previously presented evidence, establish the structure of streptamine as 1,3-diamino-2,4,5,6-tetrahydroxycyclohexane. Streptidine is the corresponding 1,3-diguanido compound.

Streptamine is optically inactive and probably represents one of the eight possible *meso* forms. Correlation of the configuration of streptamine with that of *meso* inositol is an interesting problem with which we are now engaged.

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Scientific Research and National Welfare

H. S. Reed (*Science*, 1945, **102**, 524) apparently writes in behalf of the Executive Committee of the Pacific Division of the AAAS and makes certain statements to which one might take serious objection. The conclusion of his letter reads as follows: "For the first five years the Board of Research and Development could utilize existing laboratories. No greater mistake could be made than to spend large sums at present in the construction of Federal laboratories. It would be much better to make grants of funds to private industrial laboratories or educational institutions under the supervision of the Board of Directors. It will take nearly five years for the board to prepare an adequate program for research. In its essence, men and their intellects are the important things in research rather than lofty buildings. I am not in favor of having the research funds spent in the existing laboratories of the Federal Government because I do not believe that there are now men in those laboratories who are capable of directing basic scientific researches, except in a few cases."

The undersigned, in the belief that the somewhat unfortunate wording of the above statement was not intended to be taken literally, is writing this letter for the purpose of clarification of the terminology used, in the hope that this clarification will have sufficient circulation through the medium of *Science* to rectify the unfortunate impression which a misunderstanding of terminology implies.

As a pure academic scientist, the undersigned (in his capacity as reserve officer in the U. S. Navy) has been closely associated with aspects of the problem of national scientific welfare in connection with national defense. In an attempt to clarify this problem the undersigned published an article entitled "Naval research in peace and war" (*Proc. nav. Inst.*, 1945, 71, 1169). In this article some clarification of the terminology and the necessity for adequate support of Federal research laboratories for national defense were set forth in detail. In what follows the essence of this analysis, pertinent to Prof. Reed's letter, is presented with the hope that it will serve to clarify the situation:

What Dr. Reed and many others do not appreciate is that there is much more to the question of industrial and national defense research than is implied in the pure scientists' view of research. The undersigned has chosen to classify three aspects of the scientific research as it affects national welfare. These are: (1) the pure or *fundamental research* which leads to an understanding of the laws of nature, the discovery of new facts and laws, and the theoretical development of that knowledge; (2) the *basic research* as it applies to industrial or military development involving basic studies of the fruits of fundamental work to determine their potentialities antecedent to application; (3) the *applied research* and development.

Each of these phases is essential to national welfare, and each has its own specific requirements and qualifications. Thus, *fundamental research* must be unrestricted as to problems, mode of attack, scope, freedom of publication, etc. It is vital to the country's welfare, for whatever nation is paramount in *fundamental research* will also excel in the other phases. The logical place for this work is primarily in the academic environment and perhaps in a few specially equipped industrial and government laboratories. Primarily, government laboratories are intended to furnish research of types *more immediately* profitable to the Nation's needs and welfare, which must in some degree limit the amount of the often wasteful effort which goes into pure or *fundamental research.*

Basic research is usually somewhat more expensive. It requires larger fields for application and test and is definitely the concern of academic engineering schools, industrial laboratories, and the Federal Government laboratories. It perhaps should not have too many restrictions on freedom of effort, method of attack, and freedom of publication. However, in many questions vital to the Nation's welfare there may be urgent need for secrecy or classification. This point is often over-