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FRIDAY, NOVEMBER 20, 1903.

THE MISUSE OF PHYSICS BY BIOLOGISTS
AND ENGINEERS.*

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THIS somewhat informal paper is preliminary to a paper which I have in preparation on statistical physics. My chief object in presenting this preliminary paper is to call attention to some of the precise notions of thermodynamics and to point out the essential limitations of that subject. Gibbs, for example, raises the question repeatedly in his writings as to the legitimacy of the thermodynamic discussion of things, such as thermoelectricity, which are associated necessarily with irreversible processes. What I have in mind concerning thermodynamics proper and concerning statistical physics is a general point of view which completely elucidates this question of Gibbs, setting precise limits not only to systematic thermodynamics, but to systematic physics in the broadest sense, and marking sharp boundaries between systematic physics and what we may call statistical physics.

A great deal is, I think, to be gained for science at the present time by insisting upon the sharp delimitation of those general ideas in physics which are related primarily to thermodynamics just as a great deal has been gained in the last half century by the sharp delimitation of those general ideas which relate primarily to

MSS. intended for publication and books, etc., intended for review should be sent to the responsible editor. Professor J. McKeen Cattell, Garrison-on-Hudson, N. Y.

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