PHYSICAL LABORATORY MANUAL FOR SECONDARY SCHOOLS AND COLLEGES

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CHARLES F. ADAMS

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AND COLLEGES

BY

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PREFACE.

THIS manual is the outgrowth of several years of experience with pupils in the physical laboratory as well as of a study of the growth and development of laboratory work in secondary schools. The development of the work in my own hands has been attended with an elimination of qualitative exercises, or illustrative experiments, and a reduction of the number of exercises at first attempted. My experience and study lead me to believe that the best results are attained by comparatively few exercises, the greater part of them being quantitative in character. Quality of work, rather than quantity, should receive the most consideration. The tendency in my own work has been to strive after greater accuracy from year to year. To allow pupils to do quantitative exercises in a careless manner, with small regard for accuracy, is to do them an injury. Under these circumstances a quantitative exercise ceases to be such and becomes qualitative; and, moreover, it is a pretense and a sham. The position here taken as to number and kind of exercises is, I believe, in accord with the best thought and practice of the time. In support of this it is necessary only to mention the report of the Physical Conference to "The Committee of Ten."

In the selection of experiments and methods of procedure great care has been taken to adopt only those that are capable of giving results of a considerable degree of accuracy in the hands of pupils. Regard has also been paid to those demanding inexpensive and

durable apparatus. Perhaps to some a few of the exercises may appear to be too difficult, but it is believed that they should be such as to demand the very best thought and endeavor the pupils are capable of giving, while at the same time not being beyond their capacity.

In the presentation of the subject matter, it has been my aim to make the instructions so clear and explicit that the pupil need not go wrong, and to select that order of procedure that will give the best results. Here again accuracy has been one of the chief considerations. It has also been my endeavor to develop in the pupils the power of independent thinking, and to that end to withhold from them that which they ought to be able to think out for themselves. Very often too much help is given to the pupil in the laboratory rather than too little.

It is with pleasure that I acknowledge my indebtedness to the excellent manuals and text-books in common use, and to the many teachers and instructors in physical science from whom I have received valuable suggestions while preparing this work. I wish also to acknowledge my obligation to Prof. John O. Reed, of the University of Michigan, for valuable hints.

C. F. ADAMS.

DETROIT, MICH., October, 1896.

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