

**A MANUAL OF  
BACTERIOLOGY FOR  
AGRICULTURAL AND  
GENERAL SCIENCE STUDENTS**

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A Manual of Bacteriology for Agricultural and General Science Students by Howard S. Reed

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**HOWARD S. REED**

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A  
MANUAL OF BACTERIOLOGY

FOR AGRICULTURAL AND GENERAL  
SCIENCE STUDENTS

BY

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## PREFACE

The study of bacteriology in technical schools of all kinds has grown rapidly in the past few years, and especially in the institutions which teach agriculture and allied subjects. The present work is an attempt to outline a profitable course for students in such classes. The Manual is the outgrowth of several years' experience in teaching bacteriology to students of agriculture and engineering, and includes some experiments which have not previously appeared in print.

The writer has tried to outline many experiments calling for the simplest kind of equipment, but which should acquaint the student with some fundamental facts concerning bacteria. In the main, however, the Manual is devoted to more extended experiments which call for precise results and need precise apparatus for their performance. Wherever possible the experiments are planned to give quantitative results, to the end that vagueness of statement and uncertain thinking may disappear.

In addition to the outline for the study of bacteria, a section has been added outlining the study of important fermentations caused principally by fungi. In most cases the agricultural student desires to become acquainted with the more fundamental principles of the cultivation of these organisms.

The appendixes are intended to present in a convenient form both new and well-known methods. The section on sterilization is designed to aid the advanced worker by supplementing the facts given in the body of the Manual. Emphasis is placed upon several facts recently brought out in investigations on sterilization.

References to the literature bearing directly upon the subject of the exercise have been introduced wherever possible. The conspicuous position of these references is designed to stimulate the student to do collateral reading.

The section on soil bacteria has been read by Dr. J. G. Lipman, Director of the New Jersey Experiment Station. That on the bacteria of milk has been read by Professor E. G. Hastings, of the University of Wisconsin. My colleague, Dr. E. B. Fred, has prepared portions of the appendixes and given many valuable suggestions throughout the work. Mr. C. H. Crabill has aided greatly in the preparation of the illustrations.

In the preparation of the material, frequent use has been made of the manuals of Löhnis, Eyre, Frost, Heinemann, Abel, Russell and Hastings, Muir and Ritchie, and others, to which acknowledgment is due.

HOWARD S. REED



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