

Handbook for
SCIENTIFIC
PHOTOGRAPHY

Alfred A. Blaker

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*The contemplation of things as they are
Without error or confusion
Without substitution or imposture
Is in itself a nobler thing
Than a whole harvest of invention.*

—Francis Bacon

Preface

This handbook is based upon *Photography for Scientific Publication* (W. H. Freeman and Company, 1965), but the material presented has been so greatly revised, expanded, and reorganized that the book has been retitled. Virtually everything that was in the earlier version has been retained in some form, but much entirely new text and many new text figures and photographs have been added. The result is a new book rather than a simple revision.

Handbook for Scientific Photography is intended to be a compact source of useful and practical information about photography in the laboratory, or for laboratory-related purposes, for people who need to illustrate scientific articles or books. Many researchers, lacking access to a suitable photographic service laboratory or being unable to pay for professional assistance, must learn to do their own photography. The available literature on the subject, however, often leaves them without the particular knowledge they most need, and most photographic instruction gives no more than very general aid. Consequently, the quality of scientific photographs in journals and books is often inferior to that of the text they accompany. Because the clarity of a scholarly publication depends in part upon the clarity of its illustrations, and because the likelihood of acceptance of one's thesis will be enhanced by its clarity, it is obvious that one should strive to produce the best possible photographs for such purposes.

The main concern of this book is black-and-white still photography of subjects encountered in scientific research. There is supplementary material on color photography but, since color reproduction is costly and hence relatively uncommon in scientific

publication, this material is not extensive. There is a substantial emphasis on the photography—using commonly available equipment—of subjects whose small size requires the application of closeup and photomacrographic techniques, in magnifications up to about $\times 80$. There is also a chapter on photography through the microscope, subdivided according to simple and more complex methods, in which general techniques are discussed rather than specific equipment. Although most of the text deals with the photography of subjects that are motionless or nearly so at the moment of exposure, one section describes a particularly useful and versatile method of photographing small, lively subjects. Throughout the book the approach is pragmatic, being in terms of what one *needs to know* to accomplish the stated ends, rather than in terms of theory or ideal circumstances.

The coverage of basic photography is skeletal, on the assumption that most readers will have some general knowledge of the field. If you need a greater depth or breadth of knowledge of the basics, or if your laboratory work also entails frequent field studies requiring photography, you should see my other recent book, *Field Photography: Beginning and Advanced Techniques* (W. H. Freeman and Company, 1976), which concentrates on field and field-related photography and includes much more detailed coverage of basic photographic techniques.

No attempt is made here to describe specialized techniques already well covered elsewhere, except as is necessary to provide a summary knowledge for better understanding of a given problem. This exclusion applies particularly to techniques requiring special equipment, such as the photography of spectra, oscilloscope traces, or aerodynamic flow fields. Such highly specialized techniques are discussed thoroughly in separate books, technical articles, or the literature accompanying the equipment in question.

The reader should keep in mind that knowledge of photographic techniques can be readily transferred from one type of subject to another, if they share some common characteristics. Thus, even if your immediate concerns seem to require reference to only a single small portion of this handbook, an initial reading of the whole text will be of material help in solving your specific problem. Simply referring to the index for notations on a particular subject will give no true idea of the usefulness of the book. Remember that, although the subject matter of a given illustrative plate may be foreign to your field of study, the characteristics being shown and the principles

comprehended in the photography may well apply to your own subject matter. Thus, for instance, the relatively widespread appearance of insect materials in the plates is due both to the easy availability of suitable specimens and—more importantly—to the inherently great structural variety of such materials. The characteristics displayed in many of these photographs may be readily seen in other, vastly different types of subject matter. The very unpredictability of a researcher's needs may make a seemingly unrelated piece of information just what is needed to solve some new problem.

No claims are made to complete knowledge or to originality of technique. The methods described here are those that have been found most useful by me, my associates, and my predecessors. I hope that they will prove useful to many others.

All the photographs in this book—except as noted below—were made by me; the blame for any deficiencies can thus be clearly assigned. Most of them were made as part of my daily work at the Scientific Photographic Laboratory of the University of California, Berkeley, where I was employed for many years. Some were made expressly to illustrate matters discussed in the text; a few others were existing examples of my personal photographic interests. The last two plates in the book are photographs made in 1885 and 1906, respectively, and were reprinted by me from negatives in the possession of the Museum of Vertebrate Zoology at the University of California, Berkeley.

A handbook such as this is necessarily a synthesis. The author of such a book must read, observe, be taught—and then adapt widely and freely. In a very real sense this book is the sum of the experience of a great many people, not all of whom can be identified. But some direct help can be clearly recognized, and those who gave it can be given the deserved credit.

Without the five years of excellent on-the-job training at the Scientific Photographic Laboratory under Victor G. Duran, I could not have undertaken this work. Much credit must also be given to Dr. E. S. Evans, Dr. Max Alfert, and Dr. Robert D. Raabe, who were members of the Laboratory's guiding faculty committee, for encouraging the experimentation necessary to develop and refine many of the techniques described in this handbook.

Nor could the great variety of specifically illustrative photographs have been collected without the cooperation of many of the people

who have had work done at the Laboratory and who have allowed me to use the resulting pictures here. Those who have given such permissions, or who provided subject matter for photographic experimentation, are credited in the plate captions. Dr. David Wake, Director of the Museum of Vertebrate Zoology, was very helpful in allowing access to the museum's negative files and in granting permission for the publication of pictures found there.

Grateful thanks are due Zev Pressman of the Stanford Research Institute, Dr. Edward S. Ross of the California Academy of Sciences, and Dr. Richard D. Zakia of the Rochester Institute of Technology for reading the manuscript and offering much helpful criticism. Many of their suggestions have been incorporated into the text. Much of the book still reflects the valuable advice and criticism given by Dr. Ralph Emerson of the University of California, Berkeley, when I was writing the original edition.

Any author would be helpless without the assistance of a great many people in the office of his publisher. Most cannot be credited by name because of the group nature of a publishing effort, but I must single out two people for special consideration—Fred Raab, whose editing of the manuscript has been a magnificent effort, and Jack Nye, whose performance as designer is obvious from cover to cover. My association with the personnel of W. H. Freeman and Company, over more than thirteen years, has been uniformly satisfying to me.

Last, but certainly not least, I would like to thank my wife, Sally, and my children (all six of them) for their patience during a period of unusual neglect, with special thanks to John, Frances, Barbara, and Elizabeth for their service as "galley slaves."

ALFRED A. BLAKER

Walnut Creek, California
July, 1977

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