THE MORPHOLOGY OF HUMAN BLOOD CELLS

DIGGS
STURM
BELL

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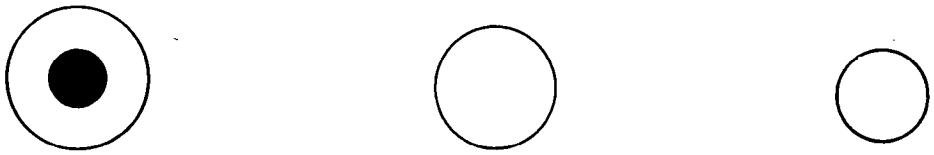

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PREFACE

THIS ATLAS is written primarily for medical students and student technologists who for the first time are learning about the morphology of normal and pathologic cells, for medical technologists who daily examine blood smears in physician's offices, clinics and hospitals, and for physicians who supervise laboratories. Emphasis is placed on the characteristics of individual cells and on differential morphology rather than on diseases of the blood and blood-forming organs.

Thin smears of human peripheral blood or bone marrow were used. Unless specifically stated in the captions, the cells were stained by the Wright's method. The various cells were painted in water color by Dorothy Sturm. With the exception of several of the larger plates the paintings were reproduced with an 1800 magnification. The size of the various cells in the color plates is therefore comparable throughout the text.

It is impossible to portray by means of relatively few cells the infinite variations of color, nuclear structure, granules and cytoplasmic morphology of all normal and pathologic cells. The authors have attempted to select cells which are most representative. Once selected, a cell was painted or drawn as that particular cell appeared. Diagrammatic representations of morphologic features have been avoided in the color plates. The color plates have been supplemented by black and

white and color photographs, ink drawings, tables and descriptions. All color plates have been placed before text for ready reference and continuity.

The terminology used is that recommended by "The Committee for the Clarification of Nomenclature of Cells and Diseases of the Blood and Blood-Forming Organs," sponsored by the American Society of Clinical Pathologists and the American Medical Association (1949–1950). In this terminology the suffix "blast" is reserved for the most primitive cell of a given sequence and the suffix "cyte" for all cells more mature than the "blast." The prefix "pro" is used for the second cell in each developmental sequence. In those sequences in which there are four types of immature nucleated cells, as in the granulocytic and erythrocytic series, the prefix "meta" is applied to the fourth cell.

Because of lack of agreement among hematologists concerning the names for many blood cells, the more common synonyms are given. Descriptive terms based upon morphologic features are used in preference to eponyms.

The bibliography includes selected texts and monographs which are recommended for reading by students. No attempt is made to discuss the various theories of cell origin or to give individual credit to the countless workers whose research furnishes the basis for our present concepts. We acknowledge our debt to them and our gratitude for their contributions. Appreciation is also expressed to:

The "Jaycettes" of Memphis, who first financed the painting by Dorothy Sturm of an initial series of cells which serve as visual aids at the University of Tennessee. The development of this series helped us to formulate plans for the atlas and to interest publishers in the project.

Professor Tom Jones of the University of Illinois who encouraged us in the continuation of the art work and who as medical consultant to Abbott and Company made the preliminary arrangements for the first publication of the paintings in color.

Abbott and Company, and particularly Mr. J. S. Dunham, Executive Editor, who published the "Morphology of Blood Cells," first in three issues of "What's New," and later as a monograph. By assuming the initial cost of the color plates and graciously allowing the use of these plates by W. B. Saunders and Company, the publication of the book has been made possible.

The staff of the Hematology Laboratory, including Dr. A. P. Kraus, Miss Helen Goodman, Mrs. Julia Browder, Miss Dorris Shelton, the residents in hematology, Miss Maribette Sifford, Mrs. Janice Perry and Miss Patricia Terry.

Mr. John Dickson, chief medical photographer of the University of Tennessee, who gave freely of his time and skill in making photographs.

The W. B. Saunders Company for their numerous courtesies extended to us and for the quality of their work.

L. W. DIGGS

April, 1956

CONTENTS

Chapter IX

COLOR PLATES I TO XXXI

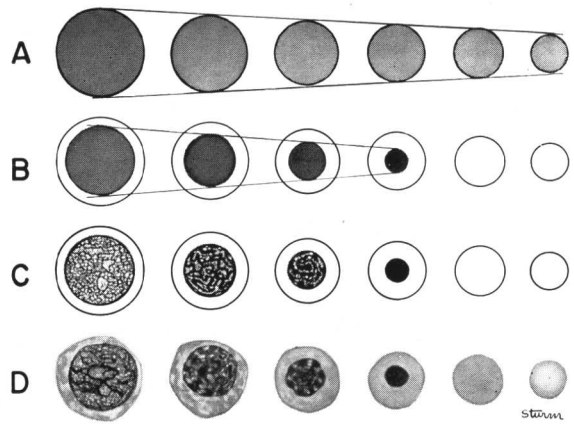
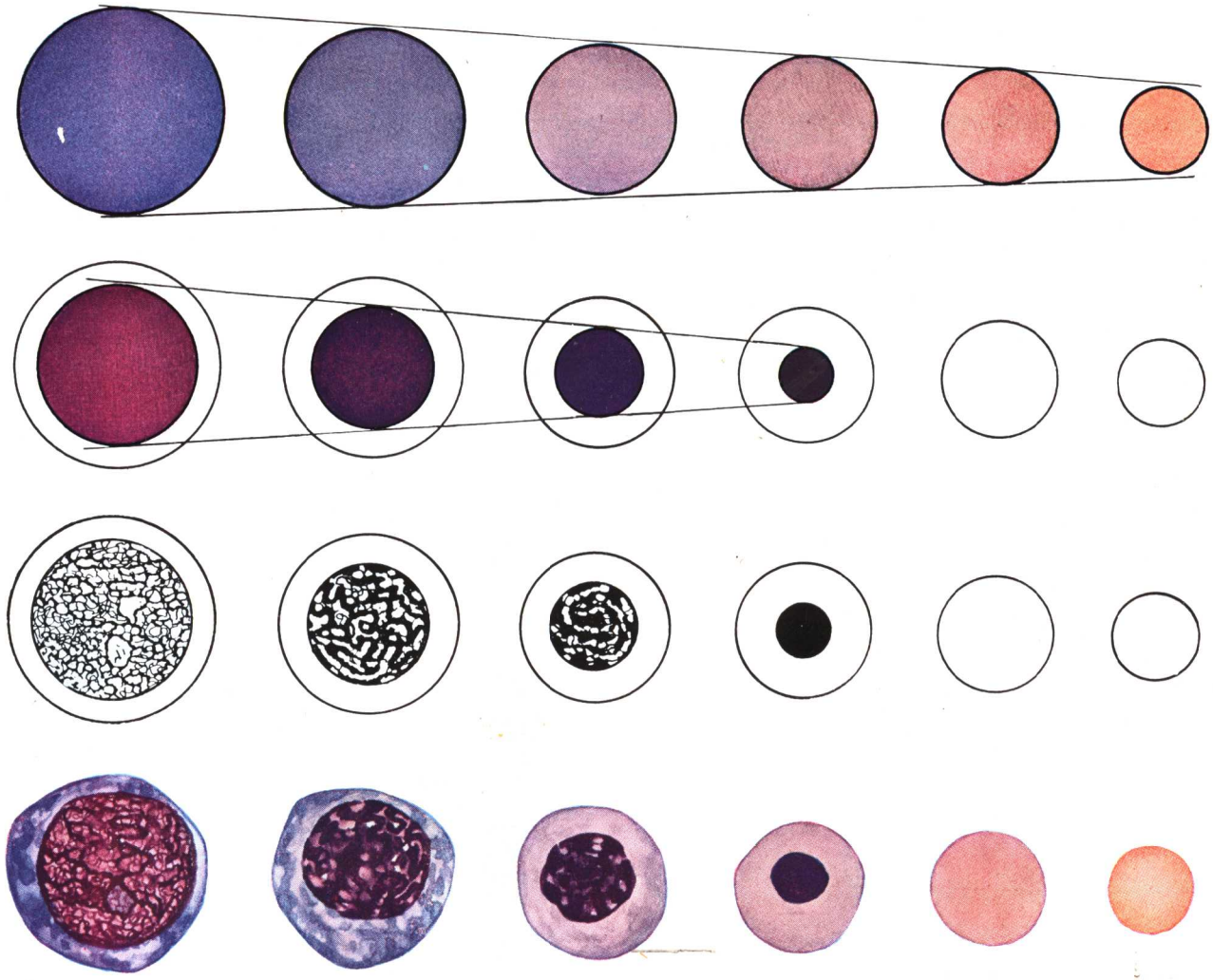


Plate I. MATURATION SEQUENCE

A. Cell size and cytoplasm color
B. Nuclear size and color
C. Nuclear chromatin structure
D. Composite (Left to right: Rubriblast, Prorubricyte, Rubricyte, Metarubricyte, Diffusely basophilic erythrocyte, Erythrocyte)



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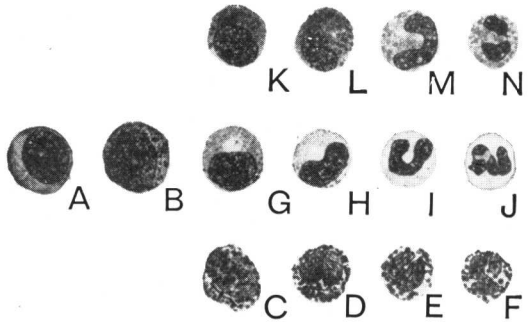
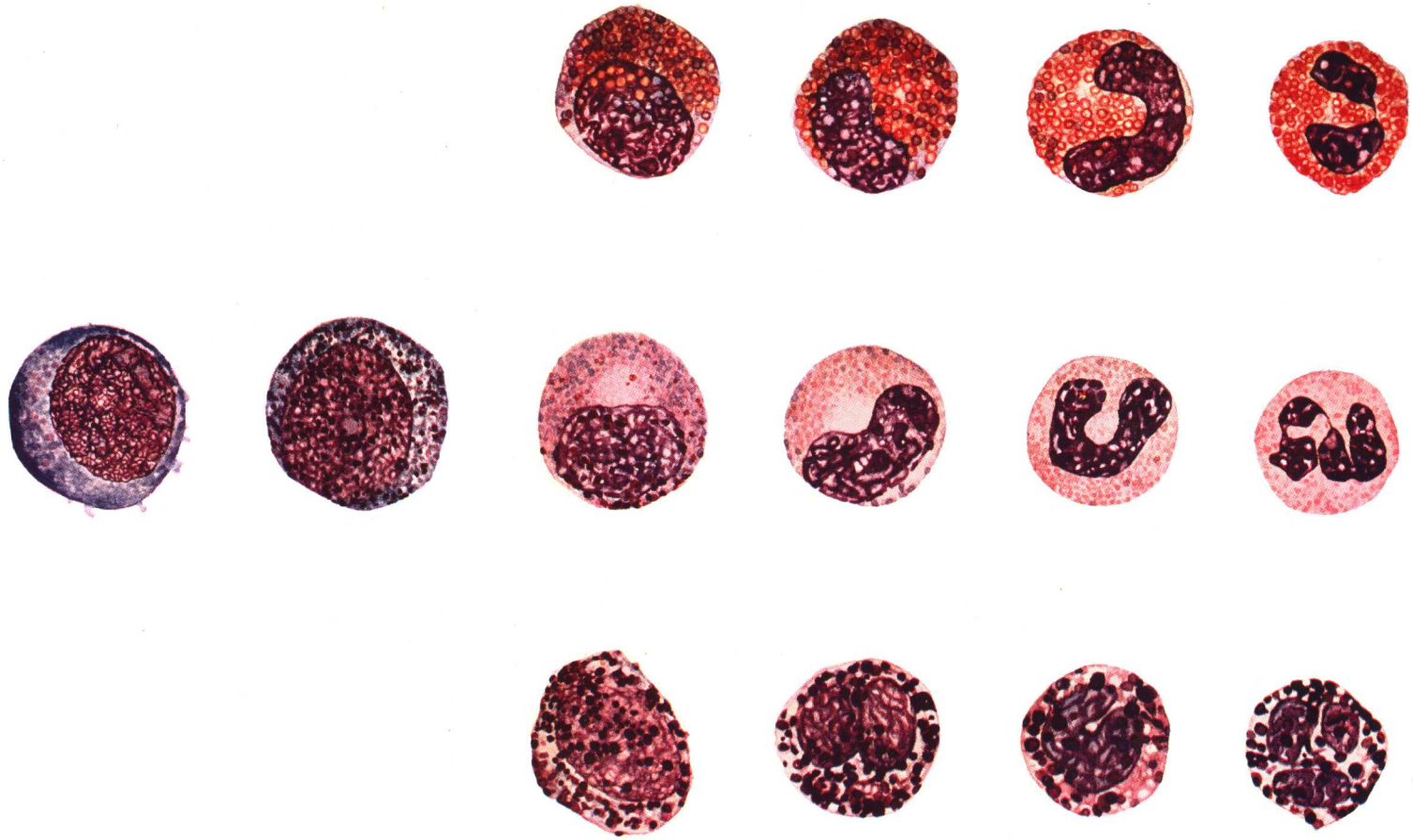


Plate II. GRANULOCYTIC (MYELOCYTIC) SYSTEM

A. Myeloblast
B. Progranulocyte (promyelocyte)
C. Basophilic myelocyte
D. Basophilic metamyelocyte
E. Basophilic band
F. Basophilic segmented
G. Neutrophilic myelocyte
H. Neutrophilic metamyelocyte
I. Neutrophilic band
J. Neutrophilic segmented
K. Eosinophilic myelocyte
L. Eosinophilic metamyelocyte
M. Eosinophilic band
N. Eosinophilic segmented



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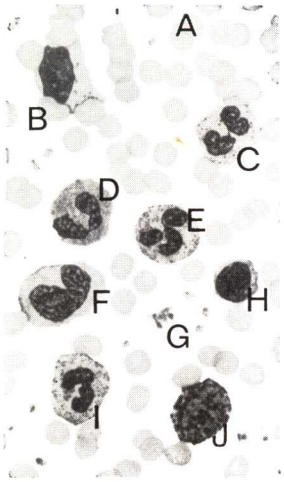

Plate III. CELL TYPES FOUND IN SMEARS OF PERIPHERAL BLOOD FROM NORMAL INDIVIDUALS

The arrangement is arbitrary and the number of leukocytes in relation to erythrocytes and thrombocytes is greater than would occur in an actual microscopic field.

A. Erythrocytes
B. Large lymphocyte with azurophilic granules and deeply indented by adjacent erythrocytes
C. Neutrophilic segmented
D. Eosinophil
E. Neutrophilic segmented
F. Monocyte with blue-gray cytoplasm, coarse linear chromatin and blunt pseudopods
G. Thrombocytes
H. Lymphocyte
I. Neutrophilic band
J. Basophil