leaders of the period set out to introduce certain other lines of botany, phases of the "new botany," as it were. They began to teach vegetable physiology, mycology, phytopathology and phytogeography. Laboratories for the study of botany were established in widely scattered institutions. The astounding development that has marked these newer interests since 1900 is a fitting tribute to the reliability of the philosophy and vision of Gray and his small band of intimate coworkers. Rodgers' book is a lively assemblage of fragments, sometimes grave and sad, sometimes gay but always serious, from the intense careers of the men who dedicated their lives to the problems of that particular period in the development of science in America.

The author mostly treats of taxonomic surveys and explorations in the South and in the wide-open West. Some attention is also given to botanical expeditions in Canada, Mexico, Central America and South America during the same time. The creation of and the expansion of botanical laboratories, agricultural experimentation and progress in North American paleobotany are treated as among the other more tangible contributions of the group of men that were bound together under the magnetic influence of Dr. Gray. The group includes, besides Gray, the names of Torrey, Parry, Porter, Lesquereux, Engelmann, Chapman, Watson, Farlow, Goodale, Macoun, Pringle, E. L. Greene, Britton, Beal, Coulter, Bessey, Trelease, Vasey, Burrill and several others including the somewhat younger L. H. Bailey, who is still living.

The book is attractively published. The difficulties of printing the numerous quotations (in small type) from correspondence and the free use of footnotes for bibliographical references and other purposes have been very well handled. The only illustrations in the book are excellent reproductions of photographs of Asa Gray, Leo Lesquereux and George Engelmann. The value of the book would have been greatly enhanced if a larger selection of portraits had been chosen to grace its pages. The present generation of botanists as well as those to come would value the work much more if it included a greater use of such distinctive features.

The reading of "American Botany 1873–1892" will contribute hours of genuine pleasure to the comparatively few "old timers" who are still among us. The book is an early "must do" on the desks of every broad-minded younger (20 to 60) botanist in this country and beyond the seas.

RAYMOND J. POOL

DEPARTMENT OF BOTANY,
THE UNIVERSITY OF NEBRASKA

AERIAL SURVEYING

Essentials of Aerial Surveying and Photo Interpretation. By TALBERT ABRAMS. 289 pages. McGraw-Hill Book Company, New York, N. Y. $3.00.

THE various lectures and demonstrations given by the staff of the Abrams School of Aerial Surveying and Photo Interpretation are combined and edited in this book, and equipment developed by the school is illustrated. Training in the use of such equipment must supplement a study of theory if one is to become expert in this field. Those who have received such training will find this publication a useful handbook, yet it is so simply, clearly and concisely written that the casual reader desiring a general understanding of the subject will find it interesting reading.

The whole field of aerial photography, map making and map reading is covered, starting with simple subjects and progressing to more involved ones. Background material is covered first: use of the slide rule, ratio and proportion, logarithms, map projections and topographical drafting. Next comes the making and developing of aerial photographs and their interpretation. The more advanced section follows with such subjects as stereo plotting, topographic relief models, aerial mosaics and world charting. Finally, a glossary of terms is provided for ready reference.

ALTON B MOODY

DEPARTMENT OF SEAMANSHIP
AND NAVIGATION,
U. S. NAVAL ACADEMY

SPECIAL ARTICLES

NODULAR POLYMYOSITIS IN RHEUMATOID ARTHRITIS[1]

SINCE the fall of 1938 we have carried on a restudy of the pathology of rheumatoid arthritis. Because of the frequency of physical signs suggesting nerve involvement (trophic changes, hyperreflexia and muscle atrophy), and because a search of the literature revealed that the nervous system was singularly neglected in previous studies, special attention was focussed on an investigation of the nervous system.

In previous reports[2, 3] the presence of a specific

[1] This work was done under grants from the National Foundation of Rochester, Michigan, and the Children's Fund of Michigan. We wish to express our thanks to Drs. Charley Smyth and S. E. Gould of Eloise Hospital, for the use of material from the amputated legs and two biopsies. Additional biopsies were from the Department of Internal Medicine and Department of Pathology at Harper Hospital. These findings were demonstrated in May, 1944, at the annual meeting of the American Rheumatism Association and at a meeting of the Wayne County Medical Society in December, 1944.

inflammatory type of nodule in the perineurium of many peripheral nerves of cases of rheumatoid arthritis was demonstrated. These lesions were often found remote from involved joints and in nerves not having articular distribution (for example, in ileohypogastric and ileoinguinal nerves). While continuing our investigations, the opportunity of studying the amputated legs of a 27-year-old woman suffering from rheumatoid arthritis presented itself. Investigation of more superficial nerves was pursued to determine the presence of nodules in small nerve branches. In searching through blocks of embedded muscle tissues, inflammatory nodules were encountered microscopically, scattered irregularly throughout the muscle tissue itself. These lesions were similar to those found previously in trunks of peripheral nerves of other cases of rheumatoid arthritis and in the nerves of this case also. The muscular nodules were composed of compact accumulations of lymphocytes, a few plasma cells and an occasional epithelioid cell and eosinophilic cell. Giant cells were absent. There were very few reticulin fibers, but a definite increase of collagenous connective tissue in endomysium and perimysium between the inflammatory cells. An inner necrotic center of the nodule, as seen in some of the perineuritic nodules, was not seen. The muscular nodules varied in size from a collection of as few as 20 lymphocytes, to a nodule that could be seen with the naked eye on the slide of a hematoxylin and eosin stained preparation. For confirmation of this finding, muscle biopsies of 14 additional cases of typical rheumatoid arthritis were performed. These were taken from the deltoid, triceps and gastrocnemius. A large number of muscle controls taken from routine autopsies, muscle biopsies and muscle tissue removed at operation were examined. All controls were negative. In no single instance of the 14 additional cases of rheumatoid arthritis have we failed to find inflammatory nodules. This is remarkable, because the weight of any muscle tissue removed did not exceed five grams —a very small portion of the entire skeletal muscular system.

Besides these widely disseminated muscle nodules, definite changes in the muscle fibers themselves were found; hydropic degeneration, edema, loss of striation, marked swelling or shrinkage and atrophy of muscle fibers. The distribution of these pathologic changes was irregular. Normal appearing fibers were found in a muscle bundle showing severely swollen or atrophic fibers. The presence of the inflammatory cells in clusters and in nodules and the finding of hypertrophic collagenous fibers without increase of reticulin fibers in the muscular nodules of patients suffering from rheumatoid arthritis must be regarded as specific. The numerically high incidence of these findings and their presence in small amounts of muscle tisues, taken at random, leads to the conclusion that there must be an enormous number of these minute nodules in an active case of rheumatoid arthritis.

It can not be stated at this time whether or not the nerve and muscle lesions precede the joint involvement. Nor is there any evidence available permitting us to state whether the muscle lesions are primarily connected with the small blood vessels or with nerves. All this awaits further investigation.

SUMMARY

The regular findings of a *nodular perineuritis* in peripheral nerve trunks and of a *nodular polymyositis* in skeletal muscles indicates the systemic nature of this disease. Rheumatoid arthritis is not solely a disease of the joints but a systemic disease, characterized by a widespread distribution of a nodular lymphocytic inflammation in peripheral nerves and skeletal muscles. The new findings in the nerves and muscles offer an explanation of the generally encountered clinical manifestations of pain, tenderness, trophic changes and muscular atrophy.

HUGO A. FREUND
HARPER HOSPITAL
GABRIEL STEINER
WAYNE UNIVERSITY COLLEGE OF MEDICINE
BRUNO LEICHTENTRITT
ELOISE HOSPITAL
ALVIN E. PRICE,
Major, M.C., AUS
17TH GENERAL HOSPITAL

MAINTENANCE OF THE BLOOD LEVEL OF PENICILLIN AFTER INTRAMUSCULAR INJECTION[1, 2]

THERE is a recognized need for a method to maintain the blood level of penicillin after a single intramuscular injection. When saline is the vehicle, penicillin is quickly absorbed; it disappears rapidly from the blood stream and is largely excreted. Thus, it becomes necessary to reinject penicillin at two- or three-hour intervals if amounts detectable by present methods are to be maintained in the blood stream. Other investigators have attacked this problem by the use of oil[3] and beeswax-peanut oil[4] as vehicles and,

[1] From the Harrison Department of Surgical Research, Schools of Medicine, University of Pennsylvania; and the Hospital of the University of Pennsylvania, Philadelphia.

[2] The work described in this report was done under a contract recommended by the Committee on Medical Research between the Office of Scientific Research and Development and the University of Pennsylvania.

[3] G. W. Raiziss, SCIENCE, 100: 412, 1944.

[4] M. J. Romansky and G. E. Rittman, SCIENCE, 100: 196, 1944.

[2] H. A. Freund, G. Steiner, B. Leichtentritt, A. E. Price, *Jour. Lab. and Clin. Med.*, 27: 1256–1258, 1942

[3] H. A. Freund, G. Steiner, B. Leichtentritt, A. E. Price, *Amer. Jour. Path.*, 18: 865–885, 1942.