able to tryptophan conversion is equivalent to a 0.015 per cent. yield of indoleacetic acid from pure tryptophan, versus a 0.022 per cent. yield of indoleacetic yield from crude corn. If tryptophan were the corn auxin precursor, then corn would have to be pure tryptophan, which is obviously absurd. It may be safely concluded, therefore, that tryptophan is not the corn auxin precursor to which most of the auxin activity is attributable.

On the other hand, it may be concluded from the work of other investigators[5,6] as well as from that of Gordon and Wildman, that tryptophan is a plant auxin precursor of a low degree of activity. Their results[4] suggest that auxin yields obtained from green tissues by methods involving extraction periods of many weeks[12] may possibly be attributable to tryptophan conversion into auxin.

G. S. AVERY, JR.
J. BERGER

CONNECTICUT COLLEGE

THE ROOTS OF SPINAL NERVES

EVERY one acquainted with the structure and function of the spinal nerves is aware of their threefold origin. Although this fact was recognized and generally accepted during the closing years of the nineteenth century, present-day descriptions of the spinal nerves continue to be based on the knowledge of a still earlier day. Consequently, they are initially misleading and always cause the beginner unnecessary difficulty in gaining an appreciation of the sources and functions of the fibers in peripheral nerves.

Each spinal nerve contains axons arising from cell bodies located in dorsal root ganglia, in the spinal gray matter and in the ganglia of the sympathetic chain. Fiber bundles from the first two mentioned sources are known as roots of the nerve, but the bundle from the third source is reduced to the status of a branch or ramus in all current descriptions. There seems to be no reason for continuing this erroneous designation except long-established custom. While it is true that the gray root is much smaller and joins the rest of the nerve at a point some distance removed from the union of the dorsal and ventral roots, such differences are mere details of pattern in comparison to the complete reversal of meaning occasioned by referring to a root as a branch; or, in the sense that these terms are employed, in speaking of a contribution as a derivative.

To obviate the above-mentioned misnomer in present terminology the following changes in the description of spinal nerves are proposed: (1) With an occasional exception, all spinal nerves are formed from three roots, a dorsal, a ventral and a gray (sympathetic). (2) Every spinal nerve gives rise to three primary rami and some of them give rise to four; the constant rami are the dorsal, the ventral and the recurrent, while the one arising from only certain of the nerves is the white (visceral) ramus. A white ramus springs from each of the thoracic nerves, the cranial three lumbar and the third and fourth sacral nerves; in addition, a white ramus may issue from the eighth cervical, the fourth lumbar or the second sacral. (3) The trunk of the spinal nerve is the portion between the roots; *i.e.*, it extends from the junction of dorsal and ventral roots to the point where the gray root joins the bundle formed by the union of the other two. By this definition the dorsal, the recurrent and the anterior rami arise directly from the trunk; but the white ramus is peculiar in that it may arise from the trunk, from the anterior ramus, or pass to the sympathetic chain enclosed in a sheath common to it and the gray root.[1] As to the composition of the rami with respect to the triple origin of the parent trunk, the dorsal and ventral rami contain fibers from all three roots, the recurrent carries fibers from the dorsal and the gray roots, and the white ramus receives fibers from the dorsal root and from the ventral root. It is to be noted that the white ramus alone carries dorsal and ventral root fibers only as implied for all rami in the usual introductory description.

That all spinal nerves have not two roots, but three, is factually correct. The question raised is: Shall all three roots be known as such or shall one of them remain disguised as a ramus and so continue to confuse and confound those who must eventually learn that the nerves to skin contain not only afferent fibers but efferent fibers as well; that in nerves to muscle, fibers from all three sources are generously represented; and that the white rami instead of being strictly efferent contain abundant afferent fibers? The author is aware that some afferent fibers may course with the gray ramus, that dorsal roots apparently carry efferent impulses as well as afferent, and that the possibility of afferent fibers in the ventral roots may not be excluded entirely. However, the errors imposed in neglecting to mention these facts in an introduction to the subject seem trivial compared to the continued persistence of the term "gray ramus" when the structure so named has long been established as a root—and an important one—of each and every spinal nerve.

DONALD DUNCAN

LOUISIANA STATE UNIVERSITY

TAXONOMY AND GENONOMY

SYSTEMATIC biology has been occupied in the past primarily with the end results of speciation. The object of practising systematists has been to define

[12] K. V. Thimann, F. Skoog and A. C. Byer, *Amer. Jour. Bot.*, 29: 598–606, 1942.

[1] D. Sheehan and J. Pick, *Jour. Anat.*, 77: 125, 1943.

the limits of the entities which they have discovered and to arrange them according to their resemblances. The methods employed have been principally those of comparative morphology. The relationships within these entities and the intraspecific structure which is conditioned by the ecology of reproduction have been neglected or but little attended to. Either they have been overshadowed by the practical necessity of creating a workable system, or their study has lagged because of the inadequacy or absence of the necessary techniques. In recent years, however, some systematists, augmenting the orthodox methods by others more suitable, have undertaken to analyze these phenomena. They have become interested not so much in the broader relationships which exist between species and between genera, relationships which can be inferred only from observation and on which no experimental attack is possible, but in the more intimate familial relationships of the individuals which comprise a species. By these studies it is hoped that they may peer beyond the end results of speciation and learn more directly its causes and course. They also believe that thereby a more satisfactory arrangement can be devised.

Several terms have been applied to such studies; they have been variously described as the "new" systematics, as biosystematics and as population genetics. These terms are awkward and are not wholly revealing. None has gained more than tentative acceptance despite the need for a term which can be generally applied. I am venturing therefore to propose the term *genonomy* to connote these laws of the blood relationship, coined from the Greek words τὸ γένος (the race or offspring) and ὁ νόμος (the law or ordinance). This term can be used in apposition to the term *taxonomy,* which can be defined as the laws of arrangement and employed to connote what Turrill has termed "alpha" taxonomy. If the need is felt for a more inclusive term to embrace both fields of activity, I suggest that the term *systematics* be used in this broader sense. As employed at present it is somewhat ambiguous, but more or less synonymous with taxonomy. To illustrate concretely by a study in progress: "The Systematics of *Delphinium Hanseni*" would subsume both its taxonomy and its genonomy. The former would embrace the usual studies of arrangement: nomenclature, differentiation and description of the entities and their geographic distribution. The latter would embrace studies entailed by the familial relationships of individuals, such as their breeding structure, intraspecific variation and its distribution, ploidy, the investigation of certain natural hybrids and the relationship of the entities involved in the polyploids and hybrids.

CARL EPLING

UNIVERSITY OF CALIFORNIA

ISOLATION OF INFLUENZA A BY INTRA-ALLANTOIC INOCULATION OF UNTREATED THROAT WASHINGS

WE wish to report that in this laboratory it has been possible to isolate and identify influenza virus A from untreated, unfiltered throat washings by intra-allantoic inoculation of developing chick embryo. The Hirst red cell agglutination-inhibition test was used for identification.

During a current epidemic twenty untreated unfiltered throat washings freshly collected in 20 per cent. normal horse serum saline have yielded four positive agglutinations on the first passage. One of these was verified as Influenza A by the agglutination-inhibition test.

Details of further studies will be published later.

MINNIE THIGPEN
JAMES CROWLEY

INFLUENZA LABORATORY,
DIVISION OF PREVENTABLE DISEASES,
MINNESOTA DEPARTMENT OF HEALTH

SCIENTIFIC BOOKS

NATURALIST AT LARGE

Naturalist at Large. By THOMAS BARBOUR. 314 pp. Little, Brown and Company, Boston. 1943.

WE use the expression "emergent evolution" to designate apparent mutations, which are really due, not to any change in the germ-plasm, but to a new combination of genes, giving a result which may be as wonderful as it is unforeseen. We must suppose that the elements which, coming together in the right manner and proportion, gave us Thomas Barbour, existed in his ancestors, even in those remote ancestors who would now be called savages. We are filled with a sense of wonder and mystery when we think of these early origins, destined to find their highest significance in a future then remote. If we ask what these elements were, we find the answer in Barbour's book. An intense curiosity about the phenomena and significance of animal life, a desire to discover facts hitherto unknown, a very keen sense of the beauty of nature, a remarkable capacity for friendship—all these faculties, separately or in combination, must have served Barbour's ancestors well, but it was a happy chance that brought them together in a single outstanding individual. But even so, nurture had to be added to