gland. The second type of distribution, as judged by recognizable buttons in relation to cells, was apparently confined to the zonæ glomerulosa and intermedia and the outermost zona fasciculata.

In order to follow up these findings, two silver impregnation techniques were used[8,9] for demonstrating reticulum (Fig. 4) and nerve fibres (Figs. 1, 3 and 5). While no absolutely convincing nerve endings were seen by silver impregnation, yet some of the appearances were very much akin to the buttons made visible by methylene blue preparations. However, fine nerve fibres were often seen, both as a network around small arteries (Fig. 3) and singly (Fig. 5) or in groups, in relation to the cells of the zonæ glomerulosa, intermedia and outermost fasciculata. All these fibres were much finer than the obviously myelinated fibres to the medulla which transverse the cortex in bundles (Fig. 1), and also finer than the strands of reticulum (Fig. 4).

These findings suggest therefore that, in addition to a possible vasomotor innervation, the adrenal cortex may possess a nerve supply to its outer cell layers. It would also seem that intravital injections of methylene blue provide a useful means of studying these nerves. Further work on this problem is being attempted.

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[1] Hollinshead, W. H., *J. Comp. Neur.*, **64**, 449 (1936).
[2] Young, J. Z., *J. Anat.*, **73**, 540 (1939).
[3] Kiss, T., *Acta Anat.*, **13**, 81 (1951).
[4] Stöhr, P., *Z. ges. Anat. I.Z. Anat. Entwgesch.*, **104**, 133 (1935).
[5] Hoshi, T., *Mitt. allg. Path. Sendai*, **3**, 328 (1927).
[6] Boeke, J., *Anat. Anz.*, **86**, 150 (1938).
[7] Feindel, W. H., Sinclair, D. C., and Weddell, G., *Brain*, **70**, 495 (1947).
[8] Long, M. E., *Stain. Tech.*, **23**, 69 (1948).
[9] Holmes, W., *Anat. Rec.*, **86**, 157 (1943).

## A Possible New Principle in Taxonomy, and its Evolutionary Implications

In the course of studies on the taxonomy of Coleoptera, lasting many years and dealing with groups at all levels from sub-orders down to species, it has gradually been borne upon me that taxonomic groups are not usually to be distinguished from the nearest related ones by more than one really constant character. Expressing the same concept in another form, if a taxonomic group is distinguished from related ones by the possession of character *A*, its constitution will not be quite the same as it would be if it were defined by the possession of character *B*. From superficial observation, the same principle appears to hold very generally in the animal kingdom, and quite probably among plants as well. Though this circumstance may well be familiar to many taxonomists, it does not appear to have been explicitly recognized as a general principle hitherto; if it is ultimately considered worthy of a name, I suggest 'the non-congruence principle'.

The implication of the non-congruence principle seems to be that differences of the sort used by taxonomists normally evolve one at a time. If any general statement can be made about taxonomic characters, it is probably that they exhibit more-or-less marked discontinuities but do not segregate like single gene mutants. The discontinuities are therefore presumably adaptive rather than genetical in origin, that is, they result from the relative inadaptiveness of the intermediate conditions; the evolutionary changes producing the differences were presumably relatively rapid. Genetical analysis of segregation in interspecific and intergeneric hybrids suggests that such differences involve changes in numerous genes.

To a non-specialist geneticist like myself, it seems quite plausible to assume that, if an adaptive change 'gets under way' involving a co-ordinated shift in a large number of separate hereditary factors, the genetical machinery of a species is liable to become 'tied up' in a way which would render it difficult or impossible for another change of the same type to be carried out simultaneously. If so, an explanation is provided for the apparent inability of selection to operate on more than one taxonomic character at a time, and the non-congruence principle would follow as a necessary consequence.

To take a familiar zoological instance of the possible application of the principle, we may consider some of the characters of the class Mammalia. The characteristic dentition, the secondary palate, the lower jaw suspension, the fur-clad skin, viviparity—in distinguishing Mammalia from Reptilia these characters are almost equivalent; but not quite, for the criterion of viviparity would exclude the Monotremata from the mammals, while the dentition alone would include a large number of Theromorph reptiles, and the secondary palate would include some of the later Theromorpha. According to D. M. S. Watson, there is some reason for supposing that the hairy skin first appeared with the small Ictidosauria (for example, *Oligokyphus*), that is, in succession after the dentition and secondary palate but before the truly Mammalian jaw-articulation. It may, of course, be objected that we know little or nothing of the adaptive significance of the changes involved in this instance, so that their serial occurrence might well be attributed to functional necessity, each change providing a necessary prior basis for the next. The account of the evolution of the horse given by G. G. Simpson seems to offer another example; the three major shifts—that from four toes to three in the Oligocene period, that from low to high molar teeth in the Miocene, that from three toes to one in the Pliocene—apparently occurred in regular succession though there is no evident adaptive reason why the first and second, or second and third, should not have gone on concurrently.

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## Physiological Forms of *Eucalyptus citriodora* Hooker

Since the discovery by Penfold and Morrison in 1927[1] of physiological forms in *Eucalyptus dives* Schau., many other examples of this phenomenon have been found in the Myrtaceæ and also the Rutaceæ[2]. The term 'physiological form' is applied to those plants in a naturally occurring population which cannot be separated on morphological evidence, but which are readily distinguished by marked differences in the chemical composition of their essential oils.

In 1948, the occurrence of a physiological form of *E. citriodora* was recorded[3] in which citronellal, the principal constituent of the 'type', had been almost entirely replaced by an equivalent amount of citro-