with a broader and more thorough training under the very best specialists that the world could afford. He is equipped to do synthetic work that no other or very few could do in the scientific study of modern man as he is now. While he had a full and better medical course in medicine than most physicians have ever enjoyed, he was also trained well in experimental psychology and also in anthropology, and he is now applying anthropology and psychology to medicine. Thirty years ago he started the word "Social-Pathology," which has come to be adopted in the English language. He is now starting new research under the title of anthropological psychiatry, and more lately new studies of Congress under the head of legislative anthropology. Such a man should be utilized.

THE A. CRESSY MORRISON PRIZE

EARLY this year The New York Academy of Sciences offered two prizes of $250 each known as the A. Cressy Morrison Prizes for 1926, one of which is to be awarded (in December of this year) for the best essay on intraatomic energy of the sun. It has been called to our attention that in the issue of SCIENCE dated August 13 of this year there is a paragraph stating this fact but quoting the subject erroneously as "*inter*-atomic energy of the sun." As there is of course a great difference between *inter*-atomic and *intra*-atomic energy and as this paragraph has already caused considerable query and surprise among astronomers I am wondering if you would not be good enough to correct this statement in an early issue of SCIENCE as the papers must be presented to the secretary of the academy prior to November 1.

ROY WALDO MINER,
Recording Secretary

SCIENTIFIC BOOKS

The Families of Flowering Plants, I. Dicotyledons, Arranged According to a New System Based on Their Probable Phylogeny. By J. HUTCHISON. xi–328 pp., 264 figs., numerous maps. Macmillan & Co., London, 1926.

IT may be said unreservedly at the beginning that this book is of the greatest interest and importance for all botanists whose activities extend beyond the naming of plants and the arranging of them in herbaria, and it is of especial importance to students of fossil plants, who are presumably interested in phylogeny.

The book returns in a measure to the ideas of Bentham and Hooker in their classical Genera Plantarum, but departs from them in many commendable respects. Briefly, it contains a discussion of the principles of classification, with some comments upon previous attempts, an annotated list of the families, an artificial key to the families, a well-illustrated account of the orders and families, a glossary and a good index.

The author considers that the dicotyledons fall naturally into two series: one, mostly arborescent, starting with the Magnoliales; and a second, mostly herbaceous, starting with the Ranales (restricted). These two lines evolve independently, except that the Urticales, Umbellales and Asterales are derived through both, *i.e.*, they are polyphyletic.

The outstanding difference from the system of Engler and Prantl (so-called), with which it is natural to compare the present attempt, is in regarding all the so-called Apetalae as reduced forms. Some probably are, others are not, and I would dissent from the author's conclusions on account of the geological record, and for the familiar reasons, too lengthy to enumerate here, but which have been stated many times during the discussions of the last fifty years. The "universally accepted theory of the foliar origin of the carpel" may be no more fundamental than the distinction of monocotyledonous and dicotyledonous seedlings, which is a bugbear that is likely to persist for years to come. Certainly there is no fossil evidence that entomophily preceded anemophily, and fossils with the latter habit are rather more conspicuous in Mid-Cretaceous floras than are the former.

It is impossible, with our present knowledge, to demonstrate phylogenetic hypotheses, and it is doubtless illusory to attempt to do so. At the same time, it seems to me highly desirable that those who know plants should give their colleagues the benefit of their conclusions, however these may fall short of demonstration. Only by friendly discussions and further investigations can we progress toward the goal.

It should be understood, therefore, that the following comments, both commendatory and adverse, represent my personal opinions, and do not detract in any way from my admiration of Hutchison's book or my belief in its usefulness, since, after all, the bulk of the text consists of a well-illustrated and admirably characterized account of all the families of dicotyledons, which is entirely objective.

In working out his scheme the author seems to me to lose sight of the fact that the familiar trends from single to aggregate fruits, polycarpy to oligocarpy, monoecious to dioecious, hypogeny to perigyny or epigyny, etc., are present in all sorts of combinations in unrelated families, and are of the nature of parallel adaptations, seemingly reversible even within the limits of a single family.

Despite the promise of the foreword, contributed by A. W. Hill, I can not discern that the author has

taken the very considerable fossil record into account beyond being influenced by the entirely speculative essay of Arber and Parkin. Floral morphology, perhaps the most variable feature in plants, is greatly overweighted in this as in all classificatory schemes, and I fancy that I can see the ghosts of Bentham and Hooker influencing some of the author's decisions.

It seems to me that more consideration should be given to the evidence of the probable late origin of such herbaceous groups as the Cruciferae and Caryophyllaceae. For example, in seeking to justify his separation of woody and herbaceous plants Hutchison says, "Many of the primitive families are either entirely woody or entirely herbaceous" (page x), and then names under the second category the Ranunculaceae, Papaveraceae, Crassulaceae, Saxifragaceae, Caryophyllaceae and Cruciferae. That any of these are primitive is almost entirely a matter of opinion. Surely the Crassulaceae are rather specialized, all are practically unrepresented in the fossil record, and there are many facts that suggest their relative modernity. It should be recognized that extreme habitat specializations, *e.g.*, to shores and salt pans (Frankeniaceae, Plumbaginaceae) or to aridity (Cactaceae, some Euphorbiaceae) do not give issue to new types, but represent blind endings which are likely to be comparatively modern, as is further indicated by their restricted distribution.

From a fair knowledge of both distribution and geology I venture to think that the so-called Wegener hypothesis of continental displacement raises many more problems than it solves.

I am heartily in sympathy with Hutchison's sharpening and multiplying the orders. The old aggregations that passed as Ranales and Geraniales have been sadly in need of segregation for a long time, and I am glad to see the Laurales set apart and the shifting of the Piperales from a primitive to a derivative position. I much doubt the suggested alliance between the ancient (despite the aforementioned ghosts) Proteaceae and the Thymeleaceae, the separation of the Hydrangeaceae and Saxifragaceae, or of the Myrsinaceae and Primulaceae, although I concede that the last may have a foundation.

Hutchison considers the Juglandales as derived rather late from the Sapindales, although the former appear early in the geological record, as do also the Moraceae; and the Fagales are among the earliest clearly recognized angiosperms.

The Platanaceae, although antedating both in the rocks, is considered to have been derived from the Rosales through the Hamamelidales, and to lead to the Amentiferae. The question of direction of evolution is a puzzling one in all groups of organisms, but I believe that the direction has been reversed in this instance.

There is a vast amount of inertia among systematists, whether it be in the writing of regional floras, or the arrangement of herbaria, and it is doubtful and probably not desirable that Hutchison's scheme should be adopted. A pious wish for international uniformity in taxonomy is probably as elusive a will-o-wisp as international comity, or the nomenclatural stability that we have heard so much about during the last thirty years, but that the first general phylogenetic presentation of dicotyledons after nearly forty years of systematic activity should not receive the attention and discussion which it deserves is unthinkable.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

THE CULTIVATION OF OPALINA

IN a recent paper appearing in SCIENCE,[1] a report was made on the reaction of Opalinas to various laboratory media. The maximum period over which these animals could be made to live was seventy-three hours. In working upon a problem of the specificity of Opalinas in frogs, we found that this period was too short for the purposes of our experiments.

A search of the literature on this subject revealed a method used by Konsuloff[2] in 1922 which succeeded in maintaining Opalinas in culture for two months. There was one fault to be found with this method, however; he had to change the medium every day. For our purposes this was unsatisfactory. Therefore we refined Konsuloff's technic until we have succeeded in cultivating Opalinas for twenty-five days without having to change the medium.

The procedure is as follows. Pütter's fluid, which has the following composition, is used.

NaCl	.8 per cent. sol.	100 parts
Rochelle salts	30.0 per cent. sol.	5 parts
Distilled water		400 parts

This is made with boiling distilled water to ensure as complete sterility as possible. After this has cooled it is subjected to the action of a suction which is maintained until bubbling ceases. This removes any excess air, a factor which has been demonstrated by Konsuloff to be lethal if permitted to remain. To this fluid is added, in the proportion of .25 grams to 200

[1] Larson, Van Epps, and Brooks, SCIENCE, Vol. LXII, No. 1604, page 289, (1925).

[2] Konsuloff, S., "Untersuchungen über Opalina," *Archiv. f. Protistenkunde,* Band 44, Heft 3, (1922).