examples will ever be numerous enough to give a very complete picture of all the fossil forms. Ingenuity in devising new paleobotanical techniques has enormously enlarged the potential botanical information obtainable from fossils; nevertheless, the best source of information about plants in general is from the species that can provide us with *vital* information, *i.e. the extant forms.* The functional characteristics of the fossil forms must be judged always in relation to what is known about modern representatives in the present flora. Modern plants serve as standards by means of which fossil plants are evaluated. Would it not be a wise policy to acknowledge this principle taxonomically?

Nomenclatural types are of critical importance in the application of names to plants. Identification involves assignment of a specimen to a place within a group of technical circumscription, and the oldest valid name-carrier (type) within the circle of circumscription determines the name of the group. For stability of nomenclature it is most essential that the characteristics of the name-carriers be unambiguous. In fact, the essential usefulness of a name in designating a particular group of plants often depends to a large extent on how definite a determination can be provided for its nomenclatural type (see Dayton. *Leafl. west. Bot.*, 1943, 3 (10), p. 217, re. *Steinhauera*). If, as in the instances cited by Prof. Merrill, the oldest name-carrier happens to be a fossil specimen, that name under the present Botanical Rules must be applied to the group. Although opinions differ as to what the particular requirements should be for designating a new nomenclatural type (any new group must include its type), there can be little question that implications of names attached to modern material are generally more *understandable* than those carried by fossils. The writer believes that, wherever possible, the modern type material should be given precedence, but to do this a new policy must be incorporated in the code of nomenclature.

To serve this purpose the writer suggests that the following sentence be inserted in the International Rules of Botanical Nomenclature, either as a part of Article 18 under Section 2 regarding "The Type Method," or as a part of Appendix I, "Regulations for Determining Types," yet to be proposed, or in whatever place it may seem more appropriate.

Names based on types composed of modern material always take nomenclatural precedence over names permanently attached to specimens of fossil or subfossil character.

The inclusion of such a statement would authorize a departure from priority in the few instances where fossils have received names ahead of congeneric descendants in the modern flora. In these instances it would insure that the valid name is typified by material deriving from the best source of evidence and information. If such a principle were incorporated in the Rules, it would obviate any future argument like that about *Steinhauera*; it would tend to insure the stability of names established with reference to modern material as types. Although discerning paleobotanical investigation is tending more and more to link closely related ancestral forms with those of the present flora, it is probably simpler (where evidence warrants it) to place such fossils according to names referring to modern material than it is *assuredly* to adjust modern names to fit nomenclatural types among fossils that happen to have priority.

Adoption of such a provision probably would validate automatically the names *Platycarya* and *Rhamphocarya* mentioned by Prof. Merrill—both typified by modern material. It would permit Prof. Cheng and Dr. Hu to propose a new and appropriate generic name for the modern *Metasequoia.* According to Merrill, the new group suggests *Glyptostrobus* and *Taxodium* in its vegetative characters, and its botanical alliance is scarcely with *Sequoia,* as one might infer from the name of the fossils with which it has been identified.

Appropriate or not, a name is a name; however, a full set of characteristics can be established for the modern plant in a way that is scarcely true of fossil forms. Among the Coniferales, in particular, characteristics of the frequently complex type of polyembryony are important. These could be established for the modern material, but who can determine the degree to which they apply to the fossil *Metasequoia?* There always will be matters of doubt concerning some of the features of fossils regardless of how definitely their relationships may be adjudicated. Inevitably, knowledge of modern forms is on a more certain basis and is accorded more prominence in botanical thought. If this state of affairs is given due recognition as suggested above, problems of nomenclature for both fossils and modern forms will, to some extent, be clarified.

JAMES M. SCHOPF
U. S. Geological Survey, Washington, D. C.

Brown, Mature-Fruit Color in Pepper (*Capsicum frutescens*)

In a collection of pepper material from Mexico turned over to me by the late J. N. Gilmore, one strain produced fruit which turned a deep chocolate brown at maturity instead of the normal red or yellow commonly found in this species. Later, an off-type plant with brown fruit was found in a field of the California Chili variety, and one plant with brown fruit, but otherwise typical of the variety, was found in a field of Mexican Chili. In conversations with several seedsmen I have been told that this character has been seen on a number of occasions by them in their collections. The only reference in the literature to this color of pepper fruit is made by S. M. Bukasov (*Bull. appl. Bot., Genet., Plant Breed.*, 1930, Suppl. 47, 526–529), who describes two forms which are quite widespread in Mexico and in Guatemala.

The chocolate-brown mature-fruit color in pepper is of especial interest because of the nature of the brown color and its rarity or absence in fruit generally. At the onset of ripening the color changes directly from green to brown and involves all of the wall tissue, which becomes a uniform chocolate brown throughout. A suggestion of this same phenomenon is sometimes seen in certain commercial peppers which develop a distinct brownish color before becoming a clear red at maturity. It was suspected that this color was due to the retention of chlorophyll in the ripening fruit instead of to the partial to complete loss of chlorophyll which normally accompanies the softening, coloring, and other physiological processes of ripening. Thus, with the normal red pigments developing at maturity the combination of chlorophyll and red pigments produced the brown. To determine this, F. P. Zscheile extracted mature fruit with an acetone-hexane mixture. Upon saponification, chlorophyll in high concentration was removed, leaving a reddish-orange solution in hexane. Adsorption of this mixture on a magnesia column and development with acetone in hexane demonstrated the presence of a wide variety of carotinoids, from light yellow to dark orange in color. No other types of pigments were observed.

Preliminary data on inheritance indicate that the brown fruit color is due to a single recessive gene which inhibits the normal chlorophyll destruction at fruit maturity. In a cross with a normal red-fruited form, the F_1 had normal red fruit and the F_2 population segregated 61 red to 20 brown—a very good 3: 1 ratio.

Since the action of this gene appears to be the prevention of the normal chlorophyll breakdown at maturity, it should be possible to produce a green mature-fruit color by crossing with a pepper having a yellow mature-fruit color. Such a combination might possibly have some value for prolonging the sale period of green salad peppers.

This gene is of considerable theoretical interest in providing additional material for a study which is under way of the mechanism of chlorophyll decomposition during the fruit-ripening process.

PAUL G. SMITH

Division of Truck Crops, University of California, Davis

Crystalline Synthetic Vitamin A and Neovitamin A

At a meeting of the American Chemical Society on September 15, 1947, announcement was made of the commercial synthesis of vitamin A (J. D. Cawley, C. D. Robeson, L. Weisler, E. M. Shantz, N. D. Embree, and J. G. Baxter), and evidence was presented to prove that the synthetic vitamin is identical with natural vitamin A of marine origin. It was also shown that the synthetic concentrates contain neovitamin A, the geometrical isomer of vitamin A previously isolated from fish-liver oils (C. D. Robeson and J. G. Baxter. *J. Amer. chem. Soc.*, 1947, 69, 136). Since a number of geometrical isomers of vitamin A could have been produced in the synthetic process, it is of interest that only the naturally occurring forms actually resulted. This note is concerned with the identification of the two vitamins in the concentrates and with the determination of the relative amounts of each present.

The synthetic concentrates are bright orange, viscous oils, with potencies as high as 2,400,000 U.S.P. units/gm and with extinction coefficients at 325 mμ as high as 1,250. Crystalline vitamin A was obtained from the concentrates by the method developed for crystallizing the natural vitamin (J. G. Baxter and C. D. Robeson. *J. Amer. chem. Soc.*, 1942, 64, 2411). The synthetic and natural crystals were found to be substantially identical in biological potency (3,300,000 U.S.P. units/gm), ultraviolet absorption coefficient [E(325mμ) = 1,800], and in the blue color obtained with antimony trichloride [E(620 mμ) = 4,400]. Further confirmation of the identity of the synthetic and natural vitamins was obtained by comparing the melting point and other properties of the crystalline acetate and anthraquinone-β-carboxylate esters of the synthetic vitamin with those of the corresponding esters of natural vitamin A (J. G. Baxter and C. D. Robeson. *J. Amer. chem. Soc.*, 1942, 64, 2407).

It was found that the synthetic concentrates also contain neovitamin A. This was demonstrated by crystallizing the synthetic neovitamin as the red anthraquinone-β-carboxylate ester (m.p. 133–135°) by essentially the same process as that used with natural neovitamin A (*J. Amer. chem. Soc.*, 1947, 69, 136). The vitamin A in a rich synthetic concentrate was removed as completely as possible by crystallization from ethyl formate at – 70°. The neovitamin present in the noncrystallizable residue was further concentrated by selective adsorption on sodium aluminum silicate. A fraction was thus obtained containing neovitamin A and vitamin A in the proportion of 90: 10. Esterification of this concentrate with anthraquinone-β-carboxyl chloride followed by crystallization from methyl acetate gave an ester identical in properties with that obtained from natural neovitamin A.

Assays of two synthetic concentrates by the maleic anhydride method (*J. Amer. chem. Soc.*, 1947, 69, 136) indicated that the proportions of vitamin A and neovitamin A present were 1.5: 1 and 2: 1. These ratios closely approximate those earlier reported for fish-liver oils. The similarity suggests that vitamin A either *in vivo* or *in vitro* is converted, in part, by catalytic agents into neovitamin A, and therefore that the occurrence of neovitamin A in liver oils is not necessarily indicative of any peculiar requirement of the fish for this isomer. Instead, it appears that "vitamin A," physiologically speaking, must be considered as a mixture of the two geometric isomers.

We wish to thank A. J. Chechak, F. B. Clough, C. C. Eddinger, H. M. Kascher, and Max H. Stern for valuable technical assistance, and the Spectroscopy, Biochemistry, and Custom Distillation Departments of this Company for their generous cooperation.

J. D. CAWLEY, C. D. ROBESON, L. WEISLER, E. M. SHANTZ, N. D. EMBREE, and J. G. BAXTER

Distillation Products, Inc., Rochester, New York

* * *