sary if we are to save the trees in this country." The Federal Government has made available $400,000 of Civic Works Administration funds with which to attack the disease up to May 1 next. Additional or other funds will be required after that. Governor Lehman urges that for the next two or three years, "or for such period as is necessary to determine the feasibility of eradication, the Federal Government continue to supply all funds necessary to adequately prosecute the complete eradication program."

DISCUSSION

WHAT ARE "EXPANSION" AND "CONTRACTION"?

IN a recent issue of SCIENCE (November 10, 1933), Dr. Mast takes exception to the terminology which I have proposed (September 29, 1933) to designate the movements of the pigment masses in the chromatophores of vertebrates and their changes in shape and apparent size. I proposed the terms "chromatosome," "melanosome," etc., for those pigment masses, and contended that the terms "expansion" and "contraction" be applied to these contained masses, rather than to the chromatophores themselves, to which many writers continue inconsistently to apply them.

Mast's account of the movements of the pigment granules back and forth along definite paths will hardly be disputed, at least for certain cases in which these phenomena have been carefully followed. We may also accept as probable his assertion that the source of the movement lies in the colorless cytoplasm, rather than in the granules themselves. His further reasoning, however, is difficult to follow. "While it is evident," he writes, "that the pigment masses (chromatosomes) change enormously in form, there is no evidence indicating that they *per se* change in size, *i.e.*, expand and contract, and that the change is due to processes within them." Again, "Under the conditions which induce movement of the pigment granules out into the branches of the chromatophores they become distributed through a relatively large space, and under those which induce movement in the opposite direction they become concentrated in a relatively small space."

I fail to see why Mast's account of what happens to the pigment granules in a chromatophore would not apply in its essentials to a volume of gas, subjected to variations in temperature or pressure. Here the molecules "become distributed through a relatively large space," or "become concentrated in a relatively small space," as the case may be. Yet no one hesitates to say that the volume of gas "expands" and "contracts." The same is true of liquids or solids, though within a much narrower range.

The fact that the pigment granules are suspended in hyaline protoplasm, and that this is (probably) responsible for their migrations, should not affect the issue. The "chromatosome," *i.e.*, the aggregate assemblage of pigment granules, does *expand* and *contract* in the same sense that a volume of gas expands and contracts. To say that the component particles "spread out" or "aggregate" is no more true in one case than in the other. But it is often convenient to avoid such circumlocutions, and to speak directly of what happens to the assemblage of particles. Is it not just as accurate to say that urethane, for example, causes "the chromatosomes to expand" as to say that this drug causes "the pigment particles in the chromatophores to spread out"? And is it not much simpler?

I can not, therefore, agree with Mast's contention "that the phrase 'expansion and contraction of these masses' (chromatosomes) describes the phenomena in question but little, if any, more accurately than the phrase 'expansion and contraction of chromatophores.'" If the words, as I have used them, are misapplied, it is likewise incorrect to speak of the expansion and contraction of the mercury in a thermometer or of the air in a tire-pump.

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CONVENTIONS OF BOTANICAL NOMENCLATURE

A RECENT article by Dr. R. W. Brown[1] is provoking in more senses than one; the sober admonition that "the botanists should now without hesitation follow the wise leadership of the zoologists" in a matter of nomenclature may well provoke the petty rage of *Fachleute;* it will provoke not only rage, but also attempts to answer and reflections on the nature of botanical nomenclature.

The field of systematic botany is cultivated by men of all nations; the fruit of their labor is intended for the use of all men, and all men are free to propose improvements in methods of cultivation. Dr. Brown urges at least four improvements: (1) The adoption of a standard system of pronunciation of scientific names; (2) the elimination of case-endings from personal names in specific epithets; (3) a new rule in codes compelling authors of names to supply the etymology; and (4) the decapitalization of all specific epithets.

Specific answers are to be derived from general principles. The names of plants are not code-designations arbitrarily established and subject to tinkering; they are words of a language, subject to the rules

[1] SCIENCE, 78: 333–335, 1933.

of grammar of the specific language and of language in general. As Latin, formerly the common language of scholars, has passed from use, scholars in most fields have ceased to possess a common language. If systematic botanists have clung to Latin, it is not because they are all prigs: we are not so silly as to pride ourselves upon a barbarous *Latina qui fecit tremblare pilastros*. We are glad to write in an ancient language, since then we can with justice insist that Italians and Dutchmen, Russians and Japanese write in a language which we can read. The fact that Latin is no longer a spoken language relieves us of the necessity of fixing the pronunciation.

Subject to the rules of Latin grammar, scientific names are bound by convention. By convention, any person is free to name an unnamed group; the name is applied and becomes binding by its publication together with a description, in Latin, of the group. The name is subject to various requirements which need not be retailed. Those familiar with the requirements, and with their operation, realize the futility of any attempts to restrict, more precisely than at present, the creation of names. We rely upon the goodwill of authors to explain their names; we can not reject the names if no explanation is forthcoming. In fact, we can not enforce under penalty the requirement of description in Latin, but must depend upon the conscience of every author. If some one violates the rule, he may expose any of us to the necessity of translating Danish or Portuguese. This insistence that there are botanists whose language is not English is not lightly to be brushed aside. I have seen a systematist compelled to find an interpreter of Japanese for a passage mistakenly supposed to describe a new group.

It is not by the rules of Latin grammar, but by convention, that the name of a plant is a proper noun, and that the name of a species consists of two words. The second word, in the names of most species, is an adjective; the term "specific name" as applied to most specific epithets is a misnomer, but a harmless one, creating no confusion in the minds of the instructed.

When, occasionally, the specific epithet is a noun in the nominative, it is in opposition with the generic name: *Robur, Cepa, Plantago-aquatica, Pecten-Veneris, Omorika* and *Mays* are usable by themselves as names of the species in whose full names they appear as specific epithets. By adoption into botanical Latin, the Slavic *Omorika* and the Indian *Mays* become proper names, as *Picea* and *Zea* are.

English grammar permits the use of naked nouns as adjectives. We speak of the Hoover administration or of the United States Geological Survey. Not so the Latin. In writing *Picea Engelmann,* one would imply that the name *Engelmann,* standing by itself, is usable as the name of a species of spruce.

All modern languages written in Roman characters distinguish in use between capital and small letters. Classic Latin did not make this distinction; in applying it to printed copies of Caesar's Gallic War, or to scientific names, we are necessarily guided by the usage of modern languages. Usage in all modern languages agrees that sentences and proper nouns begin with capital letters. It is as wrong to write *Michauxii* with a small initial as to apply the same treatment to United States Geological Survey.

Except as noted above, modern languages differ in the use of capitals; and in former years, botanical Latin published in different countries showed differences in the capitalization of proper adjectives. These differences have disappeared, in so far as the international character of systematic botany is appreciated, by compromise; personal adjectives are capitalized, geographical adjectives are not. This compromise has the usual weakness and strength of compromises. One may be jarred, at first, by seeing *californica* written with a small initial; but one realizes that if Germans do not insist on decapitalizing all proper adjectives, Americans need not insist on capitalizing all of them. A person who understands, and is not a hopeless non-conformist, soon becomes heartily reconciled to the system. One foolish individual protests that the state of California is far more important than any individual; another that capitalized specific epithets seem to mar the symmetry of a list. *De gustibus non est disputandum.*

About forty years ago, American systematists were engaged in a bitter dispute over rules of nomenclature. That controversy ended with a considerable body of American botanists defying the rest of the world to do its worst. By the experience of that time, we know that attempts to bring a strange harmony out of a confusion which is largely apparent create a confusion which is intolerable; also, that meddling with names does not clear the way for an interest in realities. On the contrary, it focuses attention on names. Still individuals are deluded by objectives which are neither feasible nor particularly desirable. The commonplace facts here stated seem adequate in answer to one such person. It has seemed worth while to repeat them, because the whole accepted system of botanical nomenclature is worthy of active support. It is not on the whole an arbitrary system; its arbitrary features (as in the capitalization of adjectives) are such as can be settled only arbitrarily; it is suited to the use of students who recognize an international public.

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