

given by Saccardo or they have been shifted from their proper historic use and do not now contain their original types. Of course, in some cases this is correct, since the list includes some metonyms where the type falls within the limits of an earlier valid genus. The number of these has not been determined, since it will depend on the conception of generic limits and will necessarily change from time to time with the increase of our knowledge. As genera are now recognized it probably does not exceed 20 per cent. This would leave an estimated 218 valid genera to 100 of which, or 45 per cent., the oldest available name is not applied by Saccardo. Of the 100 monotypes 58 appear in Saccardo under their original name, while 42 must be sought under other genera. In one case noted, five genera have at different times been founded on the same type species, and three of these names are still doing duty in both Saccardo and Engler and Prantl.

Glaring inconsistencies like those might be cited almost endlessly. The above, however, is sufficient to show conclusively first, that we have at present no widely accepted 'prevailing usage' in regard to the names of fungus genera; and secondly, that the usage that has prevailed in the formation of generic names has not led to stability or to the establishment of any logical system of procedure. In fact, the existing condition is so confused and anomalous as to imperatively demand an immediate and sweeping reform. Doubtless all will now agree that any rational system of nomenclature must be based strictly on priority. This in itself is a long step in advance, for only a generation ago the foremost systematists laid less stress on priority than on the supposed appropriateness of a name. The unfortunate result of their practices has just been passed in review. While all will agree on the basic principle of priority there will be divergence of opinion when the attempt is made to formulate a code of rules for applying it. The ideas and methods of the earlier writers were so diverse from our own that it is impossible to bring their work into harmony with ours without adopting rules and methods that are necessarily more

or less arbitrary. It is perfectly clear that they had no idea of the type of a genus or a species in the sense in which we use the word to-day. Their 'type,' in so far as they had one, was a mental concept; and yet if we are to prevent this endless shifting of generic names from one group of plants to another, it becomes necessary to tie down these ancient concepts to the material basis of a single species. The exact way in which this is to be done really matters very little. No rule or system of rules can possibly be devised which, if consistently followed, will not throw out or change the meaning of many of the names accepted by modern writers. Any attempt at reform based on a method devised for the purpose of 'saving names' can only end by adding to the existing confusion. Let us then nerve our minds to the point of seeing not only any, but, if necessary, all of our most favored names sacrificed to consistency, and unite in adopting the simplest and most direct code of rules that can be agreed upon. When this is once done and its provisions are carried out in good faith we shall by the one cataclysmic effort have placed the nomenclature of our science on so firm and stable a basis that we need no longer dread the appearance of each succeeding contribution to mycological knowledge on account of the changes in names that have been so constant and so annoying an accompaniment of each forward step in the past.

F. S. EARLE.

NEW YORK BOTANICAL GARDEN.

#### ENERGETICS AND MECHANICS.

WITHIN the past ten years energetics has been brought to the front as furnishing a systematic account of phenomena that are connected most directly with quantitative relations of energy, and of its transformations. To any one who has stood aloof from the polemic between the 'energetic' and the 'forceive' view, it must seem proved that the former has rendered a permanent service to physics, by devising and putting into circulation forms of statement that are freed from superfluous hypothetical assumptions, and brought closer to the foundations of natural science in ascertained facts. For example, the

current of thought, simplifying and clarifying in this sense, that runs through Professor Ostwald's 'Naturphilosophie' is undeniable, whatever particular attitude between full acceptance and opposition we may take toward the author's expressed or implied philosophy. But in summing up the gain due to such movements, that lesson from history must not be lost sight of which teaches that a new interpretation of phenomena rarely supersedes the previous views; it most often supplements and modifies them. So here, while we may accept the suggestion from energetics, and cry good riddance to a cumbrous apparatus of molecular forces, premature, at least, for our present state of experimental knowledge and, perhaps, finally illusory, it is not required by consistency to follow the extremists in their tendency to banish the conception of force completely, nor need we even derive those parts of mechanical doctrine which are stated through equations of motion from an exclusive source in energy relations.

It is something, of course, that we have a direct and roughly quantitative appreciation of force through muscular sensation; but further, attacking the matter more broadly, several points may be urged in restraint of relegating force to the scientific lumber-room. First, let us grant fully one great advantage of an energy equation: that it renders possible a true statement of relation between conditions at the boundaries of an interval, while we are ignorant of the internal mechanism, *i. e.* the details within the interval. But let us notice, also, that this is coupled with a corresponding disadvantage. The energy equation is not immediately capable of recording internal details, even where the process has been traced continuously or minutely; and to this extent it fails to represent completely our acquaintance with those cases. In parallel with the energy equation (the integrated form), therefore, the force equation or its equivalent (the differential form) is then justified and requisite. That is, though it is well to acknowledge ignorance and bridge the gap with the energy equation, yet it would be pedantic to use equations of that type exclusively, and thus ignore knowledge that we

really possess. Secondly, it is part of the general intellectual position which has led to the development of energetics, that the introduction and use of physical quantities are to be determined according to their convenience and sufficiency. Now it is true and interesting that the condition of equilibrium (zero value of accelerations) can be described as a compensation of one form of energy by another (Ostwald, *passim*); but that does not settle any question of practical convenience in the definite calculation of conditions for equilibrium. And it is precisely when those conditions obtain, that one factor of energy becomes indeterminate or unimportant, leaving attention to be concentrated upon the remaining factor. Hence the universal procedure in measuring the forces, pressures, etc., that are practically essential elements in a state of balance, through the whole range from constructing the piers of a bridge to applying D'Alembert's principle. For the purpose of physics it is not always enough to know that an algebraic sum is zero; the magnitude of the self-neutralizing terms is of importance. To be sure, this particular aspect of the situation may be met by using freely coordinate derivatives of energy, and thus narrowing the question to the choice between the directer and the more artificial introduction of the necessary forces. But even this resource would not occupy the vacant field entirely; a third point remains to be considered. What account does the view peculiar to energetics give of normal forces, those actions which guide moving bodies without directly affecting their energy of motion? The scalar kinetic energy is unaffected by mere change of direction; there is no measurable exchange of energy (apart from friction) between a body moving with constant speed in a curved path and the guiding mechanism. Yet these are not instances of equilibrium, either, describable in terms of compensating forms of energy; none of the extensions of energy equations to cover tangential forces by means of coordinate derivatives apply here. This seems to be the weakest spot in the scheme of energetics, at which it stands most in need of supplement by direct use of equations of motion. Everywhere

in dynamics the directive forces play a prominent part. Nor is this necessarily confined to molar mechanics; wherever the generalized equations of Lagrange are proved to be serviceable, the significance of the term  $\partial E/\partial s$  cannot be overlooked. It registers the occurrence of directive or guiding forces, as a type, in conjunction with those whose form  $(d/dt \cdot \partial E/\partial v)$  indicates their relation to changes of energy.

FREDERICK SLATE.

UNIVERSITY OF CALIFORNIA,

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#### QUOTATIONS.

PRESIDENT ELIOT.

'NATURE's patient ways shame hasty little man,' a sentence from one of President Eliot's lectures, is the keynote to much of his work; for he has made nature's patient ways his own. He celebrates to-morrow (March 20) his seventieth birthday, and this year, also, the thirty-fifth anniversary of his presidency of Harvard. For an estimate of his achievements this is neither the place nor the time: the limits of an editorial article are too narrow; and his labors are, we trust, far from an end. *Serius in cœlum redeat*. But we add our hearty congratulations to those of Harvard graduates, friends of learning from all colleges and schools, and worthy citizens in every walk of life; and we seize this moment as suitable for dwelling on two or three aspects of President Eliot's career. He stands among the foremost citizens of the United States; were there a common denominator by which one could measure men of widely different talents and callings, he might rank the very first. This success is indubitably due in large part to a power which has wrought, like the force of a glacier, without haste, and without rest.

It is as an educator that he enjoys the widest fame. For more than a third of a century—a period of unexampled material progress—in a country which has leaped forward rather than developed, he has been at the head of our oldest and richest university. He has thus enjoyed a unique opportunity to set his stamp upon the educational system of a nation; and this opportunity he has employed to the uttermost. The principles

which he intended to follow he laid down with precision in his Inaugural Address in 1869; from those principles he has never swerved. He declared: "This university recognizes no real antagonism between literature and science, and consents to no such narrow alternatives as mathematics or classics, science or metaphysics. We would have them all, and at their best." Against the old hard and fast curriculum—"one primer, one catechism, one rod for all children"—he set his face unflinchingly, and proceeded to build up the elective system, which at Harvard already rested on a firm foundation. The opposition within his faculty and without was determined, sometimes bitter. His theory that "a well-instructed youth of eighteen can select for himself—not for any other boy, or for the fictitious universal boy, but for himself alone—a better course of study than any college faculty, or any wise man who does not know him and his ancestors and his previous life, can possibly select for him"—this theory was assailed and ridiculed as individualism run mad. But President Eliot held to his course, and he has seen his theory accepted in every important college of the country. He has weathered the storm that raged about him twenty years ago, and has anchored in the desired haven.

As champion of a movement which put sciences and modern languages in 'fair competition' with the classics, he has urged ceaselessly more skillful instruction in these new subjects. In his Inaugural, he bluntly told the 'scientific scoffers at gerund grinding' that 'the prevailing methods of teaching science the world over, are less intelligent than the methods of teaching language.' Experimentation in the laboratory, original investigation, drill in accurate observations, he has made the burden of many addresses and reports. Moreover, it is owing largely to his efforts that the standard of professional schools has been raised, and that secondary and grammar schools are now reorganizing their programs according to the modern idea of developing the aptitudes of the individual. But it is upon English that he has laid the greatest stress. He began his presidency by