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,
February 24, 1904.

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. *Serus 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 unceasingly 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

quoting Locke's complaint as to the neglect of the mother-tongue; and he has returned to the theme again and again. At Harvard he has built up an English department that has been a stimulus to every other college and to schools of all grades.

In this vast enterprise, President Eliot himself, the moving spirit, has had neither the authority nor the will to force the action of faculties or committees. More than once he has seen his opinions thrown into the arena of open debate and voted down. But, convinced that his views, if sound, will ultimately triumph, he has waited with Olympian calm for the march of events. Though the immediate effect of the changes has in some cases seemed to be chaos, he has never been discouraged; he has shown that, to rearrange a curriculum, to train competent instructors in new subjects, to establish traditions of mental discipline, will be the task of generations yet to come.

In his discussion of public questions he has insisted upon the right of the individual to attain his highest intellectual and moral development, unchecked by a cast-iron regimen of studies, or by intolerance in church or state. His criticisms of organized labor have voiced the conviction of our sanest publicists, that 'democracy must profoundly distrust the labor union's too frequent effort to restrict the efficiency and the output of the individual workman.' This doctrine of individualism, a tenet of the liberals of the old school, is falling into temporary decay; it is opposed by certain captains of industry, who want to crush out the individual and pile merger upon merger; it is opposed by the trades unionists, who condemn all laborers to the lock-step; yet President Eliot has steadily, with candor and courage, striven for the basic principle of our Declaration of Independence.

These are the achievements, these the qualities that have won him, year by year, a wider recognition; have transmuted cold respect into affection. In the earlier days of his presidency a reserve of manner, absorption in details of administration, and a frank indifference to the gusts of undergraduate sentiment made students regard him with an uncomfortable awe, as if he were a sort of Iron Chancellor in an empire of education, or—to recur to a former comparison—as if he were really a glacier. Time has proved the falsity of this first impression; has shown that no college president has endured with more serenity and good-humor the criticism of his colleagues; that the springs of his kindness are as unfailing as the waters that melt from the eternal ice. He has reached the goal of his ambition. In describing Dr. Asa Gray's life as 'happy,' he declared: "It is the greatest of human rewards to be enfolded, as years advance, in an atmosphere of honor, gratitude and love." That greatest of rewards President Eliot himself has reaped in full measure, while his eye is not dim nor his natural force abated.—*New York Evening Post.*

NOTES ON INORGANIC CHEMISTRY.

WATER GAS IN THE CHEMICAL LABORATORY.

A PAPER was recently read before the Society of Chemical Industry by Masume Chikashige and Hitoshi Matsumoto on the defects of uncarburetted water gas as a fuel for laboratory use. Inasmuch as water gas is more or less extensively used in cities and as small local water-gas plants are easily installed, extended studies of its use have been made by the authors, resulting in its condemnation. Among the reasons given for these conclusions are the following, which seem most important.

While the water-gas flame is non-luminous and always powerfully reducing, it is often desired to have a smoky flame temporarily, which is impossible with this gas, nor is it possible to produce a flame to any considerable extent oxidizing in its nature. The air openings in a Bunsen burner are useless, as it is not possible to mix more than a very slight proportion of air with the gas without producing an explosive mixture. The intense heat of the flame, far higher than can be obtained with coal gas, is not an unqualified advantage, as it occasions the rapid destruction of wire gauze and copper vessels; copper air baths and water-baths are rapidly destroyed, unless provided with cast-iron bottoms. Owing to the presence of carbon monoxid, nickel vessels are quickly corroded, some crucibles being burnt completely through in a single