mation has its proper effect upon our intelligent judgments of the position of things about us, and these judgments are the only thing, in the whole process, which we know ourselves to be thinking about.

What is the nature of the mechanical stimulation which excites the nerves of the semicircular canals under ordinary circumstances? Brener produces the motions by making a small incision in the canals, and drawing out the liquid contained in them by a piece of blotting paper. If, when the head is moved, the endolymph remained behind for a short time by inertia, and then rubbed against the hairs of the ampullæ as it moved forward, that might be a means for producing a sensation in the nerve. This retarded movement can actually be seen to take place in artificial glass tubes made of the same shape as the semicircular canals, but of a larger size. But when the tubes are made of the same small size as the actual canals, no effect of inertia can be detected. It is not by any means sure that in the real tubes the retardation would not take place, for they differ in many respects from tubes of glass; an actual retardation, moreover, would very naturally explain the illusion of an after-motion in the opposite direction which is, under some circumstances, very persistent after a rotation has ceased. Mach, however, considers that changes of pressure are quite sufficient to produce the required effect; on calculating their amount he found it to be not so inconsiderable, compared with the energy necessary to affect other organs of sense, as might have been expected. But whether due to changes of pressure, or to rubbing, it is no longer possible to doubt that it is to sensations in the semicircular canals, for the most part unconscious, that we owe that exact knowledge of how far and in what direction we have turned the head at any moment which is necessary to our safe progress every time we attempt to move about in space.

CHRISTINE LADD FRANKLIN.

HARVARD OF TO-DAY.[1]

I THANK you with all my heart for this kind reception; but as I look round me and remember how few there are in this large assemblage who have not borne the infliction of my lectures, I am abashed to think how widely my weaknesses and shortcomings must be known. It is fortunate for us old teachers that time so far alters the perspective under which the incidents of college life are seen that our mistakes become less prominent, and our devotion to truth and duty more evident, as we advance in years. Before another generation has passed, I trust that old Father Time will have dealt as graciously with the college work of to-day as he has with our own weak endeavors in the past; but it has seemed to me that many of her friends have of late been criticising Alma Mater very much in the same spirit which her students showed to their teachers in former times, exaggerating her failures and minimizing her successes. In a community of nearly two thousand young men it must be that offences come; and he can have known little of human nature in opening manhood who thinks that by any system of restrictions he can build a wall around the college high enough to keep evil out; and, however much he may dread the conflict, who does not know that no force of character can be attained and no manly virtue won except by meeting the enemy and slaying him?

The discreditable stories which have been so widely circulated about our college have brought upon us the scrutiny of a whole army of reporters; and, whatever of truth or of falsehood there may have been in the sensational paragraphs they have published, of this I am sure, that few societies of men, however sacred their object, could have borne the scrutiny as well. When I have indignantly repelled the scandals, I have been told that I knew nothing about that phase of college life. Thank God I do know nothing about it; and I am in constant association with hundreds on hundreds of young men who know as little about it as I do. We do not expect to solve the problem of evil at Harvard in this generation; but there is this very marked difference between the evil influences of to-day and those of only a few years back. Then the evil was everywhere pervasive. The classes were so small that all the members were brought into more or less intimate association, and one could not avoid meeting the hateful forms of vice, however greatly he might be repelled by the sight. Now associations are determined to a far greater extent by mutual tastes and affinities; the bad influences are confined to a limited class, and the great majority of our students in passing through college see as little of degrading vice as they would at their homes.

Several years ago an anxious mother consulted me about sending her son to this college. The son was anxious to study in our laboratory, but the mother feared the evil influences of the place. Nevertheless the boy came, as I afterward learned, in consequence of my representations, graduated with highest honors, and is now one of the most promising of the younger members of his profession. The mother followed her son to Cambridge. After she had lived among us for some time, she said to me one day: "I am so much delighted with this place. Things are so different from what I expected. I was told such horrid stories, and not one word of them is true." We have at least one sincere advocate, who has been convinced by experience; and there are numbers of young men who graduate from Harvard every year as guileless as this earnest woman's son.

My friends, I can assure you that the great danger of our dear college at the present time is not over dissipation, but over work. Sixty thousand dollars cannot be distributed in prizes every year without producing an enormous strain; and those of us who are directing the workers know how intense the activity is. We may know little of the evil around us, but we do know a great deal of the good. We know of lofty purposes and of earnest endeavor. We know of perseverence under great discouragements, and of victories won against heavy odds. We know of self-control and of self-devotion. We know of Christian duties habitually practised, and of truth and right manfully upheld; and we maintain that the character of a community of scholars is to be judged by such traits as these, and not by the occasional lapses of its weaker members.

Moreover, I am not one of those who think that a man is necessarily condemned because he is born with a gold spoon in his mouth, or that educated leisure is an unmitigated evil. The college has done a good work in educating rich men, and it owes a great part of its present influence to the noble use which many of its alumni have made of inherited wealth. Such men are educated more by association than by direct instruction; and, as a former president of the college once said, they gain something if they merely rub their backs against the college walls; and if this was true in the past, how much more is it true in the present, when the intellectual life of the college is so much more active, the standard of scholarship so much higher, and the opportunities of cultivating special tastes so greatly enlarged. You cannot expect of such men the asceticism of an anchorite, or the plodding diligence of a scholar; but the university owes them an education, and the duties and obligations are not wholly on one side.

During the last twenty-five years the life at the university has been rendered safer and more healthy, in every respect, by a greatly increased enthusiasm for learning, which extends to almost every department of this large institution. In no one respect has the improvement in the college been more striking than in this; and probably no officer of the college has had better opportunities of observing the change than myself. For forty years I have lectured to the successive freshman classes, beginning with the class which entered in 1849; and many of the older men around me will remember the boyish pranks which in their college days not infrequently amused the class, and greatly tried the temper of the teacher. The lecture was always an up-hill work, — a duty to be enforced on the one side, a task to be endured on the other. The lecturer was always waiting on disturbance, the class always waiting on deliverance. Not only was there no general enthusiasm, but the first suspicion of such a thing in a college lecture-room would have been regarded as a dangerous precedent, alike compromising the dignity of the teacher and violating the traditions of the place. Now, although the classes have so outgrown the accommodations that not only all the seats, but all the approaches to my lecture-room, are crowded almost to suffocation, a more orderly, a more attentive, or a more enthusiastic audience cannot be found. This change is due not simply to our elective system, but far more

[1] Address by Josiah Parsons Cooke, LL.D. at the commencement dinner at Harvard University, on June 26, 1889.

to the putting away of those petty restrictions which were formerly a constant menace, and erected an impassable barrier between the teacher and the taught. We no longer, like the Irishman, stand aloof with a chip on the shoulder, and dare any of the boys to knock it off; but we invite confidence, and receive it, and our relations with the students is not that of taskmaster and toiler, but that of guide and friend. Had our worthy president done no more than break down that old middle wall of partition, he would for this great feature of his administration alone deserve the everlasting gratitude of this community. And let me entreat you, my brethren, not to allow any one to reinstate this wall, or even to lay the first brick in its reconstruction.

Most of our sister institutions are struggling with hobbledehoydom still. Only a few day ago, one of our distinguished graduates, and a highly valued professor in another New England college, said to me: "Cambridge men do not appreciate the advantages they have gained by setting their students free from petty restraints. Treat men as boys and they will act as boys. With us the boyishness first breaks out in the chapel, and then extends to all the class-rooms. It belittles all our work, and dampens all our enthusiasm." My friends, in an institution of learning like this, you cannot prize too highly the ennobling virtue of enthusiasm. To awaken it is to make the boy a man. To fail to arouse it, at least in something, is to miss the great end of education. But such virtue cannot be had without cost. Enthusiasm implies of necessity freedom; and who in this New England, after a century's experience, is not willing to incur the risk and pay the cost which freedom entails?

Finally, brethren, while noble character is the crowning grace of education, scholarship is the brightest jewel in this crown; and you may well ask, Has learning kept pace with privilege? But in attempting to answer this question I find myself in the dilemma of the learned commentator who had devoted a chapter to the snakes of Iceland. He could find no snakes, and I can find no comparison. The scholarship of to-day rests on a level so much higher than that of twenty-five years ago, that there is no common measure. I will confine myself to my own department, of which I have accurate knowledge, and of which I may speak unreservedly, because it has so broadened out that only a small part of the instruction now devolves on the director. Besides the very large class, before referred to, which attended the elementary lectures, there were actually working in the chemical laboratory last year more students than were comprised in the whole college of my day, and the contributions to chemical science which will soon be published, as the result of the year's work of students as well as of teachers, will fill more than one half of the annual volume of our American academy. A recent writer in the *Atlantic Monthly*, discussing "Why our Students go to Europe," pays us what he evidently regards as a high compliment in saying, "Now the chemical course at Harvard equals that in most German universities." Our own students who have gone from the laboratory to study abroad will tell you, as they have told me repeatedly, that, whatever advantages may be gained by association with men of special attainments, there is no University in Germany, or elsewhere, at which the instruction is at once so broad, so full, and so thorough as at home. How does this compare with recitations from "Stöckhardt's Chemistry," illustrated by popular lectures?

Fellow alumni, our attention has been so often and so loudly called of late to the shady side of college life, that, whatever opinions you may have formed, I am sure you will not blame me for inviting you on Commencement day to bask for a few minutes in its sunshine. At such a time we can only meet assertion with assertion; but I have spoken solely of what I do know, and if any one is not convinced I invite him, following the example of the anxious mother, to come and dwell among us and partake of our life. Obviously I am no pessimist, but also I am no optimist. The members of this great family are all frail human souls. Evil is ever present with us, as it was with our fathers and will be with our children. We cannot escape the curse. But we have faith in truth and right, and will fight the good fight to the end.

> "O yet we trust that somehow good
> Will be the final goal of ill,
> To pangs of nature, sins of will,
> Defects of doubt, and taints of blood."

We all boast the same intellectual parentage. You for the most part have gone out into the world and found a career elsewhere. I am one of the few who have always stayed by the homestead since I was first received into the brotherhood with the Class of 1848. For nearly half a century I have known the dear old Mother as well as a devoted son possibly could; and let me assure my brothers who have come home to keep this feast, that during her long life our Alma Mater was never so worthy of our admiration and veneration, of our love and devotion, as she is this day.

BOOK-REVIEWS.

A Manual of Machine Construction, for Engineers, Draughtsmen, and Mechanics. By JOHN RICHARDS. Philadelphia, Lippincott. $5.

AN experience in constructive engineering extending over a period of thirty-five years, in both Europe and America, has admirably qualified Mr. Richards for the task of preparing this volume. That the task is well done, will not be doubted by those acquainted with his previous work in the same line, which includes a number of treatises on various mechanical subjects.

The book is unique in more than one respect. It is intended to meet the every-day wants of the practical man, in draughting-room or work-shop, and is consequently more a work of direct application than of theoretical instruction. While concise, as such a book must necessarily be, it nevertheless touches with sufficient detail on many minute points concerning which very little has heretofore been accessible in print. The author states that the preparation of the work was suggested many years ago by the inconvenience of common references such as are required in usual machine practice, and by a belief that some more simple form, adapted directly to use, and confined to those things most commonly dealt with, would be of value. Being made up mainly from the personal experience of the author, reproducing and classifying work already constructed, the book presents in a convenient form material gathered in the course of a long and diversified experience, the exact rules formulated in accordance with theoretical considerations being modified to suit the limitations and exigencies of actual practice.

A peculiar feature of the book is its make-up, being bound so that it opens at the end of the page instead of at the side, after the manner of a reporter's note-book, or legal-cap paper; and each alternate page is left blank, for convenience in reference and also to receive notes and original matter. The page titles and numbers are placed at the bottom of the page to facilitate convenience in reference.

The volume is divided into sections on machine design, the transmission of power, steam machinery, hydraulics, and processes and properties, followed by a section devoted to tables and memoranda of weights and measures; standards for screws, bolts, and nuts; sizes of wood and machine screws; circumferences and areas of circles; square and cube roots, etc. To engineers and draughtsmen engaged in machine design or construction, this book will prove of special value.

Monopolies and the People. By CHARLES WHITING BAKER. New York. Putnam. 12°. $1.25.

THIS work is an attempt to solve the problems presented by the new form and organization of industry. The author is impressed, as most persons are, by the rapid growth of "trusts" and other combinations of a monopolistic character, and by the evils they sometimes produce; and he here undertakes to furnish a remedy for those evils. He writes in a judicial tone and with an evident desire to be fair to all parties. He gives an account of the origin and growth of the combinations known as "trusts," with other chapters on monopolies in minerals and transportation, placing also the labor unions in the general class of monopolies. He regards them all as natural outgrowths of existing industrial conditions, and while he acknowledges that they are in some respects beneficial, he is especially impressed with the abuses that attend them. So far his readers will probably agree with him; but when he comes to state the remedies for the evils he speaks of, we, at least, are obliged to dissent. He holds that the true remedy for monopoly is