ing walk, he is led to observe the course of the sun, how it rises and sets in different places according to the time of the year. In this manner he is led to ask questions about the course of the heavenly bodies, the form of the earth, and the calculation of eclipses. For the study of geography, no maps are placed before him. Starting from his home, he is led to make maps for himself. In this manner the natural desire of the child for knowledge is taken as the starting-place for learning, which in itself is never allowed to be a burden or trouble. Just as growing plants require not only light, but heat, so the growing man needs not only instruction, but amusement. Emile finds out by himself the existence of the meridian line and the peculiarity of the magnetic needle. He observes that by rubbing amber, glass, or sealing-wax, he is able to attract pieces of straw. In this way he learns the properties of positive and negative electricity, and connects them with the magnet. Going to the fair, he finds a conjurer who draws a waxen duck in different directions over a basin of water by presenting to it a piece of bread: he soon guesses that the bread contains a magnet, and is able to imitate the trick to the astonishment of the conjurer. The conjurer takes his revenge by placing a stronger magnet under the table, so that the duck resists all Emile's efforts. The revelation of this trick is an avenue to still further knowledge. We see here that education is made not to depend on words, but on things. No formal instruction is given. Certain things are observed to take place, and the instruction lies in the conclusions which are to be drawn from them. In a similar way great importance is attached to what would now be called technical education. Emile is to have no books except 'Robinson Crusoe,' from whose example he is to learn how to supply all his needs. Instead of reading, he is to visit workshops and practise handicrafts: he will learn more in an hour's work than he would in a whole day's explanation. Even trades are to be estimated by their usefulness. The blacksmith is placed higher than the goldsmith: the baker is worth the whole academy of sciences. Emile must learn a trade. What trade is best for him? Agriculture is exposed to too many casual losses. Many trades are merely the handmaids of luxury, and produce nothing worth having: others are unwholesome either from confinement or from the attitude in which they are practised. There are objections to the more violent trades, such as masons and smiths. The best of all is to be a cabinet-maker, which is useful, cleanly, and instructive. The modern development of technical education seems to have followed on Rousseau's lines, and to have placed working in wood in the first rank.

Thus, when his boy's years come to an end, he possesses, not a great number of opinions and accomplishments, but the capacity for acquiring them. Such learning as he has, is thoroughly natural. He does not know even the names of history, metaphysics, morals, but he is accustomed unconsciously to reason about all of them. He is industrious, moderate, patient, and courageous. He does not know what death is, but, if necessary, he would die without a sigh. He demands nothing from others, and is under no obligation to them, but stands alone and independent in human society. He has no errors but those which are avoidable, and no faults except those from which no man is free. He has a healthy body, active limbs, a mind free from prejudices, a heart without passion. He has been scarcely affected by self-love, the first and the most natural passion: he has lived contented and happy, and free, so far as his nature allows. Do you think, asks Rousseau, that a child who has thus reached his fifteen years can have lost the years which have preceded?

Rousseau's book produced a great effect throughout Europe. It is said that Kant, the philosopher of Königsberg, whose habits were more regular than the town-clock, suspended even his daily walk in order to read him, yet the practical teacher will learn but little from him. His principal effect lay in the strength by which he combated existing prejudices. When Rousseau wrote, education had become not only formal and artificial, but hollow and frivolous. The French revolution might have altered this by its unaided force, but 'Emile' still remains the book in which the ideas of the revolution about education were expressed with the greatest eloquence and vigor.

What shall we say about naturalism in the present day? It is largely practised unintentionally. While different studies are struggling for the mastery, the natural desire for games and open-air activity occupies the field, and claims more and more of the pupil's life. In the vast development of modern industries requiring capacities of all kinds, some educationalists have seen an indication that special courses of teaching are unnecessary or useless. Nature, they say, and the pressure of the world's business, are the best teachers. How much skilled labor is demanded by a railway? Who trained the pointsman, the engine-driver? Who directed the complicated lines of trains, following and meeting each other with lightning rapidity, yet never colliding except by a terrible catastrophe? The teacher who follows the methods, either of humanism or realism, strives to make the best of the human mind intrusted to him. He wishes to develop its faculties to their highest point, to stimulate its natural capacity to its furthest limit. But when this is done, what guaranty have we that nature has any place for the instrument we have so carefully finished? If every mind were developed to the fullest extent which its powers admit of, yet a large proportion of such minds might remain useless and barren, because they fitted into no place which human society supplies. Leave every thing to Nature, she will fashion the material better than you can, into the form in which she most requires it. This statement is a paradox; and, indeed, natural education is in its essence paradoxical. It will always have advocates and apostles, especially in times when there appears to be a danger of over-refinement or over-pressure; but the wise educationalist will turn to it as a repository of cautions and warnings rather than as an armory of weapons fit for fighting against the ever-present enemies of ignorance and sloth.

OSCAR BROWNING.

THE ELECTRICAL ENGINEERING DEPARTMENT OF CORNELL.

THE equipment at Cornell in the line of electrical engineering bids fair to become, if it is not already, the most complete in the country, and probably in the world. It has been almost wholly contributed by friends of the university, at the suggestion of the director of Sibley College and others interested in its progress. The last and most important addition to the collection is that of the Westinghouse 650-light alternating current dynamo, exciter, lamps, and other material required in establishing the plant. The list of dynamos now includes the Edison, the Gramme, the Mather, the Westinghouse alternating current, the Westinghouse continuous, a number of Weston and minor makes, and all sizes, from a little toy machine made in the university shops, to the 50 or 60 horse-power machines just added to the list.

There comes with this liberality on the part of friends of the university an embarrassment of real importance: there is no immediately available room for the installation of these machines. The dynamo-room now appropriated to the purpose is hardly large enough for the 'cradle' used in conducting experiments on a single machine. The Weston machine is tucked in one corner, and the Edison and Mather machines are temporarily placed in the middle of the floor, and driven as best can be done from there. There is actually no room even to lay down the new machines now *en route* from Pittsburgh, still less to place them for use. In this emergency, the director has obtained permission from the trustees to make temporary provision for them by throwing the existing toilet-rooms into the machine-shop, thus securing a space of some fifteen or eighteen feet by nearly forty, in which to place all these machines. It has long been considered advisable, on the score of safety and convenience, to remove all heavy machinery from the main building, and this transfer of the dynamo-room will give opportunity to effect other improvements there in time. Professor Morris is already arranging new toilet-rooms, and getting ready to tear down the brick partitions which have been found to be in the way of the new arrangement. Professors Van Vleck and Smith are preparing plans for the belting and countershafting, in consultation with Professor Nichols, and the work is to be proceeded with at once. The space now given up to this machinery must, however, in time be required for the extension of the machine-shop, and it is only a question of time when a building must be constructed for this course and its collections. Nearly forty students now enter the course annually, and it is only second to the regular course in mechanical

engineering in importance in the Sibley College organization. The expenditure of all that may be needed to make its material part complete, aided as it is so effectively by its friends outside the university, will be more than justified.

Professor Thurston estimates that about $100,000 should be expended in its permanent establishment: $60,000 on building, including $15,000 on water and steam power, each of which should give 150 horse-power, the one for use in ordinary work, the other whenever experimental work compels the utmost possible regularity of speed; and the balance, $40,000, in supplying needed additions to the equipment of apparatus of exact measurement for heavy currents, and to furnish the income needed for running expenses, including fuel, one workman, and an assistant to the professor of physics, who should be placed in charge of this valuable property; which, although a part of the Sibley College establishment, is really managed by the department of physics in all except its power-supply. It is not impossible, that, as Mr. Cornell used to say, "there is some one walking around who wants to provide this" now greatly needed laboratory. It is certainly an opportunity for some wealthy and public-spirited friend of the university and of this side of its work to immortalize himself, while doing a noble work for his fellows.

THE STUDY OF MODERN EUROPEAN LITERATURE IN AMERICA.

THERE has been a marked change in the subjects of instruction and study in American colleges within the last few years. In literature, the study of French and German and early English has been substituted for Latin and Greek: physical science has won larger recognition, and political economy, history, and the science of government, have become prominent subjects of instruction. The change which has effected this result in the leading universities has been gradual, but many institutions are as yet untouched by its influence.

A comparison of the curriculum of any college now and that of fifty years ago would show that modern subjects now share the time formerly devoted exclusively to the classics, mathematics, and philosophy. The value of the old is not less, but new discoveries in science, and the recognition of the value of modern European literature, have displaced in part the former subjects of education. The pressing demands of modern life and modern culture have modified views, and the practical claim has been felt that the years of study should contribute to getting on in the world. These views have changed the direction of instruction, while the end of all education, intellectual discipline and the training of all the powers, has not been forgotten. What results have been attained, and what further changes are necessary that the new education may bear the choicest fruit?

The results of the study of the modern languages can be characterized as only in part successful. One American university still announces in its catalogue that the "modern languages are taught like the classical tongues." Until recently the instruction in French and German followed strictly the old method of teaching Latin and Greek. The fact that the language was still a living speech was ignored, and the pupil went forth as powerless in the presence of the language itself as a classical student would have been if he stood before an ancient Greek or Roman. Much time is undoubtedly still wasted by confused, illogical, and misdirected efforts on the part of teachers. The learning of a foreign tongue embodies the training of the eye to distinguish the printed words, the tongue to utter them, and the ear to recognize them when spoken. Linguistic training is not simple in the sense that one method will accomplish all these aims. There is beyond this the higher discipline of the study of language as the expression of thought, and its critical and philological study. The student who learns a living language as he learns a dead language will know no more of the one than of the other. Experience verified in the lives of all scholars shows how an ability to read a given language carries with it no practical mastery of the language: the ability to speak or write the language, and to understand it when spoken, is apart from a mere reading ability. Even the familiar sentences of the New Testament will not call up their Greek or Latin or German equivalent without special study. Instruction hitherto in modern languages has been directed to impart a knowledge of the literature. The key to the literature has been found in the grammar and the lexicon. After a mastery of grammatical forms, reading has been begun.

The defects of this method are the same that have characterized all classical study, — the laborious acquisition of words, the perplexing idioms, the search after the true translation, now successful and now futile, a correct knowledge of which is only possible to one familiar with the genius and spirit of the language, and its idiomatic, provincial, or possibly archaic use.

The subtle flavor of a foreign expression cannot be distilled by the aid of the dictionary alone: it must come from a knowledge of the distinctive meaning and uses of words, and an intelligent apprehension of delicate shades of expression.

Only an exhaustive knowledge of literature and of the multiform usages of popular speech can give an inner insight into the spirit of a foreign language. Such knowledge is impossible to ordinary scholars; and even advanced study, unless covering the works of different authors and periods, cannot guide the student at a distance to a critical acquaintance with the language. The method is in itself inadequate, and the results unsatisfactory. Mental discipline of a high order may be associated with this method of study; and a language is often valuable as an instrument of culture from the fact that it transplants the scholar into a new world of thought, presenting sharp features of contrast with one's native speech, exhibiting new grammatical forms and new words as the images of things.

But science has brought the nations of the world nearer; and the intellectual, political, and social life of one affects all others. Every day new discoveries in art and science and in the relations of States are flashed across the sea. Other literatures are filled with the thought, the poetry, and the throbbing life of the century. The ancient world no longer fills the domain of knowledge, and new subjects of study demand recognition.

We pass from the classical method of study to the conversational method of acquiring language, not in all cases a real advance, but in the main a positive progress. Language was studied in its common forms: familiar expressions interpreted the formal grammatical rules, and impressed them upon the mind. But multitudinous exercises often meant perpetual revolution without progress. The entire time available for the student was spent in the exhausting study of exercises: little of the literature was read, and the new tongue became a confused and endless mass of idioms. Exercises were not merely used to illustrate grammatical principles, but became an end in themselves. Few students sought an acquaintance with German or French in order to speak these languages, and yet the entire time of the student was consumed in these exercises.

A *via media* was then attained by the production of grammars, scientific in arrangement, brief and clear in statement, with exercises sufficient to illustrate the rules: idioms were simply studied to facilitate translation.

The 'natural' method, or method of oral instruction, followed. The popularity of this system has been increased by its use in the various summer schools of languages. As an accompaniment of any course of study, this method possesses real merits. Its motto is, "Learn a foreign language as a child learns its mother-tongue." This system has also been applied to teaching the classics. It requires from the first the use of the language itself by the pupil. Brief sentences are learned, and then translated so as to assert, to ask, to command, and to express conditionality: the subject becomes in turn object, and the object subject. By continuing the process, the forms of the article, adjective, and the indirect cases of nouns and pronouns, are learned. Later the forms of tenses and modes are learned. This method trains pre-eminently the memory: as a phase of instruction, it is important and valuable, but when it claims exclusive possession of the field of languages, and seeks to dominate the entire system of instruction, it is not justified in supplanting established methods.

A noteworthy application of this method has been made in teaching Hebrew, and a modified form of it has been used in instruction by correspondence.

From the Hebrew text of the Bible a living language has been constructed, and made the vehicle for the expression of familiar