portant factors determining the issue of the contest are the qualities, the relative proportions and the distribution of the bacterial and the host's cytotoxins.

The hypothesis thus outlined can be tested experimentally, but I regret that it has shaped itself in my mind so recently that I have not yet been able to make the desired experiments, which are, however, now started in my laboratory. Since my arrival here I am informed that these experiments have already furnished facts in its support, which will be published later.

Inasmuch as at least one component, and it may be both components, of the assumed bacterial cytotoxins preexist in the bacterial cells, it should be possible to demonstrate some of them in artificial cultures of bacteria, where they would be found especially as integral parts of the cells, unless extracted from the bodies of degenerating or dead bacteria. This corresponds with what is known concerning the situation of the poisons of the cholera spirillum, the typhoid bacillus and other bacteria characterized by the lack of strong soluble toxins. But the quantitative and other relations between these cultural cytotoxins and those produced in the manner described by the same bacteria during processes of infection are comparable to those between the normal antibodies and the immune antibodies. These relations would explain the familiar fact that cultures of bacteria of the class under consideration constitute in general only a partial and meager index of the toxic capacities of the same bacteria in the infected body. That cytolysins may, however, be present normally in large amount is illustrated by the hæmolysins of eel's serum and of snake venom.

In this theory, degenerated and dead bacteria, while recognized as a source of poisoning in infections, are not assigned an exclusive rôle in this regard. Living bacteria in the infected body, where they are under nutritive conditions not paralleled in artificial cultures, actively produce and secrete receptors which may become the means of intoxication of the body cells. From what has been said, we can comprehend how these diverse free receptors may enter into the formation of cytotoxins of the most varied and specific characters, such as erythrotoxins, leukotoxins, neurotoxins, nephrotoxins, spermotoxins, hepatotoxins, etc. Very probably in many instances these toxins are represented by so few receptors in bacterial cells in ordinary cultures that it would be hopeless to search for them there, although we may have convincing experimental and pathological evidence that within the animal body the same bacteria produce them abundantly under the stimulus of appropriate substances derived from cells of the host.

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(*To be concluded.*)

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*THE LENGTH OF THE COLLEGE YEAR AND COURSE.**

A number of matters of general academic interest have occupied the attention of the university faculty, and to some extent that of the other faculties, during the year. The established policy of granting no honorary degrees was unanimously reaffirmed. The administration of the disciplinary authority of the university was devolved upon a committee consisting of the dean and four professors to be elected by the university faculty. The better conduct of examinations was much discussed; but owing to the difficulty experienced in discovering the sentiment of the students towards the so-called honor

* From the tenth annual report of President Schurman to the board of trustees of Cornell University.

system, no decision was reached, and the question is still unsettled. There is a strong sentiment both in the faculty and in the student body in favor of the honor system. No one wants to see watchers in examinations. But, under the honor system, no student wants to report cases of cribbing. Thus the cheater's honor in dishonor rooted stands. A system capable of administration must be devised, yet, if it is to be successful, it must be in harmony with the sentiments of the students.

At the suggestion of the American Association for the Advancement of Science, the Christmas vacation was extended so as to include the week in which the 1st of January falls, for the purpose of enabling members of the faculty to attend the meetings of the scientific and learned societies held at that time. This action is undoubtedly in the best interests of science and scholarship and highly advantageous to professors.

The lengthening of the Christmas recess suggests some observations on the amount of vacation now enjoyed by American universities and colleges. It is less, to be sure, than that which obtains in Great Britain. And from the point of view of professors, most of whom devote the summer vacation to investigation and writing, it is too short rather than too long. Furthermore, as it is by means of such self-regenerating studies that the professor maintains his efficiency as a teacher, a vacation so used is of inestimable advantage to the university. It is probably safe to say that the overwhelming majority of Cornell professors and instructors devote two thirds of their summer vacation to strenuous productive work, while others teach in the summer session or undertake special duties of a professional or technical character.

Nevertheless, the final cause of American colleges and universities is the student. His best interests must be the supreme consideration in determining the length of vacations. The Christmas recess being now fixed for the accommodation of scientists and scholars, and the spring recess being not much more than a week, it is worth inquiry whether, in the interest of students, the summer vacation should not be shortened. The Cornell summer vacation is about the average, possibly a little shorter. For the members of the instructing staff, as already observed, it is certainly not too long. Nor is it too long for students in law, medicine, engineering, agriculture, etc., who devote the summer months to work in offices, factories, or on farms, which supplements their theoretical studies and familiarizes them with the practical side of their callings. But for students in the academic department who have nothing in particular to do during the summer, the vacation is far too long. Why should young men from eighteen to twenty-two years of age be idle for three months simply because they are students for the other nine? Of course many students in the academic department do work—perhaps to earn money to procure an education—during the holidays, and at Cornell that class is probably larger than at any other great university in the east. But others are idle, as are also some of the students from the professional and technical departments; and for these the university should offer work. Yet, as has been shown, it is not to the interest of the university to demand too much teaching from its professors, else the spirit of research is quenched and the teacher becomes fossilized.

But these conflicting demands may be met by a summer session of the academic department (including allied technical subjects) with a faculty especially appointed for the purpose made up of Cor-

nell professors, if they desire the appointment, and professors of other universities selected for eminence in their respective branches of learning or science. The Cornell summer session, which continues six weeks, attracted this year more than twice as many regular students of the university (218 as against 101) as last year. And students in the academic department who regularly attend the summer session may, if they have entered on advanced standing or done extra work in course, satisfy the requirements for the A.B. degree in three years instead of four. This is a shortening of time without lowering the standards or even changing the character of the studies. In all discussions regarding the length of the A.B. course and the nature of the studies it should embrace, the summer session has been overlooked. Yet it may contain the key to that problem as well as to the problem of the adjustment of term time and holidays.

The relation of the A.B. course to the technical and professional courses has again been under consideration.

The faculty of arts and sciences some time ago made the work for the A.B. degree entirely elective. The tabulation by Dean Crane of the studies elected for four years by the class graduating in 1901, shows no wide divergence from the results formerly obtaining under the operation of the combined prescribed and elective system. Like the A.B.'s of preceding years, the graduates of 1901 selected courses predominantly humanistic. Of all choices of studies made by the class, 80 per cent. were in languages, philosophy, history and political science, and art. As compared with the prescribed classical course of a generation ago there is, however, a noticeable change. While 10 per cent. of the elections were in ancient languages, 37 per cent. were in modern languages, and 22 per cent. in history and political science. That is to say, while under the elective system the studies of candidates for the A.B. degree continue to be for the most part humanistic, the newer humanities—English, French, German, history, economics, etc.—have taken the larger portion of the place which a generation ago was occupied by the older humanities—Latin and Greek.

The privilege of students taking the A.B. course at Cornell to elect their own studies is not likely to be modified. Of course there are restrictions upon freshmen inherent in the nature of the studies themselves. And there is the further limitation, which critics continually ignore, that the subjects embraced by the academic department do not extend beyond the humanities and the pure sciences, so that a student entering upon the A.B. course is not permitted to elect work in engineering, agriculture or other technical or professional departments.

But, while the university refuses to reduce the A.B. course from four years to three, it does permit juniors and seniors who intend taking subsequently a professional course to anticipate one year of such work as a part of the A.B. course. The question has been raised whether, in such cases, the A.B. degree is given on the ground that the candidate has studied four years or that he has taken certain studies (arts and sciences) though for three years only. And the suggestion has been made that the subjects which juniors and seniors are permitted to take in the professional schools should be restricted to those which might be regarded as constituents of a liberal culture. But a university which allows its students to elect freely among languages, literature, philosophy, history, political science, mathematics and the physical and biological sciences for the A.B. degree will meet great difficulty in applying the criterion suggested. Perhaps the best solution of the theoretical dilemma

which has been raised is to recognize frankly that the privilege of doing a year of professional work as a part of the A.B. course, which juniors and seniors now enjoy, is a favor extended to candidates who study at a university six or seven years, and that there is no reason for shortening the course of candidates whose studies cease on the receipt of the A.B. degree.

Another question, which has not indeed been formally discussed, but which has occasionally been mooted, is the advisability of requiring the A.B. degree (or its equivalent) for admission to the professional and technical courses. It seems safe to say that Cornell University is not likely soon to adopt that policy. If a youth desires to be a lawyer, engineer, physician or architect, there is no good reason why he should be compelled to study other subjects for four years as a condition of entering upon his professional course. And there is less reason to-day, when the A.B. course has everywhere been made largely, and in some institutions wholly, elective, than might have been imagined a generation ago when the prescribed classical course was deemed the one and indispensable means of liberal culture and mental training, which also fitted and qualified the candidate to undertake professional study. At Cornell University, at any rate, the established policy is to admit students to any course who are able to pass the examinations qualifying them to pursue that course. And such preliminary tests, it is generally conceded by the members of the professions concerned, do not exceed the requirements for graduation at the best high schools. The age of high school graduates is also suitable. And, finally, Cornell University could not, without surrendering the democratic spirit in which it was conceived and by which it has always been inspired, establish conditions of admission to its courses of study which would close its doors to the masses of the people and leave them open only to those who had time and money enough to study for a period of six or seven years after graduating at high schools. Nevertheless, the members of the professional faculties are fully aware of the advantages of superior education and culture to its possessor, and, other things being equal, they know it conduces to professional success. Accordingly, students whose age, means and circumstances justify such a plan are advised to study both for the A.B. and the professional degree.

SCIENTIFIC BOOKS.

Development and Evolution. By Professor JAMES MARK BALDWIN. New York, The Macmillan Co. Pp. 395. $2.60.

Although biologists all agree as to the general truth of the theory of descent, disagreement is still rife as to the *method* of descent of the species. Those who have been interested in these problems in recent years have been divided into two camps, agreeing as to the general facts but differing in their views as to the forces by which the evolution of animals has been brought about. One school has held a modified view of the Lamarckian theory, assuming that the directive force in evolution has been the environment which produces direct modifications in the individual, to be subsequently inherited. The second school has adopted an ultra-Darwinian position, denying that the modifications produced by the environment can be inherited, and insisting that acquired characters can play no part in evolution. According to this school, evolution has been due to the natural selection of congenital variations. Both of these schools have labored under serious disadvantages. The neo-Lamarckian school is quite unable to obtain any clear evidence that acquired characters are transmitted by heredity, and thus their fundamental datum is without demonstration. On the other hand, the neo-Darwinian school has labored under disadvantages of a different nature. No one questions the cogency of congenital variations or the importance of natural