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DISCUSSION AND CORRESPONDENCE

GRADUATE WORK IN AMERICAN UNIVERSITIES

THE university registration statistics published by Professor Tombo in *SCIENCE*, January 23, 1914, allow, among other things, an interesting and instructive comparison of the amount of graduate work being done in the thirty universities tabulated. The number of non-professional graduate students may be taken to represent the amount of research that is being done in a university, for, in general, a university will attract non-professional graduate students in proportion to the activity in the graduate departments. The relative amount of emphasis laid on graduate work in each university can be seen at a glance in the table below, where the thirty universities in question are arranged in rank according to the ratio of non-professional graduates to undergraduates, *i. e.*, the number of graduates to every hundred undergraduates. The first column gives the ratio of graduates to undergraduates based on the figures given under "College, Men," "College, Women" and "Non-professional Graduate Schools" in Professor Tombo's table.¹ The second column gives the total enrollment listed under these three heads, corresponding presumably with the enrollment of purely academic students.

University	Ratio	Total Students
1. Johns Hopkins	123	397
2. Pennsylvania	107	1,504
3. Columbia	102	2,960
4. New York	52	1,076
5. Illinois	32	1,097
6. Chicago	28	2,183
7. Cornell	28	1,435
8. Cincinnati	27	789
9. Yale	24	1,736
10. Wisconsin	18	1,894
11. Harvard	17	3,403
12. California	15	3,146
13. Washington	15	438
14. Princeton	14	1,443

¹ *SCIENCE*, p. 126.

15. Ohio State	13	1,018
16. Nebraska	13	1,443
17. Pittsburgh	12	438
18. Iowa	11	1,293
19. Virginia	11	439
20. Michigan	9	2,745
21. Missouri	9	1,473
22. Minnesota	8	1,648
23. Stanford	8	1,877
24. Tulane	8	345
25. Northwestern	8	1,173
26. Indiana	7	1,200
27. Kansas	6	1,729
28. Syracuse	6	1,415
29. Texas	5	1,597
30. Western Reserve	1	826

The ranking of the universities obviously does not correspond in every case with the amount of productive scholarship that is issuing from a university, but, as far as the enrollment figures are correct, it would seem to indicate the relative emphasis that is being put upon graduate work. A correlation of the totals as given in the second column with the ratios of the first column gives a coefficient of about .046, or practically no correlation at all. This might be interpreted to mean that the universities possessing enormous undergraduate departments do not as a rule show an increased activity in graduate work, such as the number of undergraduates should warrant, presuming, of course, that the ultimate ideal of a university is held to be productive scholarship.

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THE CAUSE OF THE PECULIAR SOUND MADE BY NIGHTHAWKS WHEN VOLPLANING

ALL are familiar with the resonant sound made by the nighthawk as he cavorts through the air. It may be described as a guttural "woof."

It has been a contested point as to whether this sound was produced by the open mouth or the wings. As it occurs at the point where the bird swerves upward in his downward glide and at no other time, it is very evident that the mouth plays no part, otherwise the sound would occur at other times.

While on Mt. Constitution, Orcas Island, Washington, about five o'clock in the evening one summer, Mark Said and I were watching the nighthawks in their tortuous flight. Unexpectedly one of the nighthawks made its dip, with the accompanying "woof," but a few feet from Mr. Said.

According to his description the bird threw its wings far to the front at the end of his downward glide, so that the uppermost quill feathers were pointed exactly in the direction of his glide. Going at such headlong speed, these quill feathers when thrown edgewise to the air vibrated strongly, causing the "woof."

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SCIENTIFIC BOOKS

Vorlesungen über Landwirthschaftliche Bakteriologie. By DR. F. LÖHNIS, Professor an der Universität Leipzig. Berlin, Verlag von Gebrüder Borntraeger, W. 35 Schöneberger Ufer 12a. 1913.

Agricultural bacteriology is gaining prominence in scientific and practical circles. The agriculturist realizes more and more that scientific investigations are of help to him and the demand on colleges for courses in agricultural topics is constantly increasing. However, text-books are still scarce. The series of lectures by Professor Löhnis is the outcome of a course of lectures in connection with a general course in agricultural bacteriology given by him in the University of Leipzig.

The ground is covered as thoroughly as modern knowledge permits. No one realizes more fully than the author how much work is needed to complete our really very meager knowledge in many agricultural branches. The reader must be impressed with the fact, frequently stated, that research is necessary and that authors do not agree in many instances.

The book is divided into two parts—a general part and a special part. The general part consists of fourteen lectures. The first lecture gives a general introduction to the significance and the problems of agricultural bacteriology and includes a historical review and a list of

some important books bearing on the subject. The shape, development and classification of microorganisms is covered in two lectures. The size of bacteria is admirably illustrated by diagrams showing the relation of the bacterial content of milk, butter and cheese to definite quantities of these substances. Such illustrations render the book exceptionally valuable, especially to students. Three lectures are devoted to conditions of existence and multiplication of microorganisms and two lectures to methods of cultivation and combating microorganisms.

Under the general head of "Products of Microorganisms" six lectures are united. The production of pigment, light and heat are discussed. The circulation of nitrogen, carbon, hydrogen and oxygen are given with considerable detail and illustrated in diagrammatic fashion. These complicated subjects are dealt with in masterly fashion, notwithstanding the fact that some facts are still poorly understood. Similarly, a lecture is given to the discussion of the decomposition and assimilation by bacteria of phosphorus compounds and the solution of carbonates and silicates. Mention is also made in this lecture of sulphur and iron bacteria. For the sake of completeness one lecture deals with pathogenic functions of microorganisms. It is hardly necessary to state that this extensive subject is treated briefly. However, the chief principles of virulence, infection, immunity, vaccination, serum therapy and chemo-therapy are ably dealt with.

The second "special" part commences with a lecture on the bacteriology of foods for cattle. Here the author forcefully shows the rôle played by microorganisms in the ripening and decomposing of foods. Many gaps in our knowledge are clearly pointed out.

Two interesting lectures give the student the most necessary knowledge of the milk question. The attitude of the author in regard to this important subject is of special interest. There are at present in this field the extreme views of those commercially interested and the no less extreme views of some sanitarians. Professor Löhnis takes an intermediate position, recognizing the necessity of