as revealed by these statistics of attendance.

GEO. B. GERMANN.

SCIENTIFIC BOOKS.

Die Entwicklung der Biologie im 19. Jahrhundert. Vortrag auf der Versammlung deutscher Naturforscher Zu Aachen am 17. September, 1900, gehalten von OSCAR HERTWIG. Jena, Gustav Fischer. Pp. 31.

The advancement in knowledge of organic nature was so remarkable during the nineteenth century that it is of unusual interest to have the progress in biology summed up by one of the leaders in the movement. As might be expected from Hertwig's well-known powers of clear exposition, the reading of this lecture is enjoyable; the line of thought is not difficult to follow and the analysis of the subject is as simple and direct as it is possible to make it within the limits of thirty-one pages. It is, of course, impossible in many instances to do more than suggest the line of influence of a group of men whose work has been of epoch-making importance. The names of most of the great leaders are mentioned categorically—and the list is a long one, but it is a disappointment to miss any reference to Bichat. His influence was so considerable on the development of minute anatomy in the nineteenth century that, notwithstanding the fact that he met his early and untimely death in 1802, his should be recognized as one of the great influences in the development of biology in the nineteenth century. The omission of the name of any American investigator is more in the nature of a blunder. However clear the general account of biological progress may be, it is inadequate if no place is found in it for such names as Cope, Marsh and Gray or for the mention of the embryological and cytological researches of American investigators.

The subject is naturally considered under two main divisions—the progress in morphology and that in physiology. In regard to progress in morphology, the four following factors are indicated as having had the greatest influence: (1) The establishment of the cell theory and the closely related protoplasm doctrine. (2) The development of the science of bacteriology. (3) Progress in embryology. (4) The doctrine of organic evolution.

The great influence of the cell theory is especially emphasized, not only as to its unifying tendency in uniting animals and plants on the broad basis of similitude of structure, but also as opening to naturalists the real problems of the living organism. The dis-

Leland Stanford.	Michigan.	Minnesota.	Missouri.	Nebraska.	Northwestern.	Pennsylvania.	Princeton.	Wisconsin.	Yale.
675 } (—71)	655 (17)	489(—2)	} 456(?)	374	323 } (—15)	453 (32)	773(28)	} 869	1236(44)
432 }	598 (7)	638(46)		533	272 }	.....	.....		.....
*	472 (119)	439(78)	417(?)	369	.....	355 (19)	466(38)	639	624(14)
*	821 (12)	490(27)	137(22)	145	175 (0)	376 (32)	.....	245	246(36)
.....	474 (—43)	386(29)	86(4)	14	408 (4)	538 (28)	.....	.....	148(15)
.....	.....	605(61)	53(—35)	58	64 (5)	.....	.....	18	.....
.....	.....	.....	.....	38	.....	....	.....	.....	66(—9)
.....	200 (—78)	104(—2)	.....	.....	541 (51)	361 (54)	.....	.....	.....
.....	.....	.....	.....	.....	155 (0)	.....	.....	.....	98(9)
.....	.....	.....	.....	.....	.....	.....	.....	.....	30(23)
.....	.....	.....	.....	238	261 (60)	.....	.....	108	69(—57)
.....	62 (—7)	73(3)	.....	.....	184 (20)	.....	.....	30	.....
.....	.....	.....	123(64)	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	72 (15)	.....	.....	.....
73 (—11)	93 (17)	170(—7)	39(4)	86	.....	180 (10)	123(45)	115	329(30)
.....	.....	.....	.....	.....	.....	185(—45)	.....	.....	.....
48 (—8)	418 (14)	302(27)	507(68)	256	.....	.....	.....	375	.....
.....	64 (—10)	.....	.....	21	.....	0(—10)	....	466	.....
[?]	[41]	[160]	[269]	[229]	[18]	.....	.....	[53]	[166]
1228 (—90)	3816 (64)	3536(113)	1549(214)	1903	2365 (125)	2520(—29)	1362(111)	2812	2680(178)
164	239	260	?	?	244	270	90	170	290

* Included under College. 170 students in law are enrolled; loss of 15.

covery that fermentation, putrefaction and finally, that many diseases are due to micro-organisms, stimulated studies which led to the establishment of the science of bacteriology. The revival in the nineteenth century of the question of spontaneous generation is mentioned, and the great triumph of Pasteur in demonstrating the falsity of the position of the heterogenists. Here also one notes another omission—no reference is made to the luminous researches of Tyndall on this subject with optically pure air. The great influence of embryology as founded on the work of Pander and von Baer is sympathetically although briefly treated. The facts that all animals begin as single cells, and show every gradation between that simple condition and the more complex one of the adult, and that ontogeny is in a sense an epitome of phylogeny, are sufficiently striking to endue this subject with unusual interest. Lastly, the influence of the establishment of the theory of evolution is spoken of.

In physiology the fundamental importance of experiment is pointed out—what the microscope is for anatomy, experiment is for physiology. Among the greatest advances mentioned in the first half of the century are the demonstration of Bell's law and the elaboration of the theory of specific energy by Johannes Müller. The development of physiology along the respective lines of chemical and physical physiology is discussed, together with the opposition aroused by these researches to the old theory of vitalism. The observations as to the action of chemical substances within the bodies of lower animals were turned to practical account in medicine. While physiology was being developed along chemical lines by one school, represented by Claude Bernard Pettinkofer, Voigt, Pflüger, Heidenhain and others, it was being advanced along physical lines by Robert Meyer, Helmholtz, Ludwig, Dubois-Reymond and others. With the latter school came exact methods of measuring and recording physiological activities, as with the kymograph, myograph, etc. The greatest triumph of the chemical and physical methods was in demonstrating that physiological processes are chemico-physical rather than vital. But this conception has been carried too far; some physiologists look upon life, with all its complex manifestations, as being entirely chemical and physical. This is as far wrong as the old theory of vitalism. The relation of the physicist to biological questions is similar to that of the chemist. Physiological questions can not be explained on purely chemical and physical grounds. We can not find out the rôle played by albumin in vital processes by study of its chemistry, but by direct study of the protoplasm in living cells. We must return to an anatomico-biological basis and let it be modified by the chemico-physical conception. The material world must be united by biological studies with the manifestations of the immaterial world of life.

William A. Locy.

Comparative Physiology of the Brain and Comparative Psychology. By Jacques Loeb. The Science Series. New York, G. P. Putnam's Sons. 1900. Pp. x+309. $1.50.

Professor Loeb's book forcibly calls attention to the importance of the comparative method in physiology and psychology. The present work is a translation, with additions and changes, of the German edition of 1900 by Mrs. Loeb. The book has been made into English with singular skill. It is clear, concise, scientifically accurate in statement, and, withal, readable. Of it may truthfully be said 'every words counts.' Whether one agrees or disagrees with any or all of the conclusions reached, the discussion is valuable, for it pleads for opposition, contradiction, investigation. There are not so very many physiologists, we fancy, who will fully agree with all the theories which Professor Loeb seeks to maintain; fewer still are the psychologists who will find themselves in sympathy with his attitude, and among ethical thinkers searcely any will come to the support of the new scientific construction whose possibility, nay, necessity—for our author is evidently a man of strong convictions—is hinted at. But opposition is needed for the testing of the theories in which the book abounds, although we doubt not that in the main the author's position is a safe one. Nothing is clearer than the seri-