formism is adequately understood. To gain this understanding the author has made an analytical study of the ideas of these two leaders of French zoological thought, not only as expressed in their own formulations of their philosophical ideas as to the organization of, and changes in, the living world, but also as they emerge in, or appear to modify and direct their interpretation of, the structure and classification of animals.

Both schools worked under the limitations of the anatomical method. They were alike, though not equally, without comprehension of the magnitude, value and significance of the developmental phase of animals opened to them by the work of von Baer, and neither seems to have made any serious effort to utilize the then very imperfect microscope to enlarge his concept of the living world. Indeed it seems to have been in their view more of a toy than an instrument, and its revelations seem to have had a nuance of unreality about them. Ehrenberg had not yet published his "Infusionsthiere," and the monographs of O. F. Müller did not direct the French savants from grosser and seemingly more substantial objects of investigation.

Thus, to a large degree, both were without the immense incentive to the idea of progression which the unicellular structure of the Protista afforded to systematists working subsequent to the statement of the cell theory in 1838–39. The hand lens was an auxiliary only to dissection. The classical mode of zoological investigation was well intrenched, and the microscope itself was as yet hardly in a stage of development to invite its use as a primary instrument of exploration. The complexity of the microscopic world of life had not been realized, and the significance of the structural distinctions between Bacteria, Protozoa, Protophyta, microscopic Metazoa such as the Rotifera, Tardigrada, the smaller flatworms and the microscopic larval stages of the larger Metazoa, had not been made, largely because of a lack of cellular knowledge and its bearing on development. It is not strange that the little that was known was so little used when we recall the fact that the free-swimming larval Cercaria of the Trematoda were classified with the dinoflagellate *Ceratium* and that Ehrenberg even in the time of the second edition of the "Histoire Naturelle des Animaux sans Vertèbres" (1835–45) was still finding guts and sex glands in the Ciliata, and that Linnaeus had utilized the significant names of *Volvox* and *Chaos*, that *Vibrio* and the Nematodes were put together, and that a miscellaneous assemblage of quite unrelated organisms was included in the Infusoria, named not from their structure but from their breeding place.

Lamarck was early imbued with the idea of the seriation of the organic world, though he vigorously set forth the independence of the organic and the inorganic and also the distinctions of the plant and the animal series. In his later work the idea of a linear series gave way more and more to the dendritic concept in classification.

To Lamarck the maximum simplicity of microorganisms was of great significance, while the tendency on the part of Cuvier was to disparage the significance of their small size, to emphasize their complexities and resemblances to larger forms of life and to distribute them, for example, putting Vorticella with the Zoophytes. Of all the reforms in classification initiated by the work of Lamarck by far the most significant and brilliant one was the establishment of the Protozoa as a distinct phylum. This grew out of his recognition of the simplicity of at least some of the "Infusoria." The Rotifera caused him no little trouble, though he recognized their distinctions. An extended comparison of Cuvier's and of Lamarck's treatment of the Arthropoda is used to demonstrate more fully the divergence of their methods.

The author has done a great service to students of the history of biology by tracing in considerable detail the influences which the ideas of Cuvier with regard to "types" and of Lamarck with regard to "series" had upon their systems of classification and their respective evaluation of diagnostic characters. Of especial value is his development of the growth of the idea of seriation as expressed in the systematic work of Lamarck.

A useful annotated bibliography accompanies each of these treatises.

CHARLES A. KOFOID
UNIVERSITY OF CALIFORNIA

REPORTS

REGISTRATION IN AMERICAN UNIVERSITIES

ACCORDING to an Associated Press dispatch an increase of 2 per cent. in enrolment, the smallest annual gain since the war, is shown in reports received by Dean Raymond Walters, of Swarthmore College, from 216 colleges and universities throughout the United States which are on the approved list of the Association of American Universities.

These reports, as presented in *School and Society* for December 15, 1928, show increases in 115 institutions and decreases in 101 institutions, comparing the November 1 registrations with those of a year ago.

An analysis by states shows that in twenty-six states there are more full-time students in approved colleges and universities than in 1927, and in twenty-two states there are fewer such students.

The 1928 full-time enrolment of the 216 institutions totals 417,526. The preceding five-year increase totaled 25 per cent.

"The returns of the next half dozen years must be awaited," Dean Walters writes, "to determine whether a definite break has come in the rate of increase in college enrolment."

He cites the diminishing birth-rate in America and restricted immigration as factors that will be effective in the future.

Dean Walters quotes various suggested explanations of the enrolment decreases, such as agricultural and industrial conditions, the development of junior colleges, a trend in certain areas away from the small colleges to the state universities and deliberate limitation of enrolment. He says:

"The present collegiate period, if it is a plateau, is nevertheless a plateau 25 per cent. higher than it was five years ago and very markedly higher proportionately than any similar popular level reached in other countries."

Tables in the *School and Society* article show that of the small colleges having enrolment up to 500 students, 24 report increases and 30 report decreases; institutions of 500 to 1,000 students, 30 have increases and 31 decreases; institutions of 1,000 to 3,000 students, 34 have increases and 22 decreases; universities of 3,000 students and upward, 27 report increases and 18 decreases.

The states and territories having more full-time students this year than last are: Arizona, Arkansas, Colorado, District of Columbia, Florida, Hawaii, Idaho, Illinois, Indiana, Kentucky, Maine, Massachusetts, Michigan, Minnesota, Mississippi, Montana, New York, North Carolina, North Dakota, Ohio, Oregon, Tennessee, Texas, Virginia, Wisconsin and Wyoming.

The statistics give first place in full-time enrolment to the University of California (including divisions at both Berkeley and Los Angeles) with 17,337 students, Columbia University is second with 13,691, University of Illinois third with 12,150, University of Minnesota fourth with 11,815 and University of Michigan fifth with 10,954.

Counting part-time and summer session students, as well as full-time regulars, the ranking of the highest five for a grand total enrolment in 1928 is somewhat different, as follows.

Columbia, 32,036; College of the City of New York, 28,287; California, 26,562; New York University, 26,303; Minnesota, 17,856.

The full-time enrolments of universities ranking sixth to twenty-fifth are as follows:

New York University	10,711
Ohio State University	10,293
University of Wisconsin	9,042
Boston University	8,520
Harvard University	8,110
University of Washington (Seattle)	7,282
University of Pennsylvania	6,711
University of Pittsburgh	6,235
University of Nebraska	6,235
University of Texas	5,794
University of Chicago	5,628
Northwestern University	5,559
Cornell University	5,315
Syracuse University	5,188
State University of Iowa	5,047
Yale University	4,990
College of the City of New York	4,929
University of Oklahoma	4,604
University of Cincinnati	4,297
Fordham University	4,175

For grand total enrolments, including part-time and summer students, the order of universities ranking sixth to twenty-fifth is as follows:

University of Pennsylvania	14,844
University of Illinois	13,010
University of Wisconsin	12,939
University of Michigan	12,890
University of Pittsburgh	12,674
Ohio State University	12,662
University of Chicago	12,662
Boston University	12,234
Northwestern University	12,038
Western Reserve University	10,832
Harvard University	10,793
University of Washington (Seattle)	10,339
University of Cincinnati	10,328
University of Nebraska	8,897
University of Texas	8,259
University of Iowa	8,026
Fordham University	7,859
Cornell University	7,465
Syracuse University	6,882
University of Oklahoma	6,664

Of the women's colleges on the approved list, the ten largest in full-time students are:

Hunter College	4,918
Smith College	2,022
Wellesley College	1,592
Florida State College for Women	1,550
Vassar College	1,156
Mount Holyoke College	1,006
Goucher College	979
Radcliffe College	907
Randolph-Macon College	795
Elmira College	588

Reporting that, "in general, summer school attendance in 1928 showed no great increase over the 1927

figures," Dean Walters gives the five largest summer session enrolments as follows:

Columbia University	14,007
University of Chicago	6,338
University of Minnesota	6,641
University of Wisconsin	5,065
University of California	10,228

SPECIAL ARTICLES

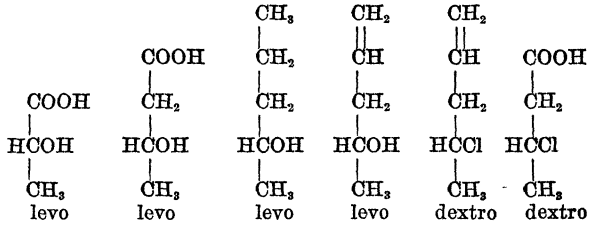
ON THE CONFIGURATIONAL RELATIONSHIP OF 3-CHLOROBUTYRIC AND 3-HYDROXYBUTYRIC ACIDS

IN recent years reports have appeared from several laboratories on the correlation of the configurations of hydroxy and of halogeno acids. The conclusions reached by different authors are quite contradictory. As an illustration two pairs of acids may be mentioned, namely, lactic and chloropropionic acids and malic and bromo- or chlorosuccinic acids. According to Clough and to Levene and Mikeska, dextro-lactic acid is correlated with dextro-chloropropionic acid, whereas Freudenberg correlates it with levo-chloropropionic acid. In the succinic acid series, Clough, Holmberg, Levene and Mikeska correlate dextro-malic with dextro-chloro- or bromosuccinic acid, whereas Freudenberg and Kuhn correlate it with levo-bromosuccinic acid.

All the conclusions were reached by indirect methods and therefore need confirmation by more direct methods.

Levene and Mikeska have advanced sufficient evidence for the assumption that in simple aliphatic secondary alcohols the substitution of the hydroxyl by a halogen atom proceeds without Walden Inversion.

Admitting the correctness of this assumption, it is possible to correlate the configurations of the halogeno acids with carbinols, and these have already been correlated with lactic acid. The process by which this task can be accomplished is seen from the following figures:



Thus, on the basis of this set of reactions, dextro-3-chlorobutyric acid is correlated with levo-3-hydroxybutyric acid and hence with levo-lactic acid.

The same conclusion had been reached previously by Levene and Mikeska on the basis of the behavior of 3-hydroxybutyric and 3-chlorobutyric acids on passing from the ionized to the unionized state. In the pair levo-3-hydroxybutyric and dextro-3-chlorobutyric acids the difference $[M]_{ion} - [M]_{acid}$ has a minus sign.

P. A. LEVENE,
H. L. HALLER

THE ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH,
NEW YORK CITY

THE SPECTRUM OF DOUBLY IONIZED POTASSIUM (K III)

A LARGE number of lines of the spark spectrum of potassium appearing in the electrodeless discharge have been classified by the author as belonging to the K II spectrum. (*Proc.*, Amsterdam, 1926; *Zeitschr. f. Phys.*, 38: 94, 1926; *Archives Neerlandaises*, 11: 70, 1928). The remaining lines lay in the region below λ 3500. It was supposed that these lines belong to the higher ionization stages K III and K IV. A list of these lines has been published by the author. Since we now know the spectra of Chlorine I (De Bruin and Kiess, SCIENCE, 68: 356, 1928) and Argon II (De Bruin, *Zeitschr. f. Phys.*, 48: 62, 1928; 51: 101, 1928) it is not difficult to locate the K III spectrum by aid of the irregular doublet law and to find the energy scheme. A doublet and quartet term system has been found. The key to the analysis is given by the deep $4s^4P_{321}$ with the term differences $\Delta\nu = 1265.9$ and 773.5. The low $4s^2P_{21}$ has the difference $\Delta\nu = 1506.9$. In the following table we give as an example the principal multiplets of the quartet sys-

		$4s^4P_{321} - 4p^4P_{321}$	
5	3513.88	28450.4	$4s^4P_1 - 4p^4P_2$
6	3468.32	28824.2	$4s^4P_2 - 4p^4P_3$
3	3448.01	28993.9	$4s^4P_1 - 4p^4P_1$
6	3420.82	29224.4	$4s^4P_2 - 4p^4P_2$
3	3358.43	29767.3	$4s^4P_2 - 4p^4P_1$
6	3322.40	30090.1	$4s^4P_3 - 4p^4P_3$
6	3278.79	30490.3	$4s^4P_3 - 4p^4P_2$
		$4s^4P_{321} - 4p^4D_{4321}$	
5	3056.84	32704.0	$4s^4P_1 - 4p^4D_2$
6	3052.07	32755.2	$4s^4P_2 - 4p^4D_3$
3	3023.43	33065.4	$4s^4P_1 - 4p^4D_1$
6	2992.42	33408.0	$4s^4P_3 - 4p^4D_4$
5	2986.20	33477.6	$4s^4P_2 - 4p^4D_2$
3	2954.33	33838.8	$4s^4P_2 - 4p^4D_1$
5	2938.45	34021.6	$4s^4P_3 - 4p^4D_3$
1	2877.31	34743.6	$4s^4P_3 - 4p^4D_2$
		$4s^4P_{321} - 4p^4S_2$	
5	2689.90	37165.0	$4s^4P_1 - 4p^4S_2$
5	2635.11	37937.8	$4s^4P_2 - 4p^4S_2$
6	2550.02	39203.0	$4s^4P_3 - 4p^4S_2$