1922 in the different states. Although he admits that he is "certainly no violent environmentalist," he vigorously combats the deduction from this correlation that "somehow high fertility in a group is *in itself* an indication of probable racial unfitness." On the contrary he submits the interpretation that a lessened birth-rate tends to accompany increase in wealth, although he places emphasis upon the consideration that other factors than economic ones are involved.

From this point, the reader is logically led into a discussion of human behavior and the birth rate, which is original not only because the data relating to normal sex behavior are new but also because of the author's implications. His presentation of the data is in the nature of a report upon a study still in progress and he warns against too sweeping conclusions. After an extremely painstaking statistical analysis the material so far collected is interpreted as pointing to a lessened frequency of sexual activity as "the intellectual content of life" becomes "more varied and interesting," an indication which receives support from further statistical evidence pointing to a smaller mean total progeny of men engaged in professional pursuits as compared with that of men engaged in pursuits less intellectual in character. To put it very crudely, the curve is "damped off" not only as a population lives in crowds, and tends to get above the poverty line, but also as it gets away from physical labor and occupations concerned with material matters and becomes more and more engaged in intellectual interests.

These are very stimulating conclusions not merely because they suggest, as the author says, further research at many points, but because of their "humanistic implications." Professor Pearl yields for a few pages only to the temptation to discuss them, but what he says is distinctly worth reading. As it may be inferred, his research has not made him gloomy in his outlook. Population will continue to increase, and the growth in population will very probably lead to wars, but it will not "inevitably increase the general wretchedness of human life apart from wars." In support of this optimistic view, he points to the facts that although we have gone a considerable way in the present cycle of growth, squalor, wretchedness and general unhappiness have not increased; that there is going on an orderly evolution of knowledge of how to control and use natural processes and, finally, that the human race is adaptively responsive to population pressure. To the modern adherent of the "inevitable misery doctrine" who is genuinely interested in an open-minded approach to the population problem Professor Pearl's contribution is to be recommended. No commendation is necessary to those who are conversant with the quality of his scientific work or with the vigor of his writing.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

AN AUTOMATIC THERMOREGULATOR, DEPENDING ON THE FLOW OF WARMED LIQUID[1]

THE following device has proved useful for maintaining a constant temperature in saline solutions that could not be heated by a direct flame; for instance, in the method described by Sollmann and Rademaekers[2] for studying exposed intestines of living animals in a saline bath formed from the abdominal walls, it is necessary to keep the bath at strictly body temperature, and this is done by adding saline solution, warmed to 55°, at a proper rate. This regulation requires a great deal of attention, and this was the immediate occasion for the construction of an automatic flow-thermoregulator. A toluene thermoregulator (I, in the figure), which is inserted in the bath, controls the admission of air and therefore the discharge of warmed saline from a Mariotte bottle (II).

The thermoregulator (I) consists of a glass tube (T) filled with toluene. The lower end of this is bent into a coil (C) which is immersed in the bath. The upper end of the tube is bent into a U, which is filled with mercury (M), with a setscrew (S), by which the level of the mercury can be regulated, as in an ordinary toluol thermoregulator. The tube above the mercury is somewhat expanded with an opening (O) blown in one side about 1 cm above the level of the mercury. The neck of the tube bears a stopper, perforated by a smaller tube, which ends just above the mercury and which is connected with the tube of the Mariotte bottle (II). The latter is maintained at a fairly uniform temperature in an ordinary water bath.

The level of the mercury is adjusted so that it is below (X) when the temperature in the abdominal pouch falls below 38° C., air then passes through (O) in the direction of the arrows into the Mariotte bottle, and the hot saline flows from the tip (P) into the pouch. As the temperature in the pouch rises, the mercury expands, closes X and shuts off the supply of air and therefore the flow from the Mariotte bottle.

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SPECIAL ARTICLES

NEW TERMS IN THE SPECTRA OF ZINC AND MERCURY

WE have recently reported (*Nature*, December 26, 1925) a pp′ group in the arc spectrum of zinc. This multiplet is similar to the one found by Ruark in the arc spectrum of cadmium in that it consists of four

[1] From the Department of Pharmacology, School of Medicine, Western Reserve University.

[2] T. Sollmann and A. Rademaekers, "Investigations on Saline Catharties," *Trs. int. d. Pharmacodyn. et de Thér.*, XXXI. 39, 1925.

lines instead of the usual six; the term p_2' is lacking. We reported, however, a diffuse pair in the exact place where the two missing lines, $2p_1 - 2p_2'$ and $2p_2 - 2p_2'$ should be, but the diffuse nature of this pair seemed to preclude their classification as part of the pp′ group. Since our letter was written, Dr. R. V. Zumstein, National Research Fellow at the University of Michigan, has photographed this region for us with the Hilger E 1 quartz spectrograph, using a 100 ampere zinc arc. In this spectrogram, the four lines (λλ2104.34, 2096.88, 2087.27, and 2079.10) which we classified as the pp′ group, show fine sharp reversals, confirming our assignment. The diffuse pair mentioned above, whose wave-lengths we have determined as 2086.72 and 2070.11, show broad diffuse reversals. They must thus also arise from deep lying terms in the zinc spectrum. Hund (*Zeit. f. Phys.*, V. 33, p. 345, 1925) has shown that there should be expected in zinc a deep lying singlet S″ and singlet D″ term, as well as the triplet p′ term. A singlet D″ would combine with the triplet p term of the arc spectrum to give a diffuse doublet. We believe the pair under discussion to be of this nature and have classified it as

λ	Int.	ν	Classification
2086.72	1R	47906.7	$2p_2 - 2D''$
2070.11	1R	48291.2	$2p_1 - 2D''$

$2D'' = -5028 cm^{-1}$

No pair similar to this has been located in cadmium. Probably in cadmium 2D″ is not so near $2p_2'$ as in zinc.

The spectrum of mercury should be similar to that of zinc and cadmium.

In Hg I we have 1S – 2P, λ = 1849.57, ν = 54065.7. By comparison with the spectra of zinc and cadmium we should expect both the pp′ multiplet of Hg I and $1s - 2p_2$ of the Hg II spectrum to be near this line. The mercury spectrum is not well known in the region below λ2000. We have, accordingly, photographed this spectrum from λ2100–1500, using the mercury vacuum spark in a vacuum grating spectrograph. The spectrum has been examined both for evidence of a pp′ multiplet and for a pair in the expected position of the first pair of the principal series of Hg II.

We have located a group in the expected position which we have classified as the pp′ group of Hg I. This group is:

λ	Int.	ν	Classification
2002.7	6	49933	$2p_2 - 2p_1'$
1900.1	5	52629	$2p_1 - 2p_0'$
1832.6	5	54576	$2p_1 - 2p_1'$
1774.9	4	56341	$2p_0 - 2p_1'$

$2p_1' = -9802$

λλ1833 and 1775 were found strong in the arc by Lymann, λ2003, strong in the arc by Stark. λ1900 has apparently never been observed in the arc. On our spectrogram, these lines have a uniform appearance and the relative intensities above listed. $2p_1 - 2p_0'$ might be otherwise chosen, but has the proper relative position and seems the best choice. The assignment of the other three lines seems certain. It is worth noticing that the excitation potentials of these four lines are, respectively, 6.18, 6.51, 6.75, and 6.97 volts, and that Frank and Einsporn (*Zeit. f. Phys.*, V. 2, p. 18, 1920) in their work with mercury vapor found weak unexplained critical potentials at 6.04, 6.30 and 7.12 volts. The excitation of λ1833 would not be resolved from that of 1S – 2P, λ1849 = 6.73 volts. The variations here are about the maximum allowed in identification by Frank and Einsporn. The recent data of Jarvis (*Bull. Am. Phy. Soc.*, V. I, p. 14, 1926) are in somewhat better agreement and give for these potentials 6.05, 6.46, and 7.13 volts, respectively. It seems quite possible that these weak, unaccounted for, critical potentials represent the excitation by successive impacts of the p′ states from the p states.

We have also located in our mercury spectrum a pair of lines which satisfy the requirements for the first pair of the principal series of Hg II. This pair is

λ	Int.	ν	Δν	Classification
1987.2	10	50312		$1s - 2p_1$
			9834	
1662.6	5	60146		$1s - 2p_2$

If we classify this pair as the first pair of the sharp series of Hg II, there then exists an exact similarity between the relative positions of these lines and the corresponding lines in the spectra of zinc and cadmium. We see that now the lines 1S – 2P, and $2p_1 - 2p_1'$ of the neutral atom, and 1S – $2p_2$ of the once ionized atom, are close together and in the same relative position in the three elements. The frequencies of these lines are given in the folowing table:

	Cd	Zn	Hg
1S – 2P	43691	46746	54066
$1p - 2p_1'$	44088	47894	54576
$1s - 2p_2$	46618	49355	60146

The pair λλ2847.83 and 2224.82 are known to be the second pair of the sharp series of Hg II. As we have now two members of the series, by the use of the Rydberg tables approximate values of the terms 1s, $2p_1$, and $2p_2$ in the Hg II spectrum may be computed. They are

$$1s = 156300$$
$$2p_1 = 106000$$
$$2p_2 = 96200$$

Since they are computed from only the first two terms of the series, they are probably a little too large.

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THE MICHIGAN ACADEMY OF SCIENCES, ARTS AND LETTERS

THE thirty-first annual meeting of the Michigan Academy of Science, Arts and Letters was held at Ann Arbor, March 31 to April 2, 1926. Professor W. G. Waterman, of Northwestern University, attended the meetings as the representative of the American Association for the Advancement of Science. Charles H. Cooley, of the University of Michigan, gave his presidential address on "The Roots of Social Knowledge." General addresses were given by C. C. Little, of the University of Michigan, on "The Genetics of Cancer"; W. G. Waterman, of Northwestern University, on "Sleeping Bear Point—a Unique Dune Area" and by Francis E. Lloyd, of McGill University, on "Motion Picture Studies in the Life-History and Physiology of Spirogyra and Vampyrella." Over 150 papers were read before the eleven sections of the Academy.

During the meeting 102 persons were elected to membership in the academy, and the following were elected to honorary membership:

Charles Mills Gayley, professor of English, University of California.
Herbert Spencer Jennings, professor of zoology, Johns Hopkins University.
Thomas Maitland Marshall, professor of history, Washington University.
Frederick Charles Newcombe, professor emeritus of botany, University of Michigan.

Officers for the current year were elected as follows:

President—L. A. Chase, Northern State Normal School.
Vice-President—Harrison R. Hunt, Michigan State College.
Secretary-Treasurer—L. R. Dice, University of Michigan.
Librarian—W. W. Bishop, University of Michigan.
Editor—Peter Okkelberg, University of Michigan.

Section Chairmen

Anthropology—Carl E. Guthe, University of Michigan.
Botany—B. M. Davis, University of Michigan.
Economics and Sociology—Z. C. Dickinson, University of Michigan.
Geography—L. R. Schoenmann, State Land-Economic Survey.
Geology and Mineralogy—W. A. Ver Wiebe, University of Michigan.
History and Political Science—Preston W. Slosson, University of Michigan.
Language and Literature—C. E. Whitmore, University of Michigan.
Mathematics—A. L. Nelson, College of the City of Detroit.
Psychology—John Shepard, University of Michigan.
Sanitary and Medical Science—Malcolm H. Soule, University of Michigan.
Zoology—Charles W. Creaser, College of the City of Detroit.

L. R. DICE,
Secretary-Treasurer

THE MID-WESTERN ASSOCIATION OF EXPERIMENTAL PSYCHOLOGISTS

THE first meeting of the Mid-Western Association of Experimental Psychologists was held at Northwestern University, Evanston, Illinois, on Friday and Saturday, May 7 and 8. On Friday evening Professor Jastrow, of the University of Wisconsin, spoke on "The Beginnings of Experimental Laboratories in the United States." Professor Jastrow told of the first laboratory established by G. Stanley Hall at the Johns Hopkins University in 1882. From this beginning he sketched the development of laboratories at Clark University, Harvard, University of Pennsylvania, Columbia and Wisconsin.

On Saturday morning papers were presented by: Professor Max Meyer, of Missouri, "Rank Classes versus Centiles"; Dr. H. W. Johnson, Mellon Institute, "Some Recent Experiments bearing on the Problem of Sleep"; Mr. S. N. Stevens, Northwestern, "Some Studies in Experimental Functionalism"; Mr. James Vaughn, Chicago, "The Hydrogen Ion Concentration of the Saliva."

In the afternoon representatives gave reports of experiments in progress at the following laboratories: Kansas, Wisconsin, Minnesota, Missouri, Wittenberg, Iowa and Ohio State. In the evening after dinner President Walter Dill Scott presided while Professor H. A. Carr, of Chicago, gave a paper on "The Weber-Fechner Law" and Professor A. P. Weiss told of the organization and program of the new Ohio State University laboratory.

More than 150 representatives from fifteen colleges and universities were present. A committee consisting of Professors A. R. Gilliland, Northwestern; E. S. Robinson, Chicago; C. R. Griffith, Illinois; Clark Hull, Wisconsin, and C. A. Ruckmick, Iowa, was appointed to arrange for the program and place of meeting for next year.