voted to a general program of contributed papers. Titles for this session should be sent by April 15 to Dr. George A. Baitsell, secretary of the section, Yale University, New Haven, Connecticut.

SIGMA PI SIGMA, the national physics honor society, will hold its convention on April 6, 7 and 8 at Columbus, Ohio, with the Ohio State University Chapter as host. Delegates from over thirty active chapters will attend the business and scientific sessions, which will conclude with an inspection trip to the Perkins Observatory. Dr. R. C. Colwell, of West Virginia University, the retiring president, will deliver the presidential address on "Electromagnetic Waves and Radio Signals." After being received into honorary membership in the society, Dr. Paul E. Klopsteg, of the Central Scientific Company, will speak at an open meeting on "Archery, a Physicist's Hobby." At a panel discussion, Dr. M. N. States, assisted by Dr. W. P. Davey, Dr. W. E. Forsythe and others, will present various phases of problems dealing with the placement of graduates in physics.

THE Emmons memorial fellowship in economic geology of Columbia University is available for this year with a stipend of $1,200. Applications and accompanying testimonials should be submitted not later than April 15. Applicants should be qualified by training and experience to investigate some problem in economic geology and should submit a definite statement of their problem to the committee, under whose oversight the work will be undertaken at any institution approved by them. The fellow must give his entire time to the problem, which may be used for a doctorate dissertation. Application blanks and further information may be obtained from Alan M. Bateman, Charles P. Berkey, Waldemar Lindgren, or the Secretary, Columbia University, New York, N. Y.

FOUR fellowships have been established at Yenching University by the British Boxer Indemnity Fund for the current academic year. The appointees will serve as research assistants in carrying forward definite research projects. These fellowships are primarily for graduates of Yenching University and carry a stipend of $480 per year. For the current year one appointment has been made in biology, one in physics and two in chemistry.

DR. VLADIMIR NIKOLAEVICH IPATIEFF, since 1930 professor of chemistry at Northwestern University, previously of Moscow and Leningrad, has made a gift of $21,000 to the university for the endowment of a chemical research laboratory for work in high pressures. The new laboratory will be placed in University Hall and will be used for research in chemical synthesis at high pressure. Dr. Ipatieff will be the director of the laboratory.

FORMER GOVERNOR PERCIVAL P. BAXTER has given to the State of Maine 12,000 acres of wild forest land in the Mount Katahdin region to be added to the Baxter State Park. The legislature in 1933 accepted Governor Baxter's first gift of 6,000 acres, which was subsequently named the Baxter State Park.

DISCUSSION

CLIMATE AND REPRODUCTION

WHITAKER'S recent discussion in these columns of the question of seasonal sterility among the Eskimos[1] may be regarded as yet another nail in the coffin of the myth of the human breeding season. The myth is one that dies hard. Westermarck in a discussion of the subject cited some two hundred references in support of the theory that the ancestors of modern man were characterized by a circumscribed pairing or breeding season.[2] The notion that the periods at which the greatest number of births occur among the human species indicate the survival of a primitive human sexual rhythm associated with "annual changes in the human organism especially connected with the sex function" was discussed very fully by Havelock Ellis many years ago.[3] These ideas find a place in the works of such distinguished physiologists as Marshall[4] and Wright,[5] and they have found a vigorous supporter in a leading student of population.[6]

Such authors have assumed that, since the catarrhine monkeys and the anthropoids are characterized by a pairing season, the ancestors of modern man must likewise have been so characterized and that certain primitive peoples still exhibit evidences of this "ancestral trait." It so happens that the major premise of this syllogism is a pure assumption without the slightest factual foundation, for the evidence is quite clear and definite that neither the catarrhine monkeys nor the anthropoid apes are characterized by a breeding season, but on the other hand that they are capable of breeding and of copulating at all times.[7] The state-

[1] W. L. Whitaker, SCIENCE, 88: 214, 1938.

[2] E. Westermarck, "The History of Human Marriage," Vol. II, p. 76, 1922; "The Future of Human Marriage," p. 10, 1936.

[3] H. Ellis, "Studies in the Psychology of Sex," Vol. II, p. 88, 1900.

[4] F. H. A. Marshall, "The Physiology of Reproduction," p. 672, 1910.

[5] S. Wright, "Applied Physiology," p. 198, 1934.

[6] A. M. Carr-Saunders, "The Population Problem," p. 92, 1922.

[7] For a discussion of the evidence which it is impossible

ments of travelers and of other occasional observers concerning the existence of an alleged breeding or rutting season among certain primitive peoples could be quoted *ad nauseam,* but there is one that has been so often quoted by those who have put their faith in a human breeding season, and which is so typical of all such statements, that it deserves to be given here together with the sort of evidence which puts such statements in the category to which they properly belong. Westermarck[8] begins his citation of the evidence in support of the existence of a breeding season in primeval man with the statement that "According to Mr. Johnston, the wild Indians of California, belonging to the lowest races on earth, have their rutting seasons as regularly as have the deer, the elk, the antelope, or any other animals.[9] With reference to some of these Indians, Mr. Powers says that spring 'is a literal Saint Valentine's Day with them, as with the natural birds and beasts of the forest.'"[10] When we consult our greatest authority on the California Indians for some light on these matters we find him writing of the Yurok, a Californian people who live along the reaches of the lower Klamath River, that they are characterized by an excessive desire for wealth and the great regard in which they hold money, which circulates among them in the form of dentalium shells.

> The significant fact is that they hold a strong conviction that the dentalium money and the congress of the sexes stand in a relation of inherent antithesis. This is one reason given for the summer mating season: the shells would leave the house in which conjugal desires were satisfied, and it is too cold and rainy to sleep outdoors in winter. . . . Births occurred among the Yurok and their neighbors chiefly in spring. This was, of course, not because of any animal-like impulse to rut in a certain season, as has sometimes been imagined, but because of highly specialized ideas of property and magic. . . . Since dentalia and other valuables were kept in the house, a man never slept there with his wife. . . . The institution of the sweat house rendered this easily possible. In summer, however, when the cold rains were over, the couple made their bed outdoors; with the result that it seems natural to the Yurok that children should be born in spring.[11]

Thus, when the superficial observations of the older observers are interpreted in the light of the facts they are seen to have a meaning quite different from that which has rather loosely been attributed to them.

In recent years, as a result chiefly of Rowan's work[12] on artificial illumination and sexual periodicity,[13] an attempt has been made to bolster up the breeding season myth in the special case of the Eskimo.[14] Whitaker has shown the unsatisfactory nature of the evidence upon which this attempt was based. In passing it may be remarked here that Rowan's work has been very generally misunderstood as proving that light *qua* light is the causative factor in producing gonadal development, whereas what Rowan has actually claimed to have shown is that it is more probably the effect of light, namely, *wakefulness,* which produces the observed effect.[15]

Now, while it is certain that no human beings are characterized by a circumscribed period of reproduction, there exists a certain amount of evidence which very strongly suggests that climatic factors do affect the reproductive capacity of most vertebrates, including man. Thus, for example, the breeding seasons of various birds and mammals can be shown to be correlated with certain seasons, and when these animals are removed from the Northern to the Southern Hemisphere, or *vice versa,* they adapt themselves after a short time to the reversed calendric seasons and come into oestrus in the season in which they formerly did, although in different months. This has been shown in the case of birds,[16] and for the mammals thus far investigated.[17] For the distribution in the incidence of conceptions in the primates with a high relative sterility and menstrual disturbance in the summer months this seasonal correlation has been shown to hold good in the case of the rhesus monkey,[18] and also for man.[19] The high frequency of disturbances of the menstrual cycle during the summer months in young and adult women has been reported by many investigators,[20] and it is also of some interest to note that

to cite here see M. F. Ashley-Montagu, "Coming into Being Among the Australian Aborigines," p. 258, 1937.

[8] *Loc. cit.,* p. 81.

[9] A. Johnston, "The California Indians," in H. R. Schoolcraft, "Historical and Statistical Information respecting the History, Condition, and Prospects of the Indian Tribes of the United States," Vol. IV, p. 224, 1860.

[10] S. Powers, "Tribes of California," in "Survey of the Rocky Mountain Region," p. 206, 1877.

[11] A. L. Kroeber, "Handbook of the Indians of California," *Bureau of American Ethnology Bulletin,* Vol. 78, 41, 1925.

[12] W. Rowan, *Nature,* 115: 494, 1925; *Nature,* 120: 11, 1928; *Proc. Bost. Soc. Nat. History,* 38: 147, 1926; *Proc. Bost. Soc. Nat. History,* 39: 151, 1929.

[13] For a review of the literature dealing with this subject see T. H. Bissonnette, *Quart. Rev. Biol.,* 11: 371, 1936, and Rowan's forthcoming paper, "Light and Reproduction," *Biol. Rev.,* 13: 374, 1938.

[14] Ll. J. Llewellyn, *Nature,* 129: 868, 1932.

[15] W. Rowan, *Proc. Zool. Soc. London,* Ser. A, 108, Pt. 1: 51, 1938.

[16] J. R. Baker and R. M. Ranson, *Proc. Zool. Soc. London,* Ser. A. 108, Pt. 1, 101, 1938.

[17] F. H. A. Marshall, *Proc. Roy. Soc.,* 122 B: 413, 1937.

[18] C. G. Hartman, *Contrib. Embryol.* No. 134: 39, 1932.

[19] C. A. Mills and F. A. Senior, *Arch. Int. Med.,* 46: 921, 1930.

[20] E. T. Engle and M. C. Shelesnyak, *Human Biol.,* 6: 431, 1934; E. Allen, *Am. Jour. Obst. and Gynec.,* 25: 705, 1933; C. F. Fluhman, *Am. Jour. Obst. and Gynec.,* 26: 642, 1933; J. L. King, *Am. Jour. Obst. and Gynec.,* 25: 583, 1933.

the greatest number of abortions appears to occur during the summer months.[21]

Apart from the evidence provided by the lower vertebrates, the fact that the lowest number of conceptions, the greatest number of menstrual irregularities and the greatest number of abortions occur in the human species wherever investigated during the summer months indicates that the reproductive life of man is in some way influenced by climatic factors. That these factors are probably fairly complex should, for methodological purposes at least, be assumed, for it now seems unlikely that any one single factor such as light or temperature alone can be considered as the sufficient cause of these reproductive phenomena. The low summer conception rates among the Eskimo of Greenland as given by Bertelsen[22] and referred to by Whitaker is yet another illustration of this apparently universal relation between low reproductivity and the summer months. What the nature of this relation is here, as elsewhere, is a problem which remains to be investigated. The purpose of the present communication is to make it clear that such a relation exists.

M. F. ASHLEY-MONTAGU
DEPARTMENT OF ANATOMY,
HAHNEMANN MEDICAL COLLEGE
PHILADELPHIA

VITAMIN B_1 IN SOIL[1]

WILLIAMS and Spies[2] have advanced the theory that thiamin (vitamin B_1) may be present in soils. Since certain thiamin-requiring fungi are able to detect minute quantities of this substance (0.05 micrograms per liter), the writers undertook to test this theory. Duplicate soil samples were obtained from two different localities in the vicinity of Morgantown, W. Va. The first was taken from a cultivated field, and the second from a sharply sloping and sparsely wooded tract that has never been under cultivation. The soil sampler was driven to a depth of 4 feet and cores of soil one inch in diameter and 48 inches long were secured. The cores were divided into 4 one-foot lengths and separately extracted with pyridine water (3:1) for 5 hours on a steam bath. The extract was filtered off, taken to dryness under reduced pressure, repeatedly dissolved in water and dried until all traces of pyridine disappeared, and the pyridine-free extract was added to the basic medium containing the essential mineral salts, amino acids and dextrose. One half of the extract from each sample of soil was added to 50 ml of the nutrient medium, solidified with 2 per cent. purified Bacto agar, poured in test-tubes, sterilized and inoculated with the test organisms. The other half of the extract was tested without the addition of agar. The following organisms were used: (a), *Phytophthora erythroseptica,* a fungus that requires thiamin for its growth; (b), *Phycomyces blakesleeanus,* capable of growing in the presence of either thiamin or a mixture of the two moieties of thiamin—thiazole and pyrimidine; (c), *Pythiomorpha gonapodioides,* which grows equally well in the presence of either thiamin or pyrimidine only; (d), *Mucor ramannianus,* capable of making equally good growth in the presence of thiamin or thiazole alone, and (e), *Sordaria fimicola,* which does not grow in the presence of thiamin or its moieties alone, but must have one of the bioses—biotin. The control medium failed to induce growth in any of the foregoing organisms, while all five fungi flourished in both solid and liquid media containing soil extract. The extract from the surface foot of soil induced a better growth than that from the lower ones, but even the fourth foot of soil contained enough thiamin to induce fair to good growth.

Cores of soils taken at a depth of 8 feet from a pasture land showed that the soil contained enough pyrimidine seven feet under the surface, where the microflora is very sparse, to induce a rich growth in pyrimidine-requiring organisms; enough thiazole to induce a fairly good growth in *Mucor ramannianus,* and sufficient thiamin to promote some growth in *Phytophthora erythroseptica.* This shows that not all the thiamin or its moieties found in the soil remain associated with living organisms but that some may leach into the clay and remain adsorbed on the particles.

Robbins[3] and White[4] have shown that thiamin is essential for the cultivation of excised roots of tomato, while Bonner[5] has found that in certain plants root formation is induced only when thiamin is added to the rooting medium. Biotin is essential for numerous microorganisms, and since it is present in many plant and animal tissues, eventually it may be found to be of considerable importance in the biological processes. It may be possible that the presence of thiamin and biotin in soils will give added significance to the role of organic matter in soil fertility.

VIRGIL GREENE LILLY
LEON H. LEONIAN
WEST VIRGINIA UNIVERSITY,
MORGANTOWN, W. VA.

PRESERVING THE VIABILITY OF BERMUDA ONION SEED

IT is well known that many seeds retain their viabil-

21 W. Millar, *Human Biol.,* 6: 279, 1934.

22 A. Bertelsen, *Meddelelser om Grønland,* 117: No. 1, 1935.

1 Published with the approval of the director of the West Virginia Agricultural Experiment Station as Scientific Paper No. 216.

2 Williams and Spies, "Vitamin B_1," p. 381. Macmillan Company, New York, 1938.

3 Robbins and Bartley, SCIENCE, 85: 246–247, 1937.

4 White, *Plant Physiol.,* 12: 803–811, 1937.

5 Bonner, paper read at Richmond meeting of A.A.A.S., 1938.