behave in reference to this one. In this way, climate may be approached through tangible evidences of its past. Pollen analyses, tree ring analyses, soil studies, studies in plant and animal ecology and studies in archeology (e.g., the work of Douglas) may be organized in a complex whole, the study of which in the field and in the laboratory may provide a body of data so coherent that geography will not have to depend on an untenable foundation of statistical climatic regions, the data of which are so complex as to defy reduction to averages.

STANLEY D. DODGE
THE UNIVERSITY OF MICHIGAN

FERTILITY AND INTELLIGENCE OF COLLEGE MEN

VERY little based on direct evidence is known concerning fertility differentials with respect to intelligence. Such inferences as have been attempted are based primarily upon correlations of the intelligence scores of children with the number of their siblings—*i.e.*, with the fertility of their *parents;* but it is plainly the correlation of intelligence with the individual's own fertility which is of eugenic interest.

Opportunity is arising to collect a limited amount of direct evidence from that part of the population which was tested in colleges with the early group tests. Such data are obviously imperfect; they are incomplete, since students tested as freshmen in 1918 are now about 37 years old and may produce children for another dozen years; they are affected by selective factors, since it is likely that certain types of alumni are disproportionately represented in the available records on fertility; and they are restricted to a single social class. Nevertheless, it seems desirable to learn what we can about this important social phenomenon. Exploratory analyses have therefore been made on the records of the Brown class of 1924 (tested in September, 1920, with the Brown University Psychological Examination).

One hundred sixty-eight graduates for whom there are records beyond the twenty-eighth birthday may be divided at their median into a high and a low scoring group. Chi-square comparison of the distributions of ages at last (reproductively significant) record for these two groups indicates that they may be regarded as samples of the same population ($P = .7$), and that therefore neither will be greatly penalized in this respect by a direct comparison. Such a comparison gives .84 children per man for the high group and .61 for the low, a ratio of about 1.4; these figures, of course, are minima.

A more satisfactory evaluation may be made by considering only those men whose last reports fell subsequent to a given birthday; these may be divided at the median as before, and for each of the two subgroups the number of children per man born before the specified birthday may be computed. Such figures are still minima, but the "temporal opportunity" to have children has been accurately equated as between the two subgroups compared at each birthday. Comparisons of this sort made for the birthdays for which significant data are available (29–34) yield High/Low ratios of 1.5 to 2.1, derived from per-man reproductivities of .42 to 1.00 for the high group and .20 to .54 for the low. The N's run from 139 to 49 for the undivided groups (*i.e.*, half as large for the high and low groups).

Various measures of reproductive efficiency, however, show insignificant differences between high and low scorers. Thus the 52 high-scoring married men have produced .19 children per man per married year and the 54 low-scoring ones .20. The intervals between marriage and first birth are very close to two years for those subgroups (35 and 37 in number) of high and low scorers who have had children. The numbers of children born in a given age period per man married at the beginning of the same period are even slightly higher for the lower groups (*e.g.*, 1.17 and 1.25 for children born between 29 and 34 per man married by 29). Finally, the numbers of children born after a given birthday to high and low groups are not greatly different; the high group has a slight advantage for the earlier birthdays and the low for the later ones.

Further analysis shows that the effective differential is in fact entirely in the marriage rate and not in the reproductive efficiency. Thus for the 139 men last known at 29 or above (who are typical), we have the following cumulative percentages:

	Married by							Unmarried by
	23	24	25	26	27	28	29	29
High	9	15	26	31	48	57	60	40
Low	4	10	12	22	27	37	48	52

By means of an arbitrary set of assumptions we may guess at the final reproductivities of the groups. For this purpose we assume that a married man for whom three years have elapsed since his marriage or the birth of his last child, or an unmarried man over 32, will have no more children, while all others will have one more each. The application of these assumptions equally to the two groups raises the per-man reproductivity of the high scorers from .84 to 1.55 and that for the low scorers from .61 to 1.26, but depresses the High/Low ratio from 1.39 to 1.23. Taking into account that the number of persons to be reproduced is slightly more than double the number of subjects, and that even in this privileged group some children

do not survive to reproduce, it is clear that the assumptions made would have to be deficient to an improbable degree to make survival probable, since for such a result the reproductivity figure may be placed at about 2.1 or 2.2. That is, the group as a whole would have to produce, to survive, about 1.5 times as many children after the age of 32 as it has produced before that age, or in all about half as many again as it seems likely to produce on the basis of reasonable assumptions.

Thus the investigation, in spite of imperfect data, has provided us with a fairly unambiguous conclusion: High-scoring college men produce substantially more offspring than low-scoring college men, and they are able to do this solely because they marry earlier and more frequently. One may speculate that they marry earlier because their superior intelligence enables them to establish themselves economically earlier—although it seems remarkable that differences as small as those between high and low scoring college men, and in a trait with such limited correlations with practical abilities, should be as effective as this. But in any case it makes little difference, for less than 40 per cent. of even the higher group can expect to be fully represented in the next generation.

RAYMOND R. WILLOUGHBY
BROWN UNIVERSITY

THE NON-TOXICITY OF GOSSYPOL TO CERTAIN INSECTS

THE 6,000,000 to 8,000,000 tons of cottonseed produced annually in this country represent a potential source of 40,000 to 80,000 tons of gossypol. Anticipating the ultimate availability of this interesting compound as an industrial raw material, various experimental approaches to determine its possible uses have been made. The chemical and physical properties of gossypol have recently been reviewed by Adams and co-workers.[1] Its anti-oxygenic action, as demonstrated in fats and oils,[2,3] indicated several possibilities which are being investigated. Its toxicity to mammals and birds[4] suggested that gossypol might be useful as an insecticide. Some negative results are published here for the information of those who might also have been interested in this possibility.

The standard laboratory technique for assaying insecticides was employed. Wooly aphids were sprayed with emulsions containing gossypol and dianiline gossypol in concentrations of 1 to 500. The compounds were dissolved in a small amount of dioxane, then diluted with an aqueous solution of a potassium soap (1:2000). At the end of 24 hours the aphids were as active as were the negative controls. Much lower concentrations of known insecticidal compounds showed 100 per cent. mortality.

Lima bean leaves were sprayed with emulsions containing gossypol and dianiline gossypol (1 to 1000), allowed to dry, and offered separately to groups of Mexican bean beetles. After 24 hours, the leaves were as skeletonized as those which had been sprayed only with the wetting agent, and the beetles were unharmed. Leaves which had been sprayed with dilute solutions of rotenone were unattacked.

These results indicate that, at least to the insects tried, gossypol and dianiline gossypol are ineffective either as contact or stomach poisons.[5]

E. P. BREAKEY
H. S. OLCOTT
Cotton Research Foundation
MELLON INSTITUTE OF INDUSTRIAL RESEARCH

THE COMMON BLUE CRAB IN FRESH WATERS

HAY[1] has given several records of the occurrence of the blue crab, *Callinectes sapidus* Rathbun, in inland coastal waters. Nevertheless, there seems to be a rather general opinion that this crab does not migrate completely beyond the influence of the sea. Brues,[2] in recording the related *Callinectes ornatus* Ordway from fresh water in Cuba, states that he has found no record of any *Callinectes* away from salt water.

On August 4, 1937, a male blue crab was caught in a sunken bucket near the floating dock of the Simmesport Fish Company in the Atchafalaya River at Simmesport, La. It was not adult, measuring 4.5 inches across the carapace. Simmesport, near the origin of the Atchafalaya, is over 160 miles from the Gulf of Mexico as the river runs. Commercial fishermen commonly take crabs there during the summer, and this is an indubitable record of the crustacean in fresh water, beyond the influence of the sea.

Rathbun[3] records this crab from the Hudson River at West Point; the Coloosahatchie River, Fla.; Rio Cobre, Jamaica, and gives other records which might

[1] K. N. Campbell, R. C. Morris and R. Adams, *Jour. Am. Chem. Soc.*, 59: 1723, 1937.
[2] H. A. Mattill, *Jour. Biol. Chem.*, 90: 141, 1931.
[3] H. D. Royce and F. A. Lindsay, Jr., *Ind. Eng. Chem.*, 25: 1047, 1933.
[4] W. A. Withers and F. E. Carruth, *Jour. Agr. Res.*, 14: 425, 1918, and many others.

[5] After these experiments had been completed, we learned from Dr. E. P. Clark, of the Division of Insecticide Investigation, U. S. Dept. of Agriculture, Washington, that he had also obtained negative results in assays of gossypol for insecticidal activity. Moreover, one of us (H. S. O.) has shown that neither gossypol nor any one of several simple derivatives possesses germicidal activity toward *B. typhosis*.

[1] *Rep. Bur. Fish.*, 1904: 397–413, 1905.
[2] *Amer. Nat.*, 61: 566–569, 1927.
[3] *U. S. Nat. Mus. Bull.*, 152: 1–609, 1930.