account of their mathematical ideas whose fruitfulness was developed by their successors. At first this term had a very simple meaning, representing merely a set of distinct permutations which have the property that they include the product of every two of them and the square of every one. Surely this is not a difficult concept for the human race to acquire explicitly as late as the first half of the nineteenth century.

The difficulty among mathematicians began to exhibit itself when, about fifty years after this technical term was introduced, efforts were made to define it abstractly and to base an abstract theory on it. This theory became elegant and useful, but it created a kind of strait-jacket which seemed to interfere with the freedom of action which many mathematicians enjoy, and it naturally curbed productivity even if it did not create a barrier thereto. A central idea of this abstract theory is that the associative law must be obeyed when the elements of a group are combined. In neither of two recent large general dictionaries of the English language, *viz.*, Webster's "New International Dictionary" (1938) and the "New Standard Dictionary" (1938) is the associative law made a definite part of the definition of the mathematical term group, notwithstanding the fact that one could not construct by means of the definitions which they give an extensive and useful abstract theory of groups.

In a recent book entitled "Premières leçons sur la théorie générale des groupes" (1935) G. Bouligand asserted (page 5) that with each mathematical proposition there is associated hereafter a group composed of all the modifications leading from one case of exactitude to a new case of exactitude. This is perhaps the vaguest and most objectionable definition of the term group that has ever appeared in a text-book and exhibits how far this particular mathematical term has wandered during a century from its first simple definition. With various other sciences mathematics is creating a kind of Tower of Babel with too few common terms besides the Ph.D. degree. It should be emphasized that the multisensual terms are even more confusing than the multitude of terms since the former frequently make it necessary to select from an ever growing list of concepts which may vary widely, while dictionaries are more apt to clarify the latter.

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HOLLY DEFOLIATION PREVENTED BY a-NAPHTHALENEACETIC ACID[1]

a-NAPHTHALENEACETIC acid has received considerable attention since Gardner, Marth and Batjer[2] reported its value in preventing fruit drop in apples. Another use for this chemical that promises to be of value to holly growers has been found at the Oregon State Experiment Station. The defoliation of holly sprays and wreaths during shipment at Christmas time often results in large losses. Spraying or dipping holly in a-naphthaleneacetic acid previous to shipment offers a method to prevent this loss.

Previous work at the Oregon Experiment Station has shown that holly is defoliated either by the presence of ethylene gas or high humidity. In the present experiments the holly was subjected to both ethylene gas and high humidity, but some of the lots were previously sprayed with solutions of a-naphthaleneacetic acid, and others were sprayed with water. Branches of holly (*Ilex aquifolium*) were sprayed and then placed in jars with apples as the source of ethylene gas. Free water was present on the sides and bottom of the jars. In 48 hours the holly sprayed with water alone was completely defoliated. The leaves began to drop from holly sprayed with .001 per cent. of a-naphthaleneacetic acid in 48 hours, but defoliation was not completed for 144 hours. The holly treated with .005 per cent. did not begin to defoliate until after eight days, and complete defoliation occurred in ten days. The leaves were firmly attached on the holly sprayed with .01 per cent. a-naphthaleneacetic acid after fourteen days. Later this lot of holly turned black and decayed without shedding its leaves. The severity of this test is evidenced by the complete defoliation of the untreated lot of holly in 48 hours. Other sprayed and unsprayed lots of holly were packed in wet paper, and these were held at 75–85 degrees for one week. Defoliation had occurred on all unsprayed lots of holly, but those sprayed with .01 per cent. a-naphthaleneacetic acid had all their leaves firmly attached at the end of the experiment.

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ONCOMING REVERSAL OF THE HUMAN GROWTH TIDE

RECENT completion of a study of height, weight and menarchial records for over 65,000 freshmen, matriculating in four state universities in recent years, has shown that the reversal in the human growth tide hinted at in 1938[1] is now becoming more definite. The mean age for onset of the menses, which for many years had been coming progressively earlier with successive birth

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[1] Published as Technical Paper No. 355 with the approval of the Director, Oregon Agricultural Experiment Station. Contribution of the Departments of Botany and Horticulture.

[2] SCIENCE, n. s., 90: 2331, 208–209, 1939.

[1] C. A. Mills and L. B. Chenoweth, *Human Biol.*, 10: 547–554, 1938.

years of freshman girls, has now reversed its trend. At the Women's College of the University of North Carolina, freshman girls born since 1918 have shown a later mean menarchial age for each successive birth year (1939–40 entering class not included). At the University of Kansas and at Cincinnati the reversal came with those born in 1920, while at the University of Wisconsin it was shown by those born in 1922 and by the whole entering class of 1939–40. While the actual changes in menarchial age are still small and not mathematically significant, the coincidental reversal in trend in all the states studied, after a number of years of steady progress toward earlier menarche, lends emphasis to the likelihood that a real biologic change is taking place.

The upward trend in student stature, so commonly remarked about and attributed to a better dietary, also shows evidence of reversal in the more southerly states. The accompanying figure indicates the height-weight

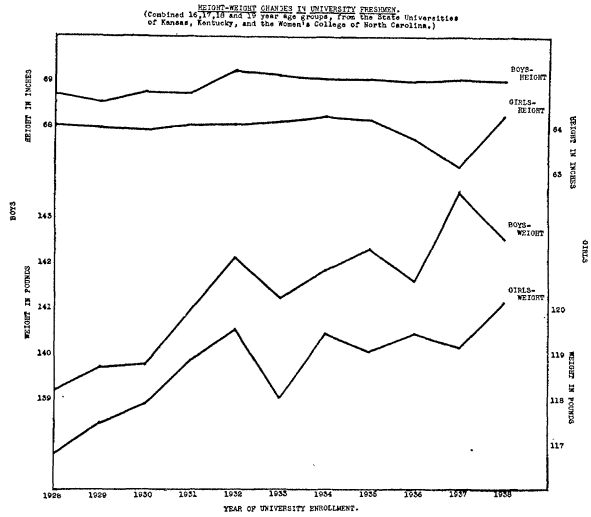

FIG. 1

changes that have taken place among freshmen entering the state universities of Kansas, Kentucky and North Carolina (Women's College only). A steadily progressive, although slight, decline in male height has occurred since the entering classes of 1932. Height of the girls showed a decline from the entering class of 1934 to that of 1937, with a sharp recovery in the 1938 entering classes. Farther north, at the University of Wisconsin, gain in freshman stature is still progressing. Wisconsin freshmen are about 4 pounds heavier and the boys 1.0 inch taller (the girls only 0.1 inch) than are freshmen in states of lower latitudes.

Improvement in both height and weight with succeeding classes has been limited largely to gains in the younger age groups of each class, with stature stabilization in the older freshmen of recent years. It appears, therefore, that adult stature may well actually be receding at lower latitudes in the United States, while more rapid growth through childhood and adolescence continues to bring young people to adult stature at ever earlier ages. Even back among students in the early years of high school, this annual stature improvement at a given age is clearly evident. Signs of stabilization have appeared here also in age groups from 13 years upward, while marked annual gains still occur in the stature of any younger age group.

Since we have already shown a clear-cut relationship between the growth and onset of sexual activity in animals and their environmental temperature level or ease of body heat loss,[2] it is suspected that cessation or reversal in the human growth tide may be due to the almost continuous unseasonable warmth that has prevailed generally over the earth since 1929, except for a few very brief periods of subnormal temperatures. Both height and weight of Cincinnati high-school students of given age groups showed distinct regression from previously prevailing levels following the very severe heat of 1934.

Certainly this cessation or reversal in the growth tide can not be related to any increasing dietary inadequacy here in America among families sending children to college. The dietary of this class of people in America has probably never been better than it is to-day, especially in the wide availability of fresh fruits and vegetables at all seasons of the year. If human development *is* affected by changes in prevailing temperature level (as that of laboratory animals has been shown to be) then we may well be deeply concerned with the prospects of long-term climatic changes. The marked physical recession of mankind during the Dark Ages occurred during centuries of world warmth, while the recent racial growth expansion has come with generally lower temperatures. Earth temperatures have been trending upward again now for over eight decades, but perhaps reaching the critical level necessary to produce growth depression only with the markedly abnormal warmth that has prevailed since 1929.

From the standpoint of general racial biology, it would seem important that astronomers and climatologists direct more systematic and intensive investigations into the causative background of world weather and longer-term changes in temperature level. Weather has ceased to be merely a subject for conversational pleasantry. It is rapidly coming to be appreciated as one of the really major forces dominating man's existence.

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[2] C. A. Mills, "*Medical Climatology*," Springfield: Charles C Thomas, 1939.