sentatives of type B. If these cross at random one obtains, by applying the symbolism of the binomial theorem, the following composition of the filial generation:

$$\frac{(m\,AA+n\,BB)^2}{(m+n)^2}=\frac{m^2}{(m+n)^2}\,AA+\frac{2\,m\,n}{(m+n)^2}\,AB+\frac{n^2}{(m+n)^2}\,BB$$

or if $m+n=1$

$$m^2\,AA+2\,m\,n\,AB+n^2\,BB.$$

If now the male and female members of the first generation are crossed at random among themselves one obtains the following frequencies of the various cross combinations:

$m^2\cdot m^2\cdot(AA\times AA)=m^4\,AA$
$4m^2\,m\,n\,(AA\times AB)=2\,m^3n\,AA+2\,m^3n\,AB$
$2m^2n^2\,(AA\times BB)=2\,m^2n^2\,AB$
$4\,(mn)^2\,(AB\times AB)=m^2n^2\,AA+2\,m^2n^2\,AB+m^2n^2\,BB$
$4m\,n\,n^2\,(AB\times BB)=2\,m\,n^3\,AB+2\,m\,n^3\,BB$
$n^2n^2\,(BB\times BB)=n^4\,BB$

or the relative frequencies

$$AA:m^2\,(m+n)^2$$
$$AB:2m\,(m+n)^2n$$
$$BB:(m+n)^2n^2$$

and the composition of the second filial generation is again

$$m^2\,AA+2\,m\,n\,AB+n^2\,BB.$$

Thus we obtain under the influence of panmixis in each generation the same proportion of pure and hybrid types. . . .

While Weinberg's paper, like Mendel's, appeared in an obscure journal, its failure to be recognized can not be ascribed to this fact alone. His later contributions dealing with extensions of the statistical treatment of the genetics of populations are found in the "regular" journals. These papers have received some attention (*e.g.*, Sewall Wright, 1930) and in them Weinberg refers to his 1908 pioneer work. However, both Weinberg and Hardy were ahead of contemporary thought and similar problems were not generally considered for at least eight years. At that time perhaps Hardy's name and the prominent place of his publication both helped to leave Weinberg's contribution neglected.

Hardy as a mathematician did not follow up his discovery by any further consideration of its genetic implications. Weinberg in 1909 reformulated his theorem in terms valid for multiple alleles—at a time when no case of multiple alleles had been discovered in man nor in plants and even Cuénot's demonstration of multiple alleles in the mouse had remained unnoticed. He also for the first time investigated polyhybrid populations and recognized their essentially different method of attaining equilibrium. Considering these facts it seems a matter of justice to attach the names of both the discoverers to the population formula.

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## THE SHOT-PUT AND THE EARTH'S ROTATION

IN SCIENCE for August 28, 1942, Joseph O. Thompson cites with skepticism a recently published statement[1] to the effect that the earth's rotation enables an athlete to put the 16-pound shot farther toward the east than toward the west. As a matter of fact there was nothing new about the statement. Artillerists in all the world's armies have been aware of the very definite effect of terrestrial rotation upon the ranges of projectiles for generations and have corrected the aim of long-range guns accordingly as a matter of regular routine.

The effects upon the ranges of athletic projectiles are not large but they are definitely larger than the precision of measurement which is implied when a hammer throw is recorded in the record book as, for example, 176 ft. 11⅛ in. or a shot-put as 52 ft. 6 3/16 in. These effects have nothing to do with the drag of the air and are in addition to any consequences deriving from the fact that gravity itself depends partly upon the centrifugal forces of our rotational motion. They are due rather to the fact that the gravitational pull upon the projectile is applied in a constantly changing direction as the earth turns, and to the further fact that the landing surface does not await the arrival of the projectile in the same relative position as it occupied when the firing occurred, but instead drops away from the projectile to the eastward or rises to meet it from the west, thus either extending or curtailing the measured range. Nonmathematical explanations are, of course, incomplete.

A few years ago the writer of this note published an article[2] upon this and other inaccuracies in the metrology of sport, inaccuracies which have, beyond the slightest doubt, imposed definite and calculable handicaps upon some competitors while favoring others. Reprints of this article were sent to all the several hundred committeemen of the Amateur Athletic Union of the United States in the faint hope that improvements in the handling of the data of field sports might result. One committeeman acknowledged receipt of the reprint but there has been nothing to indicate that any of them read it.

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## THE WATER HYACINTH IN CALIFORNIA

THE water hyacinth, *Eichornia crassipes* (Mart.) Solms, which became a serious hindrance to navigation in the streams of Florida, has been known from a few isolated localities in California for a good many years. In 1922 Jepson[1] reported it as occurring at

[1] *Collier's*, July 4, 1942, page 6.
[2] *Scientific American*, April, 1937.
[1] W. L. Jepson, *A Flora of California*, 1: pt. 6, 247, 1922.

"Warm Creek reservoir, San Bernardino, beginning to extend down stream, *Parish* 11,648; sloughs and ponds east of Fresno in the foothills acc. *Eugene Heath;* Clarksburg, Yolo Co., *Eleanor W. Smith.*" The following year Abrams[2] reported it from the same localities and no others. In 1935 the plant apparently was still confined to the San Bernardino station in the southern California area, for Munz[3] cited it from that locality only.

In 1936 the writer observed the plant in the sloughs east of Fresno, and at that time a good many plants were floating down stream. The more sluggish pools and back water areas were almost completely covered by the water hyacinth. However, an examination of the San Joaquin River just a few miles away, into which the sloughs eventually drain when their flow is not entirely diverted for irrigation, revealed no plants in that part of the river. Nor was it found at any of several points observed between Fresno and San Francisco Bay, into which the San Joaquin River flows. The absence of the water hyacinth from the main stream may have been due to the small amount of water escaping diversion into irrigation ditches between the location of the infestation and the San Joaquin River.

Late this summer (September, 1942) water hyacinth was observed in considerable quantities in the western-most channel of the San Joaquin River a few miles west of Stockton, where California State Highway No. 4 crosses the channel called Old River. This is in the delta region of the San Joaquin and over one hundred miles, as the stream flows, down stream from the Fresno region. Here at Old River floating plants forming rafts ten to fifteen feet wide and several times as long were lodged in eddies and in stretches of back water along both banks of the channel. Far greater numbers of the plant must have been swept down stream into San Francisco Bay, for the influence of the tides is operative in this part of Old River and the current flows at a rate of three or four miles per hour when the tide ebbs. This must mean that a tremendous increase in the growth of the water hyacinth has occurred within a comparatively short time, for none of this plant was observed in the Old River Channel on several occasions when fishing or collecting specimens along the banks during the past five or six years.

It is possible that the appearance of *Eichornia crassipes* in the delta region of the San Joaquin River is of no great importance, for it may be that the heavy flow of water during the winter and spring freshets will dislodge enough of the plants to keep them below the level of reproduction at which they might become a serious nuisance to navigation. But knowing the history of the water hyacinth in Florida and the way in which various introduced pests have acted in California in the past, the writer believes that this potentially bothersome water plant should be watched carefully. There is no proof that it might not, under the conditions of comparatively mild winters, increase until the sloughs and more sluggish channels become seriously fouled. Such fouling would constitute a serious detriment to water-borne transportation in the delta region and should be prevented if possible. The cost of exterminating the plant in the San Joaquin drainage system at the present time would be slight as compared with that of eradicating it if it once becomes a serious menace to navigation by small boats and barges.

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[2] L. R. Abrams, *An Illustrated Flora of the Pacific States,* 1: 349, 1923.
[3] P. A. Munz, *Manual of Southern California Botany,* 78, 1935.

## SCIENCE, WAR AND FOOTBALL

THE annual meetings of the American Association for the Advancement of Science have been called off by order of the Office of Defense Transportation. Other scientific meetings, namely, the Federated Biological Societies, the Western Society of Naturalists and the American Physiological Society, are being cancelled all over the country. The scientists are willing to do this if their absence off the roads is necessary to save transportation so vital for war needs.

And yet I read with astonishment that the annual Rose Bowl and the Sugar Bowl football games were being held just the same in Pasadena and in New Orleans. The Rose Bowl alone has an attendance of over 90,000 as compared with that of the American Association, which usually is around three to four thousand. The Rose Bowl game was with Georgia, which means undoubtedly that many of that state attended, besides the local spectators and those from other parts of the nation. In other words, they utilized the transportation facilities which the scientists gave up so that the army could use the roads, so that the vital rubber supply would be saved, so that the war effort could be materially helped.

It would be interesting to know (1) whether the ODT requested these football people to cancel their game; (2) if these requests were made, whether the controlling interests refused the request; (3) if the request was not made, why not?

Have the controlling interests come to feel that football games are more vital to the country's defense than scientific meetings, where exchange of ideas occurs? These facts are indeed a sorry commentary on the relative importance of the two types of meetings.

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