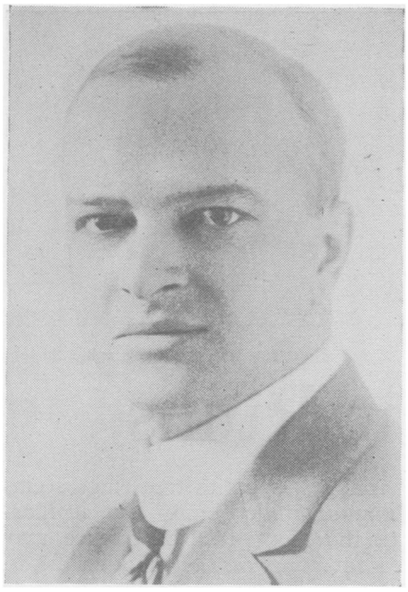


Dr. H. H. Laughlin

Science Follows the Ponies To Discover Future Of Human Race

Genetics

By Helen M. Davis

IN a quiet cove of the Long Island countryside, a group of scientists are following the races. Neither bookmakers nor horses are to be seen there, but form books are there in abundance, and no unlucky amateur better pores over the results of the races with more absorbed interest than do these scholarly men.

More surely than the highest price race tip service, more expertly than the best-informed follower of the "king of sports," these scientists have the "dope." But no leased wires run to the track side, no predictions are merchandised, not a cent is made—or wagered—in bets.

To predict the future of the human race is the goal of the scientists, not the outcome of tomorrow's races. And for guidance in this endeavor, Dr. H. H. Laughlin and his associates have turned to horses, not human beings. For, thanks to racing and the careful breeding of race horses for decades, much more is known about the heredity of horses than of any other living thing on earth.

The aim in life of a race horse is simple, but the number of factors which go to make a horse a success in his chosen occupation may be nearly as great as in the case of a man. The Eugenics Record Office, where Dr. Laughlin and his corps of statisticians work over the horses' records, wants to know what these factors are and by what laws they are inherited. The same laws will throw light on many puzzles of human life—why some win the race and some lose—why some need a special handicap and some are mud-larks, thriving on adversity. In the case of human beings, the most impartial judge cannot evaluate his fellowman's achievements and failures. But in the case of the horse, all are agreed as to just what the race consists of, and the factors can be measured in the numerical form of pounds, seconds and furlongs.

Dr. Laughlin began in 1923 to study the following program: Have the best stallions been consistently bred with the best mares, or have fashion and reputation played an undue part? Has the type of inbreeding practiced been a definite factor in speed production? What influence has the age of the sire, the age of the dam, the order of birth, and the interval between births played in speed production? Can a near-kin index for speed be worked out, by which the probable speed of an animal may be predicted from the records of his relatives?

Files have been compiled on generations of race horses which show up soundness, speed and endurance, and their opposites, inherited in all their combinations. The English thoroughbred horse and its descendants and relatives in Kentucky have furnished the answer to the questions the scientists asked, with the result that breeders thoroughly acquainted with the family records can count on a definite grade of performance from a hypothetical offspring of a given sire and dam.

Of course, practical horsemen have long claimed to be able to do this, but it is one thing to make a claim based on an unanalyzed mixture of hunch, analogy and affection, and suffer frequent disappointments, and quite another to work out by mathematical equations that a certain unborn colt, on a definite type of track, should run so many furlongs in so many seconds, and find that, when he grows up, such is indeed the average speed at which he runs. Such results light the fires of enthusiasm in the eyes of these research workers. They are more thrilling than winning any number of derbies.

A series of formulas have been worked out which give the Biological Handicap of each horse. The Q. P. or quality of performance for a given race by a given individual regardless of age, sex or condition, is a valuable measure. The Futurity Index and its relation to the Near-Kin Index and the Breeding Index give the key to the new generation of racers. The distance-going ability, the weight-carrying ability, the ability in relation to age, the mud-running ability and the energy consumed in relation to speed are being studied.

The results of these studies are being plotted in illuminating curves, requiring four dimensions to portray completely the chief factors of the race—distance run, weight carried, age of the horse and speed at which he runs. And the scientists are quietly laughing in their sleeves at some of the pet notions of the professional handicappers. They have information on which they might go out and beat the races—only they get so much more kick out of the work they are doing.

Professional horse-breeders are naturally interested in the problem of breeding better and faster race-horses, regardless of the general biological

problems involved, and the cooperation of Walter J. Salmon has made possible this program of research with the double goal of improving the American race horse and extending our knowledge of the laws of heredity.

The alliance between the horse-breeder and the research scientist is closer and of longer standing than the casual follower of the ponies might think. Stanford University this year celebrated the semi-centennial of a program of research inaugurated by its founder which has had wider results than were expected at the time. Fifty years ago, the picturesque sportsman and philanthropist, Senator Leland Stanford, in his California home was encouraging a bewhiskered individual who rejoiced in the name of Eadweard Muybridge. At Mr. Stanford's suggestion, Mr. Muybridge was trying to use photography, a discouragingly messy process then with its wet collodion plates, to settle the moot question as to the horse's best gait.

The result of these photographic researches was one of the early forms of the thing which finally evolved into the "movies." A fairly large number of people in the '70's and '80's were tinkering with the idea that if pictures of objects in motion were shown in rapid succession the objects in the picture would appear to take on life. Henry R. Heyl, in 1870, had shown such an effect—the earliest record of a motion picture exhibition which has been brought forward at this writing. Muybridge took his pictures of horses in motion in 1872. Later he combined these pictures with a projection device, and proved to the world that horses do not gallop in the way artists had imagined they did.

Of course, none of these early devices had much in common with the moving pictures of today. Photographic methods at that time were much too crude to suggest the possibilities of today's compact apparatus. And it is doubtful whether Muybridge would have been interested in scenarios and soft-focus effects with blonde curls. He wanted action, and if his "Zoopraxiscope" has a descendant today it must be the slow-motion picture.

Muybridge in his "Descriptive Zoopraxography or the Science of Animal Locomotion" twenty years later described his entry into the field of horse photography. "In the year 1872, while the Author was engaged in his official duties as Photographer of the United States Government for the Pacific coast, there arose in the city of San Francisco one of those controversies upon Animal Locomotion, which has engaged the attention of mankind from the dawn of symbolical design, to the present era of reformation in the artistic expression of animal movements.

"The subject of this particular dispute was the possibility of a horse having all of his feet free of contact with the ground at the same instant, while trotting, even at a high rate of speed, and the disputants were Mr. Frederick MacCrellish and the Hon. Leland Stanford.

"The attention of the Author was directed to this controversy and he immediately sought the means for its settlement.

"At this time the rapid dry plate had not yet been evolved from the laboratory of the chemist, and the problem before him was to develop a sufficiently intense and contrasted image upon a wet collodion plate, after an exposure of so brief a duration that a horse's foot moving with a velocity of more than a hundred lineal feet in a second of time, should be photographed practically 'sharp.'

"A few days' experimenting and about a dozen negatives, with a celebrated fast trotter—'Occident'—as a model, while trotting at the rate of a mile in two minutes and sixteen seconds, laterally in front of the camera, decided the argument for once and for all time in favor of those disputants who held the opinion that a horse while trotting was for a portion of his stride entirely free from contact with the ground. With a knowledge of the fact that some horses while trotting will make a stride of twenty feet or more in length, it is difficult to understand why there should ever have been any difference of opinion on the subject.

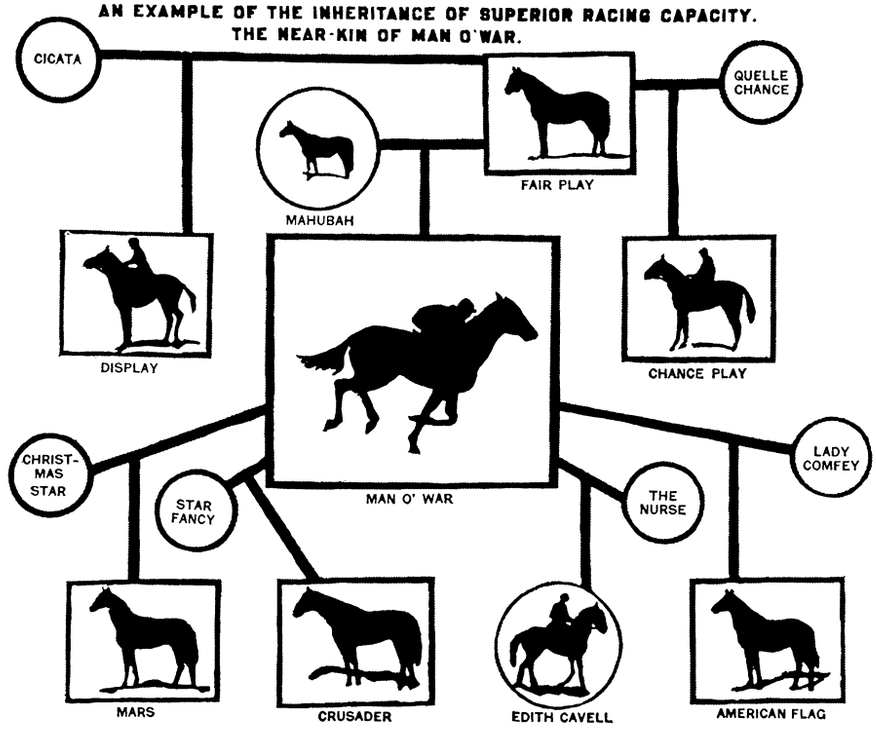
"Thus far the photographs had been made with a single camera, requiring a separate trotting for each exposure. The horse being of a dark color and the background white, the pictures were little better than silhouettes, and it was difficult to distinguish, except by inference, the right feet from the left.

"Several phases of as many different movements had been photographed, which the Author endeavored with little success to arrange in consecutive order for the construction of a complete stride.

"It then occurred to him that if a number of cameras were placed in a line, and exposures effected successively in each, with regulated intervals of time or of distance, an analysis of one single step or stride could be obtained which would be of value both to the Scientist and the Artist.

"The practical application of this system of photographing required considerable time for its development, and much experimenting with chemicals and apparatus."

The final form of this apparatus had a battery of 24 cameras side by side, the exposures being made by a curious device (*Turn to page* 374)



Science Follows the Ponies—*Continued*

which Muybridge called the "electro-photographic exposor." In this an endless belt was suspended in front of the lens. The belt was of rubber cloth, wide enough to cover the lens, and having two holes which would pass each other as the belt was turned. The rate at which they would pass was determined by the number of rubber bands attached to pull the belt when the mechanism holding it was tripped. The tripping was accomplished by an electro-magnetic device actuated by a thread which the horse broke as he walked, trotted or ran along the course prepared for him. Like modern movie producers, Muybridge built sets for staging his drama of motion.

With Stanford's horses "on location" in Sacramento and in their Palo Alto home, Muybridge photographed them as they went through their various gaits—a bewildering number of "methods of locomotion" to a generation less familiar with horses. There was the walk, "a method of progressive motion with a regular individual succession of limb movements . . . its execution is regulated by the law that the movement of the *superior* limb precedes the movement of its lateral *inferior* limb." During the walk the horse has always two, sometimes three feet on the ground at one time. Then there was the "amble," sometimes known as the "fox trot." In this "the support of the body devolves alternately upon a single foot and upon two feet; the single foot being alternately a hind foot and a fore foot, and the two feet being alternately laterals and diagonals. At no time is the body entirely unsupported."

The trot, the source of the controversy which started Muybridge's researches, is described as "a more or less rapid progressive motion in which the diagonal limbs act nearly simultaneously in being alternately lifted from and placed on the ground, and in which the body of the animal is entirely unsupported twice during each stride."

In the rack "two lateral feet with nearly synchronous action are placed upon and lifted from the ground alternately with the other laterals, the body of the animal being in the intervals entirely without support." It is declared "an ungraceful gait of the horse, and disagreeable to those who seek comfort in riding."

Then follow descriptions of a different set of motions, the canter, the gallop and the leap. It is in representing these rapid actions that artists had gone so wide of the mark, showing the horse with legs outstretched and completely off the ground, while the photographs showed that "the only phase in which he has been discovered without support is one when the legs are flexed under the body.

Having analyzed the motion of animals, Muybridge next devised an instrument which would combine the pictures into the illusion of reality. He discovered that this depended on an optical law "which in the construction of a zoopraxiscope requires that the number of illustrations must bear a certain relationship to the number of perforations through which they are viewed.

"The popular number of thirteen having been selected for the latter, the same number of figures illustrate actions without lateral progressive motion.

"When the number of illustrated phases is less than the number of perforations, the succesSon of phases is in the direction of the motion, and the disc is necessarily revolved in a reverse direction.

"When the number of phases is greater than the number of perforations, the phases succeed each other in a direction contrary to that of the motion, and the disc is revolved in the direction of the motion. An increased or diminished number of figures will respectively result in an increased or diminished apparent speed of the object."

The Zoopraxiscope, like all the early forms of moving picture projectors, was absolutely limited in the number of pictures it could show, and consequently doomed its shadow actors to monotonous repetition of one series of acts. But movie audiences were not so sophisticated then as now. The press of the world rang with praise.

At a gala performance at the Royal Institution, attended by the Royal family and by Huxley, Gladstone, Tyndall and Tennyson, the *Illustrated London News* reported: "Mr. Muybridge exhibited a large number of photographs of horses galloping, leaping, etc. By the aid of an astonishing apparatus caled a Zoopraxiscope, which may be briefly described as a magic lantern run mad (with method in the madness), the animals walked, cantered, ambled, galloped and leaped over hurdles in a perfectly natural and lifelike manner."

And so the horse, though becoming more and more "a vain thing for safety," has played the leading part in at least two important programs of scientific research. The interest in variety of gaits, which seemed so important a half-century ago, has narrowed to an interest chiefly in speed today. The horse has been so far supplanted by the automobile as a means of "locomotion" that "horse transportation" trucks are no more incongruous than busses on our highways. The horses that ride in them are creatures of luxury with truly regal pedigrees, and a research institution becomes their college of heraldry as Science, the Monarch of Intellect, goes in for the Sport of Kings.

Science News-Letter, December 14, 1929

Asteroids—*Cont'd*

of the solar system, although apparently simple, would not have been the true theory. Every new discovery shows the solar system to be more complex than we had supposed; and unless we prefer error (provided it has a show of simplicity) to truth, when it appears to our view complex, we shall value every new discovery in the solar system, because it promises to conduct us nearer to the true theory of the universe. Every new asteroid which is discovered is a new fact to be explained. The true philosopher, instead of regarding the rapidly increasing number of asteroids with indifference, will watch each new discovery with growing interest, in the hope that it may furnish the key to the true theory of the solar system.

Science News-Letter, December 14, 1929