SCIENCE NEWS

Science Service, Washington, D. C.

STRENGTH OF ATHLETES

"STRONG as a horse," spoken admiringly of a mighty athlete, is not so great an exaggeration as it sounds. Exact studies of the physical exertion put forth by the members of the famous Yale crew of 1924 by Drs. Yandell Henderson and Howard W. Haggard, of the department of applied physiology at Yale, show that each man developed, during the period of a race, about one-half horsepower.

Determinations of energy expended were obtained in various ways. The men were exercised individually on rowing-machines with power meters attached; the ratio of the amount of oxygen taken in to the amount of carbon dioxid given off in breathing was determined: the racing shell they used was towed by a power boat with a spring balance set into the towline.

"The data from these three methods were in general in fair agreement," says Dr. Henderson. "They indicate that the maximal power exerted is from .45 to .55 horsepower per man, or expressed in the heat equivalents, 4.8 to 5.9 calories per minute, with a total energy expenditure of 19 to 29 calories per minute, or 13 to 20 times the basal rate."

It was noted that these athletes did not puff and blow noticeably, however great their exertion; this is in marked contrast with the distress of untrained or half-trained men. The amount of oxygen they took in through their lungs reached about the limit of the carrying power of heart and blood; yet it was not sufficient to replace the amount burned up during the race. As Dr. Henderson expresses it, "He draws heavily on his credit and incurs oxygen deficits; these deficits are repaid by the high rate of oxygen absorption for a time after the work is ended."

THE TYPHOID EPIDEMIC

AN epidemic of typhoid fever, novel because its exact source is unknown, is spreading over the country and has reached rather serious proportions in Chicago, New York, Pittsburgh and Washington.

The cases are confined principally to the homes of the wealthy and to persons over fifteen years of age. "These facts alone relieve milk and water supplies of any suspicion of taint," said Dr. W. F. Draper, assistant surgeon general of the U. S. Public Health Service. Lettuce, under suspicion by the health officers in Pittsburgh, has also been given a clean bill of health.

Public suspicion points to oysters as the cause, and in the popular mind a clear case of circumstantial evidence has been built up against them. Due to fear of oysters and other shellfish the oyster growers have suffered financially, as their sales have fallen off to half. There is a possibility that the source of infection may be traced to "bootleg" oysters which have been stolen from polluted and condemned beds and sold in open market. In Chicago a twenty-five dollar fine has been announced as the penalty for eating raw oysters, and they are under ban in the states of New York and Pennsylvania.

Typhoid fever is nearly four times as prevalent now as in normal times according to the latest U. S. Public Health Service data. One hundred and five cities reported 197 cases of typhoid fever for the last week in December, 1924, as against 54 for the same week in 1923. Under ordinary circumstances, these cities may be expected to develop on an average 52 cases during that particular period.

The U. S. Public Health Service is making a survey under the direction of Dr. L. L. Lumsden, of every person in the badly infected areas who has typhoid in an attempt to find out the source of the infection. As soon as the data has been completed the results will be announced so that doctors and laymen may guard against the outbreak.

ULTRA-VIOLET LIGHT AND VITAL PROCESSES[1]

MANY of the papers read before the Washington meeting of the American Association for the Advancement of Science were devoted to showing how rays of a certain sort affect vital processes. We have learned that vitamins are good for us. Now we are told that sunshine is good for vitamins. Not the whole of the sunshine but mostly the part that consists of waves too short to be seen. We can understand better what the physicist means by such talks since we have been playing with radio. Our receivers are arranged for a certain range of wave lengths, say from two hundred to six hundred meters. But we all know that there are longer waves in the ether that we can not get and we are afraid that the broadcasting stations will soon be sending out shorter waves that our instrument will be inadequate to receive so we shall have to buy a new one. Now our eyes also can only receive a limited range of vibrations. There are long waves in the sunshine that are invisible though we feel their warmth. And out where the blue begins and even beyond the violet limit of visibility there are rays that will darken a photographic plate, or our skin if we lie in the sun too long. These short ultra-violet waves that burn or tan our skin will kill bacteria, and it has recently been found that taken in moderate amounts they may increase resistance to bacterial infection and stimulate various bodily processes in men and animals. They may cure tuberculous sores and swellings. They assist somehow in the laying of lime in the bones and so prevent rickets. To prevent children from becoming bow-legged it has been the custom to give them doses of cod liver oil but it has now been found that a daily dose of sunshine will do as well. Dr. Steenbock of Wisconsin has recently found that hogs kept in the shade and fed on inadequate diet will become crippled in the legs if kept in the shade, but they thrive on the same diet if

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permitted a place in the sun, a hint to farmers that they may well supplement their fodder with sunshine. Egg-laying like bone-making requires lime-using. So we are not surprised to learn, although we had not thought of it before that these short waves will aid the hen in her maternal duties. Drs. Hughes and Payne, of Manhattan, Kansas, have found that hens exposed once a day for ten minutes to an electric lamp source of ultra-violet rays laid four times as many eggs as those which did not have the light treatment. The eggs from the irradiated hens had thicker shells, contain more lime, and twice as many of them hatched. I expect we soon shall see "ultra-violet eggs" advertised for sale and at an ultra-price. Dr. Goodale, of the Mount Hope Farm, Williamstown, described at this meeting a sun porch expressly contrived to give chickens the benefit of these magic rays. Dr. Hess, of New York, as well as Dr. Steenbock, has shown that ordinary vegetable oils may be made as good as cod liver in preventing rickets by being rayed with ultra-violet. Dr. Hess found that when rats were fed on foods deficient in the anti-rickets vitamin, the addition to the diet of the white sprouts of wheat grown in the dark or even of green lettuce from the market did not prevent rickets. But if the wheat or lettuce be exposed to ultra-violet radiation for two minutes, it became active in preventing bone weakness.

The action of the ultra-violet rays on the skin affects the whole body. Exposing the left wrist to the rays will cure rickets in the right wrist as well, so it seems that the rays must activate some substance in the skin which carries the healing virtue throughout the system. Dr. Hess suggests that it may be the crystalline chemical known as cholesterol which is contained in animal and vegetable cells and is especially abundant in the outer skin. He has found that pure cholesterol, dissolved in water and exposed to ultra-violet rays, will prevent rickets as well as cod liver oil.

Invisible light is a two-edged sword. The same ultra-violet rays that are now used to save children from the crippling rickets disease, produce misformed monsters when turned on the eggs and embryos of lower animals. Dr. Marie Hinrichs, of the University of Chicago, told the American Association for the Advancement of Science of producing freak fish with one eye, distorted hearts, queer tails and other abnormalities, by subjecting the eggs from which they developed to ultra-violet radiation for half a minute.

The secret of the death and distortion wrought by these rays, she said, is due to the fact that they attack not the weakest, but the strongest place. Wherever life processes are going on most rapidly, there the rays strike and kill first. The parts that will be the brain, the eyes, the spinal cord, the heart, are first to be awakened to life in the developing egg, and the rays affect the more inert portions of the egg tissue lightly or not at all while they work their mischief on the highly vital parts. If the exposure is continued for more than a fraction of a minute, death spreads to the other parts and becomes complete, but by learning the exact moment at which to withdraw their baleful influence the organism may be left alive, but diverted from its normal course of growth.

INFANT BEHAVIOR

DECLARING that clinical studies have shown that a month of retardation in the first year of life may be as serious as a whole year of retardation in later school life, Dr. Arnold Gesell, of the Yale University Psycho-Clinic, has pointed out the possibility of measuring the mental growth of babies by their behavior.

Dr. Gesell presented the results of comparisons of behavior of infants at ages of 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12 months. These infants were observed in pairs at the Yale clinic, behavior of a two-months old child being contrasted with that of a one month old child, the behavior of the three month old with the two month old, etc. In this way, the behavior characteristic of different ages can be determined, and such determination used as a measure of mental development.

"The problem of individual differences, which is of basic importance for human psychology, has been studied mainly with adults, adolescents and school children. The further we pursue our inquiries," he said, "the more evident it becomes that we must push investigation back to the period of infancy and ascertain how individual differences assert themselves in their earliest genetic stages. For this reason the determination of monthly increments of development in infancy is of both scientific and practical importance. It also has a significant bearing on the central problem of heredity and environment."

GROWING CITRUS FRUITS UNDER DESERT CONDITIONS

CULTIVATION of oranges, lemons and other citrus fruits in regions at present too arid for them is expected to result from the accidental discovery at the U. S. Experimental Station at Indio, California, of the proper method to induce flowers and fruit on the Australian desert lime tree.

The Australian desert lime is the only plant closely enough related to citrus fruits to permit grafting, that will grow under desert conditions, in alkaline soil, and in greater cold than other citrus species will stand. As a stock on which citrus fruits may be grafted it has long been expected to extend the range of orange and lemon culture into regions hitherto unsuitable.

The only difficulty was that it would not produce seed, no matter how generously irrigated; and no seed, no grafting stock. A specimen that stood near an irrigated terrace, and received a constant small trickle of water surprised workers at the station by breaking into bloom, whereas other trees that had had their roots copiously flooded once a month refused to put forth a bud. This hint that what the trees really needed was a constant small supply of water, instead of intermittent floods, was acted upon; so that now an abundance of young seedlings are available for propagation purposes.

STERILITY IN POTATOES

THAT our cultivated potatoes are pretty close to being exclusively female in their nature is the conclusion of Drs. A. B. Stout and C. F. Clark, investigators for the U. S. Department of Agriculture.

Potatoes have long been known to form flowers, as toma-

toes and peas do, appearing to be of the same double male and female constitution of the latter; yet potato flowers rarely set true fruit enclosing seed as in the case of tomatoes and peas. A long current explanation attributed this failure to the growth of underground tubers which drew food from the aerial parts. That this is not the correct reason appears from the fact that potato shoots grafted onto the roots of non-tuberous relatives develop flowers that are no more fruitful. Moreover, in those few varieties that do form seed-containing fruit it has ben observed that tuber and seed formation go hand in hand.

Intensive studies revealed the true cause of the sterility. They found that the pollen is almost completely shrivelled up and devoid of life in the great majority of potato varieties. Good pollen, capable of fertilizing flowers, is very rare. The female elements of the potato flower, however, do not share in this degeneration. When good pollen is used on a pistil almost all potatoes can be induced to form "balls" containing true seed.

Potato varieties have retained their femaleness and nearly lost their maleness and if it were not for the lucky expedient of tuber production most of our varieties would quickly become extinct.

TEST OF THE THEORY OF RELATIVITY

FURTHER tests of the theory of relativity will take place if the suggestion of Dr. Ludwik Silberstein to the American Section of the Astronomical Union is adopted. The meeting in Washington of the American section was in preparation for the meeting of the International Union next summer at Cambridge, England.

According to Dr. Silberstein, the theory of relativity rests upon three experimental proofs. One of these, an apparent displacement of stars seen at the time of a total eclipse of the sun, has been verified to the satisfaction of all, another is a slight shift in the dark lines seen in the spectrum obtained by passing sunlight through prisms, and, while the claims of various scientists to have found it are generally accepted, the quantities involved are so minute that it is hardly a satisfactory proof.

The third test involves a peculiarity in the motion of the planet Mercury around the sun, which does not approach closest to the sun at the same part of its orbit. The perihelion, the point at which it is nearest, advances from year to year, according to the theory of gravitation as propounded by Newton, but there has long been known a discrepancy of about 40 seconds of arc per year. According to Einstein there should be a difference of 43 seconds. As authorities differ on the actual amount of difference, Professor Silberstein pointed out that a number of observations of the planet are already recorded, and that if someone could be engaged to go over these, a new and accurate value of the change in the perihelion could be obtained, and the truth of the Einstein theory could be further verified or disproven.

ITEMS

TRANSPARENCY to infra-red light is the remarkable property discovered in bakelite, the American synthetic resin, now widely used for radio panels and phonograph records. The discovery was reported by M. Georges Kimpflin to the French Academy of Sciences. The transparency is not so high as that of window-glass with common white light, but still offers interesting possibilities of mechanical application.

Infra-red light is not visible to the human eye. Recently secret-signal systems have been developed for military use, based on infra-red radiation. It now appears possible to filter the light of the secret signal through bakelite so that the tell-tale visible rays are excluded. Furthermore, filtered infra-red rays are expected to have medical application in the practice of dermatology.

Bakelite may be doped with iron and certain other useful ingredients without seriously reducing its infra-red transparency. The new experiments recall the recent development in America of a black glass, impervious to common light, but transparent to ultra-violet light, the opposite extreme of the spectrum.

ELECTRICAL means for manufacturing carbon black, a widely used pigment, have been devised by the Bureau of Mines, U. S. Department of the Interior. Carbon black consists of exceedingly finely divided particles of carbon, and is at present produced by burning natural gas with an insufficient air supply, and permitting the flame to impinge on a cool metal surface. This method has been found strongly objectionable in many communities, and stringent ordinances have been passed to regulate its manufacture.

Inasmuch as carbon black is in great demand in the manufacture of printer's ink, shoe and stove blackings, phonograph records, black leather, typewriter ribbons, carbon paper and many other articles, a method for manufacture that does away with the objectionable though inevitable uncleanliness of the present process has been much desired. The Bureau of Mines process involves the use of high voltage discharges from electric arcs acting upon cheap light-oil distillates.

UTTER carelessness in the care of her children because she can always tell where they are is the chief characteristic of an Arabian water beetle described in a lecture by Major R. E. Cheeseman. Catching her husband unawares this militant female plants her eggs securely in the middle of his flat back where he can not knock them off. Then she goes on about her business. When the eggs hatch the young grow heavier and heavier until the poor husband beetle can hardly crawl along. The one observed by Major Cheeseman was a living baby carriage as he had no less than ninety babies firmly attached to his back.

LEARNING the relationships, ancient migrations, and original homes of animals by studying the parasites that infest them is the unique method of study employed by Professor Maynard M. Metcalf, chairman of the division of biology and agriculture of the National Research Council, who spoke before the American Society of Zoologists. Professor Metcalf chose as illustrative material the "bell toads," an obscure and almost extinct group of amphibians, whose surviving members, however, are very widely distributed.