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DANGER KEYS UP OUR BEHAVIOR

By George M. Stratton,
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It has long been knownthat fear or anger may make it possible for a man to perform some unusual feat of strength. Fear or anger may add vigor to his muscles. But fear and anger and excitement are of far wider influence than this.

A concrete example will make my point clear. A scientist whom I know was one day working in his laboratory, when he was the only one in his building. He happened, by accident, to inhale a certain gas that is a deadly poison. Instantly he thought of two means to save himself from serious injury, if not from death. He rapidly tried one of these , and it failed. He then tried the other, which also proved ineffectual; and his condition was rapidly becoming critical. He at once darted to a third alternative which he had in mind, that of reaching a telephone in an office on the floor above the one on which he was working. As he rushed out into the hall and up the stairs, he thought of several persons whom he might try to call, and rapidly made his selection of the one whom he thought would most probably be at home and within reach. The telephone number of this friend stood out, he says, clear and inches high in his mind's eye as he ran up the stairs. He was just able to gasp a few words of explanation to this friend when he became unconscious. Assistance was hurried to him, and after long and hard labor he was restored to consciousness and his life was saved.

Sometimes a strong emotion may disturb the behavior of mind and body and make it effective. Deep sorrow or disappointment, and in some cases intense fear, may have this effect. It is notorious that in excitement absurd things may be done. When Morgan's men were making their famous raid into the North during our Civil War, their conduct at certain moments was that of men beside themselves. They would rush into some country store, and, in a whirl of greed, seize anything at hand. They would stuff their pockets with horn buttons, start off to southern climes with a string of skates, or with a chafing-dish on pommel, encumbrances only to be thrown to the roadside after some miles of gallop. They behaved, it is said, like boys raiding an orchard.

After the conflagration in Berkeley, California, a year and more ago, I was looking over some of the salvaged possessions which had been brought to a fireproof building of the University. There, beside a fine mahogany grandfather clock, well worth saving, was a pan half-full of baked apples!

But though fear or great excitement may sometimes make some of our actions bizarre or ridiculous, they do not as a rule interfere with the proper use of a man's powers. The man who is joyous still knows how to whistle or sing or walk with a sprightly step; and the angry man does not forget the use of language, especially that of vituperation. In some instances emotion makes a man use better what skill he has. Onthe day after a deep disappointment, in one case I know, a man played a better game of golf than he had ever played before. Often there is a greater variety of muscular movements which are at the disposal of the man who is in an emotional state than of the man who is wholly unexcited. The excited man finds himself able to pass from one kind of act over into another with greater readiness. The changes can be made more rapidly, and there are things which lie ready for him to do.

The effect upon the muscles, however, is not all. There is also a decided effect upon the intellectual powers.

In the first place, there is in excitement a repression of ideas and acts which are inappropriate; there is a pushing aside of everyting mental which offers no help to meet the crisis in hand. In a way, this is what happens when soldiers who are wounded do not until afterwards feel any pain; or when David Livingstone in Africa was seized by a lion and his shoulder was crunched and crushed. The shock, he tells us, produced in him only a sort of dreaminess, without pain and without terror, an effect which he compares with that of chloroform.

Besides this setting aside of useless ideas and impressions, there is a speeding up of the thinking which is useful. My scientist friend in his time of danger was able to think far more quickly than was usual. He thought with amazing rapidity. But what is more important, he was able to think with remarkable fertility and effectiveness to meet the particular crisis in which he found himself. His judgment worked clearly. He had to think up and consider a number of alternatives in order to discover how best to meet the trouble he was in. Just as his hands were not paralyzed or clumsy, so his thinking was not paralyzed or clumsy.

So the man in the presence of someone who has injured him is apt to think of many things that he might do or say to injure his opponent in return. The young man in love fairly blossoms with ideas as to ways in which he may express his affection or gain success over a rival. Turgeniev, the Russian writer, when asked in his latter years why he was not writing as much as before, said that he was too old to be in love, and that he had found that unless he were a little in love he could not write.

Thus certain kinds of emotion or certain phases of all emotion render us valuable service. For when an individual isstirred he finds himself for the time being on a new level of behavior , both of mind and body, andis able to meet his crisis with a more complete array of his powers and with a better organization of them. And let me repeat that these powers are not those of his muscles only but are of his entire personality, both of body and of mind.

Wire to install an emergency telephone to fight a recent forest fire in California was delivered across a mountain to foresters by airplane.

SEA GUIDES ANIMALS BY OWN RADIO SYSTEM

The simplest and most constant sound in nature, the washing of the sea, serves as a radio beacon to warn whales, porpoises, and many fishes to keep away from shore and below the surface in rough weather, according to Dr. Austin H. Clark, of the U. S. National Museum, who was formerly naturalist on the scientific ship "Albatross". Modern wireless devices for transmitting danger signals to ships off shore in a fog are rivalled by nature's own method of protecting her creatures.

"Waves breaking on the shore and white caps on the open ocean," Dr. Clark says, "give forth a high-pitched, hissing sound consisting of an infinite number of separate sounds arising from the breaking bubbles which rapidly succeed each other".

Prolonged, uninterrupted sound is intensely disagreeable and soon becomes distressing. We have all noticed this, he points out, in the prolonged ringing of an electric bell, in thecontinuous rumbling of an idle motor engine and in other ways. Being high pitched, the hissing sound of breaking waves has a marked directive quality; that is, it is easy to locate its point of origin. Being unceasing, it is distressing and repellant, and all the more sensitive sea creatures try to keep away from it. Whales, porpoises and dolphins and many fishes always keep well off shore, Dr. Clark states, and they are apparently guided by these repellent sounds, while on a windy night various other types of life which normally would come up to the surface stay well beneath it.

"The simple breaking of the waves is of immense importance to sea creatures as an index to the dangers that they run," he concludes. "Intimes of storm the repellant sound increases and by this they arewarned to keep farther from the shore and farther down beneath the surface.

AMERICA CAN SUPPORT 300,000,000 POPULATION

If the people of the United States are willing to endure a slightly changed standard of living, they need have no fear of over-population in the immediate future. But the next century will probably see a decreasein our comforts and luxuries, and our agricultural system, before the close of the period will be hard put to keep pace with our growing population.

Dr. O. E. Baker of the Bureau of Economics, U.S. Department of Agricluture, has made a study of the physical limits to agricultural production and population saturation under different systems of agriculture. His conclusion is "that after our arable land has increased about 100,000,000 acres, which appears likely to happen during the next 75 years, and if our acre yields of the crops attain those in northwestern Europe, and our diet reaches the pre-war German standard, our nation will be able to support about 300,000,000 people," But that these conditions will be fulfilled is very uncertain.

By 2000 A.D., it is estimated, our population will be between 190 and 200 million. How to feed, clothe, house, and provide with the amenities of modern life these 80 additional millions of people is a very practical problem which faces the American people, and especially, the Department of Agriculture, which is endeavoring to anticipate agricultural conditions during the next few decades.

Of course, farmers now are more concerned with the present surplus of their commodities than with the prospective shortage of agricultural products. But the fact remains that our population is increasing about 1,500,000 every year despite the diminution of immigration; that despite this rapid increase in population, no net extension of the crop area has taken place during the past few years, and that the yields per acre of crops, averaged together, show little or no increase during the past 15 years. The number of farmers and the farm population is decreasing, and there seems to be a slackened demand for land.

It has been possible, however, to have a steady increase for several years in our production of food without any increase in the area of agricultural land or in the yields per acre because a larger proportion of the land has been devoted to crops and less to pasture. More corn and potatoes and wheat and sugar and vegetables have been produced, crops which yield much more food per acre than pasture used for livestock. This movement is expected to continue, and it holds out hope for us. A changed diet, less meat, and more vegetable products, will enable our farmers to keep pace with the growing population, for several decades at least.

Moreover, a great reservoir of potential agricultural production is to be found in the tropics. In the temperate zone only about 1,000,000 square miles of possible arable land remain unused for crops or pasture, only about 40 per cent of the present cultivated area, whereas in the tropics there are over 3,000,000 square miles ultimately available for crop production.

In the United States there is available an acreage fully equal to our present acreage in harvested crops. But it is unlikely that by the year 2000 we will increase our crop acreage more than two-thirds, possibly not over one-third. This would, of course, supply food for a large addition to our population.

Dr. Baker thinks that something can be done towards increasing our yield per acre. He says: "The yield per acre of comparable crops in Germany and England is almost double that in the United States, but if we include France and Belgium with Germany and England we find that the average yield is lowered to 46 per cent. above our own. This we may consider the upper limit of increase in yield per acre which it is possible to achieve in the next 75 years."

But during the next few decades the increased food supply needed is likely to be derieved more from expansion of crop acreage than from increased acre-yields. More semi-arid pasture in the Great Plains region will be plowed up and put into crops, more forest land will be cleared in the northern portion of the Lake States and in the South, and doubtless there will be some increase in the acreage of drained and irrigated lands.

Equally important, in all likelihood, will be the changes in diet. Dr. Baker states that if the trend toward more vegetable food and less meat continues at the same rate as during the 25 years before the World War, we will attain virtually the pre-war German ratio of vegetable to animal food in about 30 years. This change in diet alone would permit a 35 per cent. increase in population.

Through extension of the crop area by a third, through increasing the acre-yields of the crops another third, and through this change in diet, which would permit population to increase a third, the United States can provide food supply sufficient for double the present population, which is the population it is likely to have about a century hence. Beyond this point it is probably that both individual

welfare and national strength would begin to diminish. But if population then continued to increase until the ratio of cultivated land to population attained that in Japan, our resources could support a population of a billion. However, as Dr. Baker concludes, "Let us hope that this condition of poverty may never be reached. It would weaken rather than strengthen the nation, for strength is measured more by per capita wealth and welfare than by numbers of people."

DENMARK FIGHTS HOOF AND MOUTH DISEASE WITH SERUM TREATMENT

Hoof and mouth disease of cattle, which caused serious trouble in the Southwest last year and was suppressed only by the most rigorous destruction of the infected herds, is being treated in Denmark, the most important dairy country for its size in the world, by means of a serum prepared from immune animals. Dr. Erwin F. Smith, pathologist of the Bureau of Plant Industry, who recently returned from Europe, told of the efforts of the little kingdom to rid itself of the desease by veterinary treatment, inasmuch as the destruction of infected herds is out of the question because of the wide prevalence of the malady in Europe.

"I spent some time in Dr. C. O. Jensen's laboratory in Copenhagen, which is the veterinary serum laboratory of the Danish Agricultural College," said Dr. Smith, "I went to see him primarily because in time past he has done important work on the tumors of animals. I found him head over ears in preparing serum for foot and mouth disease, now prevalent in Denmark. We have had several serious outbreaks of this disease in the United States, suppressed at great expense by the general Government through quarantine and slaughter of the animals. The disease attacks cattle, sheep and hogs, and sometimes men contract the disease from milk or from tending sick animals.

"The mortality of the disease varies, I believe, in different epidemics and in different localities. Dr. Jensen told me that the mortality in Denmark in untreated animals was about 25 per cent. He said that the disease had come into Denmark recently from Germany, where since the war they have become lax in caring for outbreaks. He told me that they had had 22,000 outbreaks in Denmark and 80,000 in Holland. The disease also occurs in quite a good many places in England and in the Scandinavian Peninsula. He said that the form of the disease in Sweden was so light that it was difficult to get farmers waked up to deal with it.

"I found him preparing serum for this disease on a large scale - a regular United States of America scale. This serum is obtained from animals which have recovered from the disease. They take several gallons of blood from each animal, about one quarter of the blood of the animal, with no serious result, so he said, beyond reduction of milk, supply for some time. To this blood is added chinol, an antiseptic, and allowed to stand over night. It is then centrifuged, drawn off into large sterile glass containers, and afterwards bottled in sterile bottles to send to the farmers.

"The serum is not heated or sterilized in any way except by the original addition of the antiseptic chinol. Full-grown cattle receive between 7 and 10 ounces of this serum at one injection. Young cattle are given 1¼ to 5 ounces, depending on the weight, and hogs 1 to 3¼ ounces. This injection does not prevent

them from contracting the disease, but they have it only in a mild form and the mortality is reduced to nothing at all, I saw many gallons of the blood from the recovered animals being centrifuged, many other gallons of serum waiting to be bottled, and barrels of fresh drawn blood.

"One attack of the disease generally protects the animals for three or four years or longer, but as in the case of typhoid fever and paratyphoid in men, there appear to be different strains of the foot and mouth organism and vaccination or recovery from a natural infection with one strain of the disease does not protect from another strain.

"Because men may contract the disease it is forbidden in Denmark to sell milk from herds in which the disease is present until after the milk has been pasteurized."

SUGGESTS NEW METHODS TO COMBAT INSECTS IN GRAIN

Freezing, electricity, and X-rays may all be called upon to protect from the ravages of insect pests the thousands of wagonloads of corn that are being turned out of the Mississippi Valley cornfields at this time of the year and the loads of wheat that are dotting the roads from Canada to Texas. Prof. Royal N. Chapman has been attacking the grain pest problem in his laboratory at the University of Minnesota.

"Weevils in stored grain could all be killed without resorting to chemical insecticides," said Dr. Chapman, "if the grain were merely taken out of one bin on a very cold day and put into another. It is the heat that is maintained in the depth of the binned grain that keeps them alive." This method of eradicating grain pests in storage elevators is not only the simplest and cheapest yet discovered, but the most effective as well, Dr. Chapman believes.

Another method that is very novel but still in the experimental stage is the use ofthe electric current, which literally shocks the insects to death. Good results have been obtained by Dr. Chapman when packages of goods were passed along an endless belt conveyor which brought them into contact with a series of electrodes at varying levels until the entire area of the package from top to bottom had been treated.

The X-ray method has also been used to destroy insects in packages. Its use in destroying the cigarette worm in tobacco has been known for some time, although its application to the destruction of insect pests in grain is new. However, the method has been only a laboratory process and is still too expensive to apply commercially.

Although Dr. Chapman considers the temperature method the best, he believes that a great deal of research work is still necessary along that line, due to the fact that some insects that infest human food supplies may be frozen without being killed. Probably $200,000,000 worth of harvested grain and packed food products are destroyed annually in the United States by grubs and weevils, he estimates.

WISCONSIN ASTRONOMER DISCOVERS STELLAR SPEEDERS

By James Stokley,
Science Service, Staff Writer

Runaway stars and new variable stars that periodically become bright and then faint are being discovered by Prof. Frank E. Ross, of the Yerkes Observatory, as a result of the study of photographic plates in the observatory's files. Various fields of stars, largely in the Milky Way, were photographed some twenty years ago by the late Prof. E. E. Barnard who used the Bruce photographic telescope. This instrument is a camera with several lenses, the largest ten inches in diameter, and it is mounted so as to follow the stars in their apparent daily motion across the sky. Thus these photographs show the sky as it appeared about two decades ago. To discover what has happened in the interval, Prof. Ross is comparing them with similar photographs which he is making of the same regions through the Bruce telescope.

To compare two pictures, each showing thousands of tiny dots representing stars, all but half a dozen of which are precisely the same, and to locate the ones that have moved or otherwise changed in the interval, would seem like a hopelessly complicated task; but the use of an ingenious instrument known as the blink microscope makes it relatively easy. This consists of what might be called a double periscope. One photographic plate is placed at each end. By oscillating a small lever, the observer can see first one andthen the other in as rapid succession as he desires. The stars that are the same on each plate undergo no change in appearance, but if one has moved, between the two exposures, it seems to dance to and fro as the lever is moved. If a star has varied in light, the image dot seems to grow larger and smaller, while if a new star has burst out, its image will appear and disappear.

So far, Prof. Ross has examined twenty-five pairs of plates in this way and has found more than 150 rapidly moving, or "proper motion" stars, and 40 variables, that were not known before. Some of the proper motion stars are moving faster than twoseconds of arc a year, which in about 900 years would take them over a distance equal to the moon's apparent diameter in the sky. This may not seem very rapid, but the most rapid star in the sky known to astronomers, which was also discovered by Prof. Barnard, is only moving at about five times this speed. And of the countless legions of stars onlyabout 200 have been known up to the present that move faster than one second of arc a year.

But these plates only measure motion across the sky, and if a star happens to be moving directly to or from the earth, its motion will not be apparent. Such motion, called "radial velocity", may be detected by analyzing the star's light in a spectroscope, for the light waves are crowded together from an approaching star, and spread out if it is receding . A similar effect makes a fire engine bell, for example, seem shriller when coming towards one than when going away.

For three nights a week, when weather permits, the great 40 inch reflecting telescope at Yerkes,the largest of its kind in the world, is used to make these spectrum photographs. This work was begun by Prof. Edwin B. Frost, director of the observatory, andOis now being carried on by Prof. S. B. Barrett and Dr. Otto Struve. Dr. Struve is a young Russian astronomer, and belongs to the third generation of a family of astronomers that includes some of the best known names in the history of the science.

DR. HRDLICKA DISCOVERS "GOLD MINES" OF SCIENCE

Ending a six-month survey of sites connected with man's origin and evolution in India, Ceylon, Java, Australia, and South Africa, Dr. Ales Hrdlicka, curator of physical anthropology of the U.S. National Museum, has returned with a remarkable collection of evidence which reveals three great regions as undeveloped "gold mines" for scientific research.

These regions which show such amazing richness in fossil remains and in which work is now practically at a standstill, Dr. Hrdlicka declares, are the Siwalik Hills of India, the Solo River valley of Java , and the Taungs-Broken Hill country of South Africa.

In the Siwalik Hills, which extend for hundreds of miles from Cashmir nearly to Burma, he found that five or six species of fossil big apes have been discovered, two or three of which have not yet been described by scientists. These ape remains are from different geological horizons in this single range of Himalayan foot-hill and the surface has hardly been scratched.

In the valley of the Solo River, where the famous Pithecanthropus erectus or Java ape-man's remains were discovered in 1891, Dr. Hrdlicka found another rich but neglected region. Old and well preservex fossils are still frequently washed out by the river, and natives sometimes find and sell these, but there is no scientist there to collect them. Pithecanthropus could not have existed alone. He must have had predecessors and possibly progeny whose remains may be revealed by a systematic study of the region, Dr. Hrdlicka says.

Another region offering immense possibilities in throwing light upon the origin of man, is at Taungs, and in the Broken Hill country of South Africa. Dr. Hrdlicka found two skeletons of cave men in this section, where the remains of the mysterious Rhodesian man were originaaly discovered.

Beside inspecting these sites of major importance in connection with man's evolution, Dr. Hrdlicka travelled extensively in Indianand Australiaaand made observations upon the people now liveing in those countries. In various parts of India he found definite traces of Negrito blood, and was able to trace the route followed by the ancestors of the Negritos of the Philippines in migrations from Africa by way of India.

Among natives of Tibet, he also discovered remarkable American Indian types showing that they were remnants of the same people who poulated America.

"I have some photographs of this latter people," said Dr. Hrdlicka, "which I would swear were American Indians if I had not taken the pictures myself."

More than 7,000,000 people in the United States go hunting each year.

There are three thousand tame elephants in Siam.

RADIOACTIVE LEATHER IS LATEST DEVICE FOR TREATMENT

A new way to give radium treatments of any prescribed strength very uniformly is to apply radioactive leather. Professor Taffarelli incorporated radium salts in tanning hides and found that the prepared skins had acquired their curative power. It is thought that they combined into a uniform compound with probably the albumens of the skins.

As the amount of radium salts can be regulated, the strenght of the leather can be made as desired. The leather has the advantage over many other means of radium treatments in that it is flexible and can be applied over a large area and to any part of the body surface.

GIANT TREE FOSSIL FOUND IN ILLINOIS

A tree trunk of record size, that grew in the coal-making forests millions of years ago, has been discovered by Prof. Carl Noe, paleobotanist of the University of Chicago. The find was made in a coal bed of the Carbondale formation, near West Frankfort, Illinois.

The circumference of the ancient trunk is ten feet, and the length of the section unearthed about five. The whole tree, as it originally grew, may have been in the neighborhood of one hundred feet high, Dr. Noe states. The surface of the trunk is covered with close-set pits, which are the scars left where the leaves once grew. These ancient trees had very few branches, and the leaves grew all over the trunk , like the scales of a fish. The name of the genus, "Lepidodendron", means "scale tree".

A second tree of a different genus, but related to the first giant, was also found by Dr. Noe. This section wasabout four and one-half feet in diameter and six feet long. Most of the coal in the formation where these specimens were found originated from the leaves, stems and spores of these two ancient tree types.

LIVESTOCK EATING UP NATIONAL FORESTS

The United States Forest Products Laboratory has been making some interesting experiments with sawdust as a feed for dairy cows. The outcome is doubtful. But down in the Coconimo and Tusayan national forests in Arizona, Dr. G.A. Pearson of the Southwestern Forest Experiment Station has been making some very conclusive observations of the consumption of young forest trees by grazing livestock.

In a broad way Dr. Pearson's conslusions are that stock has eaten uppossibly 200,000,000 board feet of potential timber in the last twenty years. This was under restricted grazing privileges. Dr. Pearson finds that there are about 200,000 acres of cut-over land, in the two forests on which natural reproduction of trees has failed, wholly or in large part, primarily because of overgrazing. This area is increasing yearly as timber cutting progresses. Most of the damage is caused by sheep and cattle actually eating the pine seedlings. Sheep are the principal offenders but where the cattle are too numerous they also develop a pine tooth.

Not only has livestock, grazing in the forests under permit, eaten the equivalent of 13,000 lumber houses during the last two decades, but within the last five years it has set back regeneration about twenty years. It appears that on the average it takes twenty years to obtain a satisfactory stand of seedlings in the Arizona pine forests. Seed crops are irregular, and good crops and wet seasons sometimes coincide only once in five years. In 1919, however, there was an exceptionally large yield of seeds accompanied by the most favorable weather conditions. Millions of vigorous seedlings, even on old cut-over areas with few seed trees, sprang up. Unfortunately, heavier than normal grazing has been permitted of recent years, and 95 per cent. of the 1919 trees have been devoured by cattle and sheep, another 50 per cent. has been devastated and will be eradicated at the present rate of grazing within the next two or three years. Only a quarter of what may be the best seed crop in twenty years has a chance to live.

Grazing has caused great areas of forest land to lie idle for ten to twenty years, says Dr. Pearson. At a net growth of 100 board feet per acre a year, this means the loss of 150,000,000 to 200,000,000 board feet during that time, a loss that is now proceeding at the rate of not less than 15,000,000 a year.

Dr. Pearson calculates that at their present market prices as timber on the stump and forage, trees are worth fifteen times as much an acre for timber as for cattle feed. Converted into lumber on the one hand and into meat on the other, the lumber conversion brings into the community from four to ten times as much wealth as the meat making process.

Besides reducing the amount of timber reproduction, grazing, Dr. Pearson finds, causes poor quality. To produce good saw timber the young trees must grow close together. Many of them die out in the struggle for light and nutriment, but those that remain are tall, straight and free from lower limbs, whereas without crowding they would have been squatty, crooked and covered with knot-making limbs. This scattered reproduction is often worse than none, because it is at once worthless and preventive of younger and better growth.

Dr. Pearson's investigations have been brought to the attention of the Senate Committe now considering a revision of the administration of public lands, to which the stockmen are appealing for more grazing concessions, and are believed to be contributory to more regulation of grazing hereafter in the Coconino and Tusayan Forests.

TABLOID BOOK REVIEW

HANDBOOK OF THE INDIANS OF CALIFORNIA. By A.L. Kroeber. Smithsonian Institution Bureau of American Ethnology Bulletin 78. Washington, Government Printing Office, 1925.

Students of the history of civilization can ill afford to overlook the chapter on Prehistory, in which Dr. Kroeber gives the results of shell-mound excavations which indicate that the San Francisco Bay region was inhabited by Indians who showed no cultural advance in 3,500 years. The bulk of this 995 page volume is a valuable series of tribal descriptions concretely picturing the life of each of some 50 little nations.

Most storms in middle latitude occur below 6½ miles altitude.
