THE SCIENCE NEWS-LETTER

A Weekly Summary of Current Science

EDITED BY WATSON DAVIS

ISSUED BY
SCIENCE SERVICE
1115 Connecticut Avenue
WASHINGTON, D. C.

EDWIN E. SLOSSON, Director
WATSON DAVIS, Managing Editor

SUBSCRIPTION: $5 A YEAR, POSTPAID

Vol. II, No. 110 Saturday, May 19, 1923

ADRENALIN IS LIFE SAVER, NOT RESTORER

Adrenalin, the drug which is reputed to have "brought back the dead to life", is a life-saver rather than a life restorer. It can stimulate a heart suddenly overcome by some accidental shock or strain, but it can not renew a physical frame exhausted and poisoned by long disease. Such is the official opinion of the Journal of the American Medical Association as expressed in an editorial in the May 5, issue.

The power of the suprarenal glands, of which adrenalin is the extract, to raise blood pressure by causing powerful contraction of the muscular walls of the blood vessels has been known for many years. The glands are small, two in number, and situated just above the kidneys. Their active principle, causing stimulation of the muscles of the heart and blood vessels, was isolated in the period from 1901 to 1903 by several chemists, and called adrenalin.

Recent publicity given to its use in reviving persons apparently dead has recalled attention to earlier reports of a similar nature. After several cases had been reported, two German scientists in 1910 experimented with dogs whose hearts had ceased to beat after the blood vessels leading from the organ had been tied. They found that when adrenalin was injected directly into the heart there was a strong contraction of its muscles and a rapid rise of the blood pressure, but if the injection were delayed until all the body functions had apparently stopped and until massage of the heart and forced breathing of oxygen were without effect, the results were less satisfactory.

During the war a German surgeon injected adrenalin into the hearts of three desperately wounded soldiers. Improvement was only temporary, the men subsequently dying of their wounds. Experiments continued after the war and in 1919 there was a report of 45 cases in 15 of which adrenalin had revived the patient from an apparently hopeless condition, but in no case did the patient survive longer than eight hours.

Two years ago a German surgeon reported the reviving by means of the drug of a woman who had "collapsed" while being operated upon and was so far gone that even direct massage of the heart through the operation wound failed to start it going again. Six minutes had elapsed when the drug was injected. Improvement in the heart sounds was noticed in 10 seconds, breathing was soon resumed, and four weeks later the woman was discharged as cured.

A case fully as remarkable was described in March of this year by Dr. Carl Bodon, attending physician at the American legation at Budapest. He was called to treat a man, 56 years old, apparently dying of a heart attack. While the doctor

was applying the usual strong remedies the patient seemed to die, lying relaxed and with even his lips of a death-like pallor, and with his heart action and breathing apparently ended. The drug was immediately injected into the heart. In 45 second the heart beat was again audible to the stethoscope, breathing began, and two hours later consciousness was restored. Three months later the man seemed entirely well

As the result of these cases and ninety others reported by Dr. Bodon the virtues and limitations of the new treatment are apparent. It is not to be used in hopeless cases as death from cancer or tuberculosis, where the whole body is poisoned by the disease. It is to be used when the heart stops during an operation as the result of shock or because of abnormal sensitiveness to some drug, or generally "in every case where we know the patient could have lived if the fatal state had not developed".

The Journal concludes: "It must be remembered that cases when such restoration can be utilized are rare indeed. When death comes as the result of the wearing away of tissues, as the result of toxic action by overwhelming doses of either bacterial or metallic poisons, as the result of destruction of masses of vital organs, it would be cruel and futile to arouse false hopes by what could only be a sensational experiment. Adrenalin will cause contractions in a heart even after it has been removed from the body in which it rested; but that is a far different matter than the restoration of life when that intangible thing known as the spirit haspassed away".

READING REFERENCES- Harrow, Benjamin. Glands in Health and Disease. New York, E. P. Dutton & Co. 1922. Connet, Helene. The effect of adrenalin on venous blood pressure. Baltimore. Reprinted from the American Journal of Physiology, Vol. LIV, No. 1. Nov. 1920.

Dr. Edwin E. Slosson

C H A T S O N S C I E N C E

Science Service, Washington

HOW MAN GOT HIS SHOE

According to the Oriental tale, all men went barefoot in the old days for they knew nothing of shoes. The soles of the people were hardened to walk upon the ground but the king's feet were tender for wherever he walked carpets were spread before him. This arrangement was considered mutually satisfactory, or rather was not considered at all, being regarded as natural and therefore inevitable. But one day a new bride was brought to the king, the loveliest lady in all the land, and a long strip of carpet was laid from the palace steps to the highway so that the king could go forth to meet her. As evidence of the truth of the tale you may still see such a carpet laid in front of a building where there is a wedding.

As the bridal cortege approached, the king marched majestically down the carpeted pathway to the end where he was to await his prospective bride. But when he caught sight of her riding on her palfrey he found her more beautiful than his courtiers had said she was (this is the only incredible thing in the story) and carried away by passion rushed forward to greet her.

But just as soon as the tenderfoot king stepped on the ground his soft sole was cut by a sharp-edged flint so when the princess first saw her royal bridegroom he was holding one foot in the hand and howling.

The king, feeling doubly sore from the wound and the humiliation, at once called together the wise men and the soothsayers and astrologers and ordered them under pain of beheading to devise means of carpeting the whole earth so that wherever he trod no such accident should ever happen again. The official board of experts flunked this intelligence test as usual. I mean, as usual in oriental tales. They first scratched their heads and then shook them and were likely in the end to lose them. They figured out that there was not enough material of any sort to cover the whole earth and reported to the king that his demand was mathematically impossible.

But the king was inexorable and gave them twenty-four hours to solve the problem. At the twenty-third hour the situation was saved by a poor maker of leather aprons who appeared before the king and kneeling at his feet put on them two queer looking contraptions. Then he asked the king to walk out upon the highway and the fields and see if the earth was not carpeted wherever he walked.

The king tried it and found that it was as he had been told. Overjoyed at this happy solution of the difficulty he offered the poor leather-worker half of his kingdom and his daughter in marriage. But the leather-worker declined both with thanks and asked instead that he be allowed to extend the benefits of his new invention to all the people. The king generously granted his request and issued an edict that everybody should be shod with the new pedal protectors.

I understand that the inventor made a fortune out of it since he had a monopoly of the business. But that does not matter now for he died some years later, leaving all his money behind-him, and the people got their shoes and have been wearing them ever since.

So we see that governmental interference, however arbitrary, and individual initiative, however mercenary, may sometimes work together for the good of all. If shoes did not get their start this way, various other things did, and at any rate it illustrates the way allied science softens the asperities of the earth and protects humanity from injury. Man is a featherless, furless, hoofless biped, exposed to all weathers and wounds. Yet he has managed to make himself fairly comfortable in all climates and feared by the most formidable beasts. Climate is forever beyond his control, yet the cave-man of the Mediterranean was, by the invention of fire, enabled to follow the edge of the ice-sheet as it retreated at the end of the Glacial epoch and inhabit the northern region. Man makes a local climate in his home or factory, as warm or cool, as dry or humid, as he likes, wherever he may live.

The alternation of night and day are unalterable yet man has rearranged the periods of light and dark to suit his duties or accommodate his pleasures. From the beginning man had the power to make it night whenever he wished by simply shutting his eyes but he has only recently acquired the art of making it day when he wants to by simply pressing a white button.

Born devoid of protective integument, man has made for himself artificial skins which he can change with fashion and adjust to the weather so that he need not pant like a polar bear in the tropics or shiver like a monkey in the arctics.

He can outsoar the eagle on his self-made wings. He can out-run the deer in his automobile. He can dive longer than the whale in his submarine. He can lift an elephant in air with his engines.

But man is only beginning to make himself at home on this planet. He is not yet awake to his power and possibilities. He is lacking in a thousand things as necessary to his comfort as shoes and does not yet know that he lacks them. We are still living in the barefoot age for the most part, hardening our soles by bruises and cuts, which we might avoid if we knew a little more and used what little we do know.

READING REFERENCES- Towle, Herbert Chester. The shoe in romance and history. San Francisco. Press of A. Carlisle and Company, 1915. Allen, Frederick J. The shoe industry. New York, H. Holt and Company, 1922.

ASTRONOMERS DISAGREE OVER GAPS IN SATURN'S RINGS

The remarkable gap that divides the ring of Saturn into two main parts is once more the subject of an attempted explanation, this time by the English mathematician Goldsborough; but a second scientist steps forward immediately to prove that the new theory is wrong. Mr. W. M. H. Greaves of Cambridge, England, in two papers presented to the Royal Astronomical Society of London, contends that Dr. Goldsborough has not satisfactorily accounted for the division in Saturn's ring.

The halo that surrounds the planet Saturn is not duplicated anywhere in the solar system, nor in any other system as far as we know. It was considered at first to be a disc or plate, until closer observation revealed it as an extremely thin ring encircling but not in contact with the planet. In 1675 the Italian astronomer Cassini discovered that what had appeared as one broad ring was in reality two, separated by a narrow dark band. The dark band has since been known as Cassini's division.

Whether this dark band is totally devoid of matter, or whether it is merely a space in which the shining material of the rings is not so dense, has long been the subject of controversy, Moreover, up to the present time no one has found a really acceptable explanation as to why this gap or division in the ring should exist.

Saturn is the second largest of the eight planets in the solar system. It is nearly one hundred times as massive as the earth, and its diameter is nearly ten times the earth's diameter. Its day is only ten hours and fourteen minutes long, but its year is equal to 29½ of our years. In addition to its ring system Saturn has ten moons. The planet itself, like Jupiter, is gaseous, and there are wavy, cloudlike streaks marking its surface. Once in a while a definite marking or spot, similar to a sun-spot, appears, giving the terrestrial observer a chance to determine how fast the planet turns on its axis.

Saturn's ring system, however, is of greatest interest, because it is a unique occurrence. When we see Saturn in different parts of its orbit the rings are seen in various phases, sometimes edge-on, sometimes partially broadside. When seen edge-on they are almost invisible, appearing as a narrow streak, which proves them to be extremely thin. When they turn their greatest surface toward the earth they increase Saturn's brightness more than two-fold. The rings are not gaseous like Saturn itself; they are composed of numberless small solid dust particles, each one revolving about the major planet as a separate moon. They do not shine with light of their own, but merely reflect the light that falls on them from the sun.

Besides the conspicuous gap discovered by Cassini, which divides the inner from the outer ring, additional dark streaks or divisions have been found on the bright surface of the rings. These as well as the larger gap, are thought by astronomers to be regions where the dust particles composing the rings are for some reason thinned out or entirely absent.

Dr. Goldsborough, in a paper presented to the Royal Society last year, offered a theory to account for the large gap in Saturn's ring. But Mr. Greaves objects to Dr. Goldsborough's solution, saying it is a mere first approximation which would not hold if followed to the conclusion; Greaves proposes a preliminary theory of his own which attributes the gaps to the disturbing gravitational effects of Mimas, the innermost of Saturn's moons. Mr. Greaves theory has as yet been neither accepted nor rejected by astronomers.

READING REFERENCES- Lewis, Isabel M. Astronomy for Young Folks. Chapter XX. New York, Duffield and Company, 1922.

MAGNETIC GHOST ALARMS RESTAURANT PATRONS

Ghosts are said to walk abroad at night in country churchyards or to haunt old, old houses, or to wander in far-off deserted places; but cities have not been supposed to be their favorite resorts, nor in cities any such public and unromantic a place as a lunch room or restaurant. And so it was with feelings of mingled astonishment and dismay that a restaurant keeper in New York recently observed what looked like ghostly pranks played upon his furniture, employees, and patrons, according to a recent report of the Engineering Foundation.

It was seemingly a very modern ghost, specializing in electrical effects. Plated table ware would not stay put but frisked about in unaccountable ways; iron pots rooted themselves to the stove, watches were stopped; customers paid just one visit, beheld the strange doings, and fled to return no more. Help was impossible to retain. Something must be done, the ghost must be laid.

Now it happened that next door was a sub-station of the electric light company, and the restaurateur, observing the electric qualities of his familiar spirit, guessed that it might somehow have escaped from his proper domain since it is especially true of electrical sprites that "stone walls do not a prison make", So he appealed to the electric light company to keep its own ghosts busy at home.

The manager of the station thought the restaurant man might be spoofing or something, so he decided on a personal investigation. It was all too true. Steel table knives set for service leaped out of place and remained rigidly fixed, giving apprehensions as to the possible fate of a customer who attempted to eat with his knife; iron pots needed Sandow cooks to pry them from the stove, and other weird demonstrations abounded. But he had the answer. He had found his ghost.

It seems that near the wall on the side of the electric station nearest the restaurant were many large electrical conductors, each carrying heavy currents to and from the converters, or transformers as they are sometimes called. Now it is a property of an electric current to produce a magnetic field, quite similar to that of a big natural magnet, and the "lines of force" of such a field can pass through a brick wall about as easily as through nothing at all. Iron particles in such a field become themselves magnetized and try to line up along the lines

of force just as a compass needle lines up with the lines of force of the magnetic of the earth. The restaurant, or at least much of its hardware, was magnetized.

The remedy was simple. The lines of force will pass through bricks but not through steel, so heavy steel plates were set up along the wall of the sub-station towards the restaurant. The effect was magical; the ghost was laid. Knives and forks stayed put; one might eat with one's knife in safety; customers were reassured; help was again obtainable.

Said the restaurant man, "I've heard about this personal magnetism stuff and how to get it. I've had enough, I'll tell the world. No more magnetism in mine, thanks."

And that is the story of the now famous Magnetic ghost of Manhattan Island.

SCIENCE MAY INCREASE LIFE'S LENGTH BY TEN YEARS

Ten years can be added to the life span now prevailing in the United States. Dr. Louis I. Dublin, statistician of the Metropolitan Life Insurance Company, so declared recently in citing figures which indicate the possibility of this increase in average life expectancy of Americans without any new discoveries in medical science or without any attempt to get "Back to Methuselah" by the Shavian, Ponce de Leon, or monkey-gland routes.

There is great diversity in the span of life in various countries, he pointed out, ranging from the complete life expectation at birth of 61.8 years for females in New Zealand to 22.6 years for males in India. In the United States it is 54 years for males. In the light of social and economic conditions it is easy to see why these differences occur.

The substantial increase in the life expectation which has occurred in the last century is the best indication we have of the improved material progress of the great mass of people in the civilized countries of the world, he said. Figures for England and Wales show a gain in seven decades of twelve and a half years, while for Sweden, for which there is the best historical data on the Continent, there has been a gain of fourteen and a quarter years in eight decades. In our own country, for the State of Massachusetts, which has the oldest tables of any there has been a gain in the life span of fifteen years in 65 calendar value, years.

"In England at the time of the first table, only 29.5 per cent of the male and 32.4 per cent of the female population attained age 65, whereas at the time of the last table 43.5 per cent of the males and 51.2 per cent of the females attained this age," said Dr. Dublin. "In New Zealand, where the best longevity conditions prevail, 55.9 per cent of males and 60.5 percent of females reached the age of 65 in the period 1906 to 1910. As this is the age which closes the active working period of life, it must be obvious that that nation is most productive, and its people enjoy the largest measures of longevity, and shall I add prosperity , which can bring the largest proportion of its people up to the threshold of old age."

The total life expectancy at birth in the United States is now only 55 years. This could be raised to 65 years. The mortality from birth to five years could be reduced by approximately two-thirds, the mortality from five to ten by two-thirds to one-half; from 10 to 60 years by one-half; from 60 to 70 years by one-half to no reduction.

Fifteen per cent of all the deaths that occur each year are of children within the first year of age. This infant mortality cuts very heavily into the life expectation, but is relatively easy to prevent and control.

"For instance, we have assumed a mortality rate of 4.2 per 1,000 for the third year of life, and this figure is only 20 per cent below the rate prevailing in New Zealand nearly fifteen years ago", Dr. Dublin explained. "In the third year of life virtually two-thirds of the entire mortality is due to such infections as typhoid fever, diarrhea and enteritis, the four communicable diseases of childhood, measles, scarlet fever, whooping cough and diphtheria - tuberculosis and respiratory diseases. Who will deny that these conditions are within control if we mean to control them?"

To achieve a reduction by half of the mortality between the ages of ten and sixty, it is only necessary to reach about a 20 per cent reduction of the mortality for these ages in New Zealand in recent years. Such a goal is very nearly attained by the best life insurance companies in their ordinary experience, with splendid possibilities of a further curtailment of mortality among insured persons.

The prevention of occupational mortality has scarcely been begun as a nation-wide effort. There can be no question, Dr. Dublin said, that certain industrial processes widely developed throughout the country seriously shorten the life span. The effects of poisonous fumes, of deleterious dusts and actual contact with poisonous substances, and unduly long hours of labor, all result in raising the rate, while occupational accidents alone are responsible for as much as fifteen thousand deaths, for the most part of men in their prime.

READING REFERENCES- Cox, Robert Lynn. Conservation of human life, an outline of the movement among life insurance companies to prolong the lives of policyholders. New York City, Ronald Press Company, 1912.

VETERANS BUREAU TRAINING DOCTORS FOR MENTAL CASES

From the time of this country's entrance into the World War until the present, 130,000 men of the armed forces, or veterans of the war, have been or are in need of skilled treatment for some form of mental abnormality, according to Dr. S. I. Franz, director of laboratories at the U. S. Government Hospital for the Insane. Forty thousand of these were discharged during the war for some form of mental disability.

In order that the men still needing treatment may receive it from skilled hands an intensive course in neuro-psychiatry has been started at the Hospital under the direction of the U. S. Veterans Bureau and lectures are given to physicians by many of the best known authorities on nervous and mental diseases and the physiological conditions frequently found in association with them. Graduates from the course will be used either in hospitals or as field workers.

Dr. Franz laid much emphasis on the statement that very many of the mental cases were of a mild form, not demanding hospital care, but requiring a process of readjustment and in some cases of re-education in order to help the man to adapt himself to his environment which as the result of his war experiences may have been greatly changed. The hobo is an example of a maladjustment, he said; a victim of what psychologists call a "mental trauma", the word "trauma" being the general medical term for any injury to the body caused by violence.

"The production, or increase, in the tramp and ne'er-do-well population following our Civil War and our conflict with Spain, with its economic and social disadvantages, must not be permitted to be reproduced," Dr. Franz said. "Nor will the hobo and many other social and anti-social individuals be permitted to go unchecked if there be taken a greater interest in the problems of mental adjustments, mental traumata, and mental conflicts. It is in this that the medical profession has both great opportunity and great responsibility.

"The need for preparation of medical officers to care for the neuropsychiatric patients who are and will be under their care has been expressed by the Veterans Bureau and special courses are now being organized to instruct and to select medical officers for the special work with which that Bureau is invested. It is obviously impossible that one instructor should know enough about all branches of the work to undertake the teaching connected with such a course, and so in the giving of the course there have been brought together the ideas of many of the most eminent neurologists and psychiatrists in the eastern section of the country. On the part of neurologists and psychiatrists there has been a willingness to give of their valuable time and an enthusiasm to do what they can for the welfare of the government and the country.

"The Federal Government recognizes the importance of well-trained men to deal with the behavior disturbances of those who are its wards - who shall be able to deal with the various difficulties of mind and body - to understand the effects of mental traumata as well as those of arms and legs, and who shall be able to help the whole country because of their broad training in the problems of mental reconstruction."

COTTON BOLL WEEVIL TO BE ALLURED BY SMELL

An attempt to attack the conquering cotton boll-weevil by more subtle means than have hitherto been employed is about to be started by the Department of Agriculture. Such crude methods as gassing and poisoning having been ineffective, the insect is going to be allured to his doom through his sense of smell. At least such is the hope of the department experts.

A research is about to be begun to find out if there be any particular odor or emanation from the cotton plant which attracts the weevil. If such is found, it will be studied until the chemical substances which cause its action are isolated. It is hoped these may then be made synthetically and used to lure the pest of the cotton fields from the cotton to poisoned baits or else to cause him to raise a family before the cotton is developed enough to furnish them with the proper means of support.

The weevil is known to be attracted to the cotton plant at two distinct stages of its life and of his own. The first stage is before the buds have formed. The weevil then frequents the plant but does relatively little damage, eating only the leaves. It is later, when the buds or "squares" form that his deadly work is done. Deadly for the cotton plant, but life-giving for the weevil or for his species. It is then that the insect lays the eggs in the unformed boll, and it is about this process that the scientists have made a promising discovery.

If the eggs are laid before the cotton plant has reached a definite stage of maturity they are sterile. In other words, the buds contain some substance which when eaten by the weevil is absolutely essential to the fertility of the eggs. This substance is apparently not present in the plant until a certain stage of its growth, and it is this potent material which the chemists also hope to discover.

If they discover that, and if a substance which attracts the weevil to the cotton in the first place can be identified, the life of the weevil is going to be beset with perils. For it is then planned to make the first chemical synthetically and to use it to attract the pest to poisoned bait, or in the more subtle manner it will be combined with the second so that the insect will become sexually mature before the cotton is ready to support his new family. The eggs will be laid and the little weevils hatched as larvae, but instead of finding themselves inside a nice juicy young cotton boll, they will emerge on a cold and famine-stricken world; and lacking the means to subsist, will perish.

Such is the plan of campaign mapped out by the experts of the Department of Agriculture. The first step is to find what the substances are which attract the weevil and cause its eggs to become fertile. This work has been given to Dr. F.B. Power of the Bureau of Chemistry, isolator of the active leprosy-curing principle of chaulmoogra oil, and more recently the perfector of the first chemically perfect synthetic apple flavor.

He will work with two tons of cotton plants at a time. These will be cut green and immediately subjected to a distillation by steam, the distillate being carefully examined for substances which attract the weevils. The same thing will be done with the cotton plants when they reach the stage at which they impart fertility to the weevil eggs. The work will be done at some agricultural college laboratory in the cotton belt and is expected to begin soon.

READING REFERENCES- Boad, Bert Raymond. Cotton boll weevil control by the use of poison. Washington, Government Printing Office, 1920. Smith, George Durward. Studies in the biology of the Mexican cotton boll weevil on short staple upland, long staple upland and Sea Island cottons. Washington, Government Printing Office, 1921.

GOLD MINE IN BRAZIL IS DEEPEST IN WORLD

Brazil still contains the mine that goes the deepest below the surface of the earth, although the deepest below sea-level and the nearest, therefore, to the center of the earth, is in the United States. So said Dr. Thomas T. Reed of the U. S. Bureau of Mines in an address recently before the New York section of the American Institute of Mining and Metallurgical Engineers. He has recently returned from a visit to the Brazilian mine.

The deepest hole in the earth is a gold mine in the state of Minas Geraes, and is known as the Morro Velho or St. John del Rey mine, he said. It is owned by the St. John del Rey mining company, an English corporation which has been working it almost continuously since 1834.

The mine is now 6726 feet below the surface at the top of the shaft through which it is entered. The next deepest mine is in the Kolar Gold field of India where one shaft descends to 6140 feet. The Village Deep mine in South Africa goes to 6100. The deepest in the United States is Tamarack No. 5, a copper mine in the Lake Superior region, with a depth of 5308 feet. The bottom of this shaft is 4100 feet below the level of the sea, while that of the St. John del Rey is only 3958 feet below sea-level since the mouth of the shaft is in a mountain country 2768 feet above sea level. The Tamarack mine goes nearest to the center of the earth.

The temperature of the rock at the lowest level of the St. John del Rey mine is 117 degrees. The miners work in an air temperature of 98 degrees. The outside air has an average temperature of 68 degrees, but is cooled to 42 degrees before being forced to the lowest levels from which it is drawn to the surface by powerful fans. On its way to the lowest depths it gains heat from the rocks and from its own compression because air at that great depth is considerably denser than air at sea level.

The mine is a dry one, there being no water at the lower levels, and because of the low relative humidity of the air which has been dried before being forced into the mine, the men are able to work under satisfactory conditions. The average pay is about a dollar a day.

The St. John del Rey mine is not only the deepest mine in the world, said Dr. Reed, but is organized by the oldest registered English mining company, organized in 1830 to work a mine at a place some distance from the present workings. This mine proved to be unprofitable, and in 1837 operations were transferred to the present site where they have since been carried on almost continuously.

READING REFERENCES- Mackie, Charles Paul. Brazil. The gold fields of Brazil, their history, production, and future importance. New York, C. F. Ketcham and Company, 1887.

TABLOID BOOK REVIEW

THE STORY OF THE MAIZE PLANT.- By Paul Weatherwax; Assistant Professor of Botany, Indiana University. University of Chicago Press, Chicago. Pp. 242. $1.75

A book as nourishing of mental food as a grain of corn of physical. It is seldom one finds so much real information so interestingly conveyed as in this little book about America's greatest gift to agriculture and the material foundation of her prosperity.

After a few chapters on the history and geographical distribution of the plant and the various theories as to its origin there are several on the botanical features of the plant. Then follows a discussion of its relation to its environment, leading naturally to a description of the various methods of cultivation from the days of the Incas to the modern farm in the Corn Belt. The possible future of corn breeding is also referred to.

Much emphasis is placed on the social relations of the plant and of its intimate relation not only to Indian life in early times but to the prosperity of Twentieth Century America. The origin of maize, both geographical and botanical is a mystery, the latter especially; but whatever and wherever its origin there is no plant more typically American from the day when Columbus first relished Indian corn bread to the present production annually of more than 3,000,000,000 bushels of

"the wide Republic's emblem,
the bounteous golden corn."
