SCIENCE NEWS

THE INCREASING LENGTH OF LIFE

Science Service

TEN years can be added to the life span now preailing in the United States, according to Dr. Louis I. Dublin, statistician of the Metropolitan Life Insurance Company, who cited 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 value, there has been a gain in the life span of fifteen years in sixty-five calendar 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 per cent. 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. 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 possibilities of a further curtailment of mortality among insured persons.

The prevention of occupational mortality has scarcely been begun as a nation-wide effort. Dr. Dublin states that there can be no question 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.

GAPS IN SATURN'S RINGS

Science Service

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 Goldsbrough; 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. Goldsbrough

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. Goldsbrough, 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. Goldsbrough'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.

REVIVAL BY ADRENALIN

Science Service

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.

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 forty-five cases in fifteen 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 ten 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 forty-five seconds 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 a 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 has passed away."

THE COTTON BOLL WEEVIL TO BE ALLURED BY SMELL

Science Service

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 the 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 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.

GLANDS CAUSING PREMATURE AGE

Science Service

GLANDS which cause premature age rather than prolonged youth have been used by Dr. W. M. Swingle, of Yale University, to turn tadpoles into frogs. This process, which in the case of the bullfrog, nature does not complete inside of a year, has been accomplished by Dr. Swingle, using the gland treatment, in about two weeks. The thyroid glands of adult frogs were grafted into bullfrog tadpoles to make them hustle into premature froghood.

Thyroid gland substance is known to have some mysterious effect upon development and when the gland is unnaturally small at birth, or its function is impaired, a child's physical and mental growth is so stunted that it becomes a deformed idiot.

In some cases reported by other investigators where bits of the thyroid gland were fed, the development was more rapid than the growth of the tadpole, so that frogs apparently adult but no bigger than flies were obtained.

Tadpoles deprived of their thyroid and pituitary glands ordinarily were found by Dr. Swingle not to transform into frogs; they remained tadpoles long after normal tadpoles had metamorphosed. However, if these tadpoles without their glands are fed on thyroid or substances containing much iodine they can be made to transform. Some food containing iodine is necessary if tadpoles complete their life cycle. Without iodine they remain in the infantile stage.

ITEMS

Science Service

THE value of a smoke barrage against the assaults of Jack Frost on budding orchards and tender vegetables is being tested at the Edgewater Arsenal under the supervision of Weather Bureau experts. The smoke screens are being supplied by the Chemical Warfare Service. The use of orchard heaters to prevent frost has long been of wide application in the commercial orchards of the far west. It has been suggested that part of the effect of these heaters comes from the smoke given off, which acts as a sort of blanket to prevent radiation from the ground and the foliage and so keeps up the temperature above the frost level. The smoke screens at Edgewood are emitted without material amounts of heat from chemicals such as were used for that purpose in the war. Thermometers are set up in parts of an open field that is kept covered with smoke on clear nights when the conditions are similar to those prevailing when frost occurs. Another part of the field is left clear, but also provided with thermometers and the lowest temperatures reached in each section are recorded. If the tests show the smoke to have any important effect in keeping the temperature up, they will open the way to a wide application of some of the by-products of the war. Professor H. H. Kimball of the Weather Bureau is in charge of the investigation.

A CONCESSION to make use for power purposes of the hot steam and gases emitted by the Tatio volcano has been granted to Sr. Luis Torti, the Pan American Union has been informed. The volcano is located in the Canton of Sud Lipez, near the Chilean frontier. According to Sr. Torti, about 50,000 horsepower should be available as the vapor contains very little carbonic acid and can be immediately transported to the turbines. This quantity of power is estimated to suffice to electrify all the Bolivian railroads and to furnish power for the principal mining companies in Sud Lipez. A similar concession to a stock company has been granted in Antofogasta, Chile, to use the vapors on the Chilean side of the volcano.

ACETYLENE, the gas used in bicycle lamps and home gas plants, has been used by physicians in Freiburg, Germany, as an anesthetic with much the same results as have been secured with ethylene, the new anesthetic developed at the University of Chicago, according to information reaching here. The acetylene, which is usually made by letting water come in contact with calcium carbide, is mixed with oxygen before administration to the patient who is to undergo an operation. Ethylene and acetylene are very similar chemically as the molecule of the latter is made up of two atoms of carbon and two more hydrogen atoms.

THE British government has purchased the ship used by Captain Scott on his South Polar trip of 1901 for a scientific expedition to trace the migration, numbers and rate of reproduction of whales in the Antarctic.