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Shadow of the Atom Lies Over Human Race

Scientists Use Fruit Flies to See if Radiation Will Affect Generations to Be Born in the Future

Editor's Note: Is it possible that an invisible, slow-acting, largely undetectable poison is acting on the human race? The question of the effect of atomic radiation is one of those paramount today in the scientific world. The Star's science editor, Thomas R. Henry, has explored the subject exhaustively in recent weeks. His findings will appear in a series of six stories, of which this is the first.

By Thomas R. Henry
Science Editor of The Star

A somber shadow lies over the promised atomic age.

It is a threat to the continued existence of man on earth, implied from results of experiments with lower animals.

It is not the frequently voiced threat of slaughter and destruction in war on an unprecedented scale, but of the effects of a hidden, insidious, largely undetectable and uncontrollable poison which perhaps is capable of destroying the human race as a biological genus.

According to this thesis, which admittedly is far from satisfactorily established, it is not members of the present generation who are being injured. It is their unborn descendants for generations to come.

This is the recent warning of some of the world's foremost geneticists. They have been discussing it, largely in highly technical papers before specialized audiences for 20 years. Now men like Prof. A. H. Sturtevant of California Institute of Technology; Dr. E. D. Adrian, president of the Royal Society of London; Dr. Herman J. Muller of the University of Indiana, and Prince Louis de Broglie, a leading French physicist, feel that mankind at large should be made aware of its peril. They have been moved to express their own fears by what they consider quite unimpaired statements that the peril they have in mind does not exist.

Strikes at Chain of Life.

The poison is the effect on germ plasm—the stream of life which binds generations—of the slowly increasing background radiation of the earth itself, including the atmosphere and the seas, which may be the aftermath of both American and Russian experimental explosions of atomic bombs, and possibly from efforts to develop atomic energy for peacetime uses.

Horrors of an atomic war often have been pictured—great cities laid waste, millions killed, even civilization itself destroyed. But such calamities do not equal in magnitude the long-range threat which might not begin to become evident for several generations, according to these geneticists.

Their thesis is based largely on theoretical considerations, without thoroughly convincing or precise data. Such data will be extremely difficult, costly and perhaps impossible to obtain. Possibly never before has science been faced with such an elusive task as the one involved in obtaining convincing evidence to prove or disprove the assumptions in question. The postulated effects are quite securely hidden. No microscope will reveal them. Few, if any, now alive will witness them in human beings. It probably will be necessary

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to postulate from species to species—always a dangerous procedure even when such species are as similar as mouse and man.

No Man Can Escape It.

The implications of the warnings are so far-reaching, however, that they would seem to justify almost any amount of research, national and international. These implications are that all branches of the human race may deteriorate seriously, both physically and mentally, and perhaps within a relatively few generations, because of the deleterious changes being introduced into man's germ plasma by the increase in background radiation. Over a relatively short time such radiation presumably is increased equally for everybody on earth by an American explosion in the South Pacific or a Russian explosion in Arctic Siberia. In other words, a Russian explosion a month later might be affecting the population of Washington genetically about as much as the population of Vladivostok.

The implications were stated forcefully by Dr. Sturtevant in an address before the Pacific Division of the American Association for the Advancement of Science.

"There is no possible escape from the conclusion that the bombs already exploded will ultimately result in the production of numerous defective individuals—if the human race survives for many generations. The risk is one to which the entire human race, present and future, is being subjected," the California professor said.

Great Problems of Genetics.

Can anything be ascertained to prove or knock down this thesis? In the entire field of science there probably is no subject more complicated, more difficult to understand, more clouded by prejudice and less available for controlled experiments than genetics—especially human genetics.

Generations of human beings are not subject to experimentation. So most reliable experiments have been and are being made with *Drosophila*, or fruit flies—tiny insects which can be reared in colonies of thousands, and which produce as many as 25 generations in a year. With the fruit flies, long lines of heredity can be established with great numbers of individuals, and, with highly precise technique now known to geneticists, the actual mechanism and ef-

Glossary of Genetic Terms

The following glossary will be found helpful in connection with Science Editor Thomas R. Henry's six-story series exploring the effects of atomic radiation on the human race.

Gene—An invisibly minute particle of protoplasm which is the recognized unit of heredity. It has the unique property of "guiding and bonding together of raw materials around it into an exact duplicate of itself." Each of the trillions of cells which make up the human body contains the full human complement of thousands of genes. Those in the germ cells are passed on to the next generation.

Chromosome—A fine thread thousands of times longer than thick, differentiated along its length into hundreds or thousands of functionally distinct and individual self-reproducing regions—the genes. Every cell in the human body has 26 chromosomes.

Gamete—The mature germ cell of one individual, plant or animal.

Zygote—The union of two germs

cells to constitute a new individual.

Homozygous—An individual who receives identical genes from both parents.

Heterozygous—An individual with parental chromosomes which do not completely match.

Mutation—A change in the gene structure of protoplasm which results in changed hereditary characters.

Half-life—The interval during which half of any radioactive originally present will disintegrate. Uranium has a half-life of several billion years. Radioactive iodine used in thyroid treatments has a half life of eight days. After six half lives, it is calculated, only infinitesimal traces of the original substance will remain.

Roentgen—The accepted unit of radiation defined as "the quantity of gamma or X-rays that will produce a certain electrical conductivity in a cubic centimeter of air under constant pressure and temperature.

Gamma Rays—Exceptionally potent X-rays, the principle radiation causing genetic damage.

fects of genetic changes can be determined.

It is assumed that, generally speaking, the laws of heredity throughout the whole organic world are about the same, from one-celled bacteria to 20-trillion celled men. This would mean that the findings with fruit fly populations can be applied, at least roughly, to human populations.

There Are Differences.

The fact remains, however, that fruit flies are not men. Both are animals, but they belong to widely divergent branches of the animal kingdom. The human organism, presumably, is somewhat more complex. It is known, for example, to differ greatly from the insect organism in ability to withstand radiation. A population of fruit flies can endure, without notably bad effects on living individuals, 10 times the amount of radiation which would kill 100 per cent of a human population.

An insect is born more complete and permanent than a mammal. Throughout its life it has a small percentage of dividing cells. Dividing cells are most susceptible to radiation—the principle fact which makes it of value in treatment of neoplasms or new growth, such as

exists in various forms of cancer. One somewhat fantastic, remote possibility is that man is hastening the day, predicted in the wilder soft of science-fiction, when he himself will be extinct, leaving behind him the more resistant bugs as the earth's dominant creatures.

Fruit Fly Substitute.

As it is impossible to experiment with populations of thousands of men and women, or with few exceptions, to observe human effects over generations, the fruit fly is the most immediately available substitute. A year of fruit fly generations is equivalent to more than 700 years of human generations. At the genetics laboratory of the Carnegie Institution of Washington at Cold Spring Harbor, Long Island, Dr. Bruce Wallace has carried populations subjected to varying amounts of radiation from radium for 135 generations. There hardly have been 135 generations of humans since the days of ancient Babylon.

Science, however, is not concerned as to whether increased radiation will eliminate fruit flies. The question is whether it will eliminate men.

Tomorrow — Atomic Radiation and the Genes.