

Tale of 3 diseases: A common cause?

At first glance, one would doubt whether Alzheimer's disease, a kind of senility that strikes people of middle age; Down's syndrome (mongolism), which causes severe mental retardation; and leukemia and related cancers would have anything in common. But now research conducted by a University of Minnesota investigator, Leonard L. Heston, suggests that a genetic defect is implicated to some degree in all three groups of disorders and that the defect expresses itself in faulty microtubules. Microtubules are tiny tubes that usually course smoothly through cells and are necessary for the organizations of genetic material during cell division and numerous other cellular activities.

Heston's study centered around 30 persons who had died from Alzheimer's disease. He then obtained medical histories on the victims' parents, siblings and children and on all relatives of the victims and their siblings through second-degree genetic relationships. He conducted interviews with the relatives wherever possible and obtained autopsy results whenever relatives died while the study was in progress. Altogether he studied 301 first-degree and 556 second-degree relatives of the 30 Alzheimer victims.

He found the incidences of Down's syndrome and of leukemia and other myeloproliferative disorders (cell cancer such as Hodgkin's disease, lymphosarcoma and multiple myeloma deriving from bone marrow) were notably excessive among this relative group compared with the general population.

Of the 837 persons he studied, Heston found 13 with myeloproliferative disorders; the expected number from a general population would be 5.9. Among the 301 first-degree relatives, he found 10 cases; the expected number would be 3.06. And of 777 relatives, Heston found 6 with Down's syndrome; the expected number from a general population would be 1.2.

Why should there be an unusual clustering of the three disease groups among these families? Heston believes that they are especially prone to some genetic defect that is common to all three disease groups. Alzheimer's disease has a known genetic component. There have been several reports of familial clustering of Down's syndrome and of the myeloproliferative disorders. So what might the common genetic defect be? Heston proposes that it is pathological microtubules.

In nerve cells from patients with Alzheimer's disease, bundles of microtubules constrict and twist, producing in the cell cytoplasm a tangled mass. An identical lesion occurs at early age in the neurons of persons with Down's syndrome. During their fourth decade, victims of Down's develop a dementing illness with microtu-

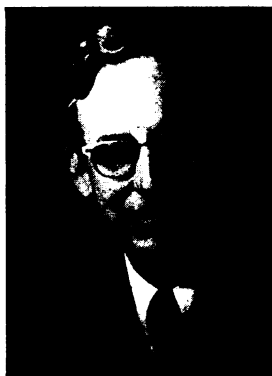
bule pathology indistinguishable under the microscope from that seen in Alzheimer's disease. Although there is not yet any evidence of a link between the myeloproliferative disorders and microtubule pathology, Heston says there are good reasons here, too, to suspect a common pathological mechanism. For instance, the frequency of leukemia is increased 20-fold among persons with Down's syndrome.

In the April 15 *SCIENCE*, Heston speculates that microtubule pathology due to aging, rather than to a genetic defect, might be at the base of senility in persons over age 65 and in Down's children born to older mothers. Senility in older people features the same neuropathologic changes seen in Alzheimer's disease and is separated from Alzheimer's disease by only one criterion, age of onset. Commencement before age 65 signifies Alzheimer's disease, commencement after 65, senility. In other words, Alzheimer's disease may be merely a premature and severe form of a malady that tends to affect a number of people if they live long enough. And the observed increased risk of giving birth to Down's children as women grow older may be due to the greater likelihood of their fertilized eggs giving rise to microtubule pathology. □

Odum: Ecology's highest award

In 1940, Eugene Odum, then an instructor at the University of Georgia, suggested that the zoology department include a course on ecology for majors. No one liked the idea very much. Those kinds of things were covered in other, more basic biology courses, the professors argued.

Not discouraged, Odum decided to write a book about ecology which would show that the concerns of ecology demanded a special treatment in college courses. His *Fundamentals of Ecology*, was to become the most widely used text on ecology for years, responsible in part for the subject's increasing popularity.



Eugene Odum:
Founding the new ecology.

Last week, Odum, now the Callaway Distinguished Professor and director of the Institute of Ecology at the University of Georgia, won ecology's highest honor, the Pepperdine University Tyler Ecology Award. At a White House ceremony, President Carter presented Odum the award and a check for \$150,000 which is given with the prize.

This was Odum's second big prize in the last few years. In 1975, he and his brother Howard, who collaborated on the ecology text, won the Prix de l'Institut de la Vie in Paris. Both the Prix and the Tyler award are considered by many to be equivalent to the Nobel Prize in ecology.

Odum's accomplishments span all areas of ecological research. His early work on the ecology of salt marshes broke the ground on knowledge of estuarine ecosystems. In 1954, Odum established a marine institute on Sapelo Island, Georgia, which was to continue his marine studies. Odum also founded a new branch of ecological study—radiation ecology. He was one of the first to use radioactive tracers in studies of food chains. Since the early 1950s, he has worked with the Atomic Energy Commission's Savannah River Plant on ecological studies.

Odum and his brother were one of the first to recognize the importance of energy flow as a principle of ecology. This concept was a tremendous aid to those studying the relationships between the different trophic levels of a community.

Lipid metabolism in migratory birds is another field in which Odum excelled. From studies on birds in the 1960s, Odum was able to establish a physiological understanding of the stamina of birds in long flights.

Unlike other ecologists who blanch when critics use their names synonymously with environmentalists or outdoorsmen, Odum is glad to see ecology gaining recognition. Recently, Odum has himself been seeking a wider usage and scope for ecological principles, which he has called the "new ecology." While scientists, especially molecular biologists, have been carrying out "reductionist" studies into the components of life, the new ecology would seek a holistic approach that would gather the parts and put them together.

Besides providing a framework in which the "reductionist" disciplines would operate, the new ecology would also incorporate principles of social sciences. Odum is hopeful that the now disparate fields of economics and ecology can be brought together in a valuable and meaningful way. Odum says that ecology, which is the study of the house, should not be so different from economics, the management of the house. Important national policy decisions like those dealing with energy will have to utilize data from the natural and social sciences, Odum posits, and ecology will be the common ground of both areas. □