The biota of the earth has also gradually changed with time due to such evolutionary processes as biological adaption to environmental changes by genetic alterations and natural selection.

Wonderful as the genetic mechanisms are for ensuring diversity and adaptability to changes in our physical environment, it is important to remember that their response is relatively slow, especially for the highly organized forms of life. Evolutionary changes are geared to long spans of time—thousands and even millions of years.

Although species of organisms may become adapted to living under different environmental conditions by evolutionary processes which are entirely beyond their control and which occur only over very long periods of time, man has acquired the ability to intentionally and grossly change the environment to meet his desires. One of civilized man's chief goals has been to alter his environment to make his way of life easier and more secure, and to satisfy his ambitions to acquire possessions and prestige.

Not only has man changed his own environment but he has changed or is changing the physical environment for essentially all other creatures that live on earth. Since life evolved on earth, there has never been a biological influence that has so altered the environment. The stresses and changes that man has caused to the natural communities on earth compare in magnitude to those caused by the ice ages—and the long-term effects can be expected to be more severe unless man acts promptly to find and correct his errors. Biological alterations have never before occurred so rapidly and the speed of changes resulting from man's activities is accelerating.

The tremendous quantities of man's wastes which are poured into fresh waters, into the air, onto the land, and into the oceans constitutes one of the dominant abuses imposed on nature by man.

Marked changes have taken place in many of our streams, lakes, estuaries, and coastal waters because of their misuse. Many streams throughout the Eastern United States which once flourished with fish are now barren due to pollution from industrial and domestic sources. Valuable commercial species of fish, such as salmon and shad, have disappeared from great rivers. There are many serious problems from overenrichment of slow-flowing and impounded inland waters and estuaries from domestic and agricultural wastes. Large areas of oyster beds which were an important source of food in former times and which once represented an important part of our commercial oyster fishery have either been contaminated by infectious microbes from sewage during recent years or conditions for growth have been so degraded that productivity is much less than it used to be.

Well-known examples of lakes that have become seriously degraded by pollution include Lakes Washington, Tahoe, and Erie; the Potomac is a classical example among rivers; the tidal waters of the Sacramento River are an example of a polluted estuary; and a good example of a degraded marine environment is the coastal waters of Long Island.

Domestic wastes, the excrement from farm animals, surface runoff from some agricultural lands, and certain industrial wastes contain materials which are nutrients for plants. When such materials are discharged into surface waters, they stimulate the growth of aquatic plants. Overenrichment may cause unsightly algae blooms to develop and the oxygen content of the water may become depleted until many or all forms of aquatic animal life perish. In addition to loss of fishery resources, overenrichment limits or destroys recreational values of an area, and in the case of lakes it causes premature and speeded aging.

As yet we do not have sufficient information to develop methods for controlling over-fertilization of our waters, simply because we have not done enough research and development on the subject. We do not know whether it will be possible or feasible to reverse or to stop advanced cases of eutrophication or over-fertilization in lakes. The problem is complex and likely will be very expensive to solve. It will require new techniques for treating sewage because our current methods are designed primarily for the removal or destruction of disease-producing microorganisms. By present methods, primary treatment removes the large particulates. In secondary treatment, microbiological processes break down complex organic materials to simple, soluble compounds which form a rich nutrient brew that flows into the natural water systems where it nurtures the mass growth of noxious plants. It is clear that tertiary sewage