(4) The developing program on aerobiology will be greatly aided by phenological studies on the a) species that produce pollen of an allergenic nature, b) plant pathogens, and c) harmful insects.

(5) Predict fruit and seed yields of native species (commercially important tree species to weeds) as well as crop yields based upon phenologic data throughout the range of key species.

(6) The development of phenologic maps that would predict, a) planting and harvest dates for crop and ornamental plants, b) outbreaks of plant and animal borne diseases, c) migration of birds, d) spawning of fish, e) emergence of aquatic insects. Such maps might in time, evolve into a phenologic Atlas that would be of value to farmers, agronomists, foresters, and many other groups of people. The Europeans have developed similar maps for planting and harvesting crops. This resulted from a cooperative phenologic network.

This desired information can only result from intensive studies on a few key species at selected locations (the intensive program) and from a North American Phenological Garden Network and a Survey Network. Such a program requires a great deal of cooperation and coordination. In turn the international exchange of information will be essential to the development of an efficient and accurate predicting system.

*D. Program on environmental physiology*

The program in Environmental Physiology is broadly concerned with environment-organism interaction at all levels of biological organization—from population dynamics to cellular reactions to stresses. In order to understand why particular organisms live in certain environments it is necessary to know the nature of their physiological adaptations. Studies of physiological adaptations of plants and animals can give clues as to how these organisms came, in the course of evolution, to be distributed as they are now; also such studies have predictive value as to how organisms may adapt to environments as they are changed by human influences.

*Anticipated achievements*

(1) Knowledge is needed of the physiological basis for geographic and ecologic distribution of closely related species and identification of genetic difference between local populations. For example, a comparison of estuarine and shallow-water marine animals will be made over a wide latitudinal range. Such latitudinal studies cannot be made by single investigators but rather require cooperative efforts among many laboratories and several countries. Studies of physiological variation in diverse populations are necessary to provide a rational basis for improved productivity of different habitats.

(2) Two Inter-American studies are proposed. One deals with species of expanding ranges. This is vital for both Americans as man continues to alter his habitats and many plants and animals are becoming "weeds" by expanding their ranges. Examples of such organisms are: mesquite, Acacia, house mouse, cockroaches, certain thorny leguminous shrubs. Knowledge of the physiological basis for expansion of range of such species, usually undesirable ones, is important in terms of productivity of different habitats. A related Inter-American project deals with the physiological basis for divergent and convergent speciation. Questions will be asked concerning the degree of occupancy of the same niches by related species, the similarity between ecological communities in similar environments on the two continents, the origin and relationships of similar genera and species in the Americas. Such knowledge is of evolutionary importance in providing baselines for planning man's future relations to his ecosystems.

(3) A program of great practical importance deals with chemical interactions between insects and plants and between plants. A new method of insect control may emerge from studies of terpenes and other organic products of plants which prevent development of pest insects by serving as hormonal analogues. For example, in the course of evolution some conifers have come to produce substances which protect the trees from insect attack. The fir balsam contains an extremely active analogue of the juvenile hormone of one family of bugs and has thereby achieved full and complete protection from a number of related insects. The protective compounds of a native tree on one continent against particular insects appear to be different from those of related trees on another continent. Chemical identification of the active substances for various plants against poten-