The regional primate centers: A national scientific resource

Children, behold the Chimpanzee:
He sits on the ancestral tree
From which we sprang in ages gone.
I'm glad we sprang: had we held on,
We might, for aught that I can say,
Be horrid Chimpanzees today

"The Chimpanzee"
Oliver Herford (1863–1935)

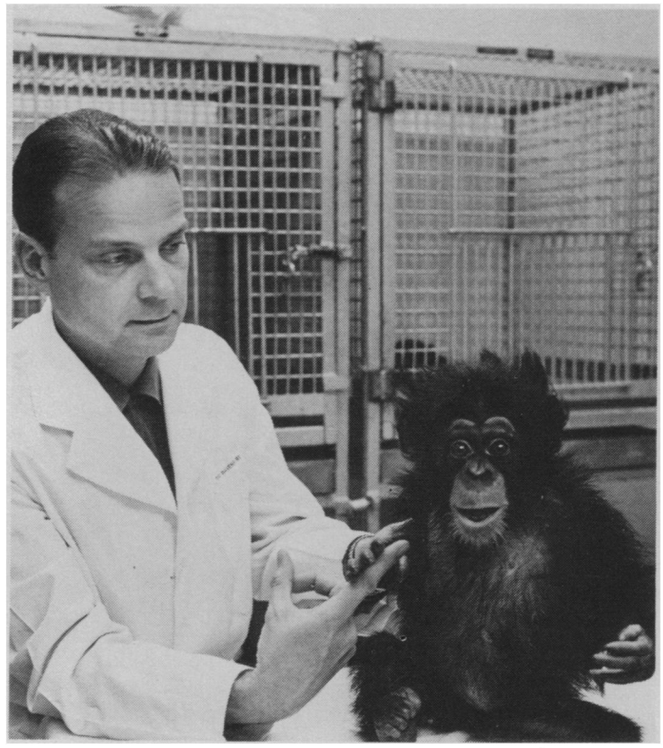


Photo: Yerkes

Davenport studies the effects of isolation on chimps.

by Robert J. Trotter

Down from the trees, but not out of the woods, man must go back to his ancestors for knowledge of himself. Research scientists rely heavily on man's most recent ancestors and closest relatives, the nonhuman primates, to serve as animal models in which human diseases and life processes can be duplicated and studied.

As early as the mid-1940's, the scarcity of such primates and the paucity of information on how to handle them became problems for the researchers. It was not until 1957 that a solution was suggested. The National Heart Institute and the National Advisory Heart Council proposed that a federally funded primate station be established for long-term multidiciplinary cardiovascular research. In 1960 Congress approved the funds and the Primate Research Centers Program was established within the National Institutes of Health. Research in other fields also used primates, and in 1961 and 1962 Congress made funds available for six additional centers.

With research no longer limited to heart disease, administrative responsibility for the primate program was given to the Division of Research Resources (DRR), an independent research component of NIH. Administrative responsibility for individual centers is provided through host institutions. Each center is located near and affiliated with a university.

To make the centers a national resource, and to give scientists in all parts of the country access to primate research facilities, the centers are widely separated geographically and are given regional areas to serve.

The centers now maintain colonies of nearly 8,000 primates, representing 45 species. Approximately 100 scientists, 275 collaborating investigators and 124 graduate students are involved in more than 500 research projects.

In addition to basic research, the centers provide basic services. They publish research findings, train personnel for maintenance and handling of primates and provide facilities for visiting scientists to learn techniques they can employ in research elsewhere. Last year more than 300 scientists received tissue samples, organs, blood, skeletons or whole animal bodies and other biological specimens from the primate centers. In some instances, for special investigations, the centers also provide live animals.

In the years since the centers have been in operation each has grown and developed a particular set of research interests and specialties. Principal staff members and the needs of the host institutions usually determined where this major interest would lie. But as needs for national attention to particular health problems became apparent, new research activities had to be initiated. Logically, the same research should not be developed to the same extent at every center. So NIH has recently taken a more active role in coordinating the over-all missions of the seven centers. NIH indicates specific areas that need to be more strongly promoted. The DRR, knowing the particular strengths of each center, reviews grant applications and is able to control each center's direction of growth. William J. Goodwin, chief of the primate research center of the DRR, says this helps to develop strong research teams in two or three areas at each center. "This," he says, "is better than letting each center grow in many directions."

The University of California Primate Center at Davis, for instance, was formerly the National Center for Primate Biology. Last month Goodwin approved the center's name change and defined a new set of goals for it. The center was originally commissioned to do normative baseline studies and to study primate husbandry. But baseline studies are nearing completion for most species, and some centers are now producing almost all the animals they need for research. Eventually, as certain species become harder to get, the centers will have to supply all their own animals, says Goodwin.

So, with primate husbandry becoming a secondary mission at every center and with baseline studies completed, the Davis center needed a new mission. The growing concern about environmental problems provided it. NIH decided that the Davis center should concentrate on environmental health with special emphasis on environmental toxiology and viral oncology.

The Yerkes Regional Primate Research Center at Emory University in Atlanta also has a well defined mission. Research there concentrates on psychobiology studies in the great apes.

Yerkes has nearly 1,000 primates, including the world's largest colony of great apes. It includes 15 gorillas, 32 orangutans, 79 chimpanzees, 5 gibbons and 2 siamangs.

Using these animals, Duane M. Rumbaugh of Georgia State University has shown that the great apes possess learning abilities not seen in other primates (SN: 4/22/72, p. 264). Now he is involved in a four-year study of primate, nonvocal language skills. A chimpanzee and an orangutan, both two years old, are being taught to communicate via a computer. One key, for example, contains all the symbols for "Give me a cookie." When the ape pushes it he is rewarded with a cookie. Eventually the symbols will be put on four separate keys and the animals will have to hit all four keys in the correct sequence. The researchers hope to learn more about the conditions that control the development of language.

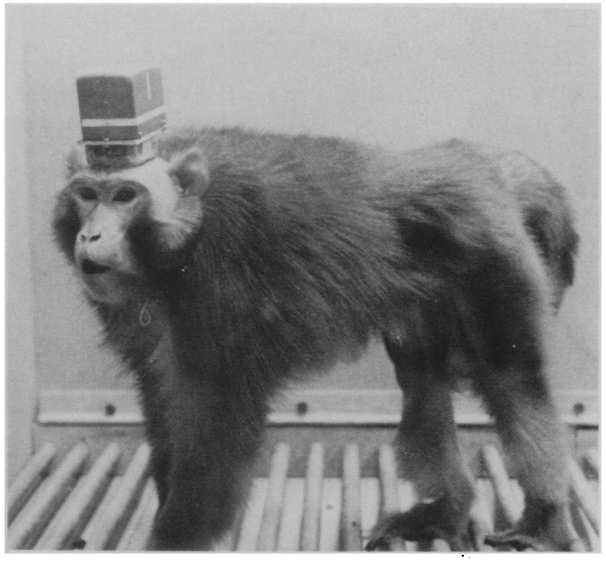
In another set of experiments Charles M. Rogers of Yerkes and Richard K. Davenport of the Georgia Institute of Technology (SN: 5/6/72, p. 299) are studying the effects of infant isolation on chimps. Beginning in 1956, each consecutive birth in the laboratory colony became an experimental subject in the program. After two years 16 animals had been accumulated for the study. They were reared in restricted conditions from birth to approximately two years of age. Following the isolation the chimps were subjected to a wide range of procedures aimed at assessing the effects of isolation.

The effects of such rearing on rhesus monkeys has been vividly demonstrated by Harry F. Harlow and his associates at the Wisconsin center (SN: 10/1/70, p. 100). But Davenport and Rogers have undertaken to analyze the effects of infantile isolation on the animal most similar to man, the chimpanzee. With the monkey, Harlow found that severe isolation produces profound effects on social behavior but has no measurable effect on intellectual factors. In contrast Davenport says, "We have obtained consistent results over a variety of intellectual assessment tests which indicate that early restricted rearing in the chimpanzee produces long lasting (into adulthood) deficits in acquisition rates similar to the performance of mentally retarded humans." This apparent difference in results may be due to data analysis, or it may be due to the difference in species. As Rumbaugh has shown, chimps and the other great apes have a more highly developed brain than monkeys, and perhaps their intellect is more easily and permanently affected by isolation. In either case, it it clear that the amount and kind of experience provided during the early years is of critical importance in later development for monkeys, apes and man.

Work at Yerkes is not restricted to the great apes. Other primate research is under way in anatomical and physiological studies of the central nervous system, histochemistry and muscle pathology, endocrinology of reproduction and studies of the blood.

In the neurophysiology laboratory Adrian A. Perachio uses implanted electrodes to study and record activities of specific areas of the brain and correlate that activity with behavior. The electrodes are implanted in the brains of rhesus monkeys and stimulated by remote control. In this way the researchers are able to localize areas of the brain that might participate in the manipulation of social behaviors such as aggressiveness and sexuality.

Perachio is also using electrical implantation to study electrophysiological activity in cortical and subcortical areas with respect to sleep. Sleep patterns of the nocturnal owl monkey are monitored under normal circumstances and again with the light-dark periods reversed. This work is sponsored by NASA as is another experiment that monitors alterations in sleep patterns while the monkeys are kept in a rotating cage. The results of this work will be applicable to astronauts who are subjected to similar circumstances in space. Other space research at Yerkes is being done on the effects of prolonged weightlessness and on histochemistry and muscle changes. A compound to breed monkeys especially for space research has also been developed there.



Rhesus monkey equipped with apparatus for remote control electrical stimulation of the brain.

Like the Davis and Yerkes centers, the other five centers have begun to concentrate on specific research areas. The Oregon Regional Primate Research Center in Beaverton specializes in reproductive physiology. Anthropology, cardiovascular physiology, cutaneous biology, immunology, neurophysiology, and radiology are also emphasized.

The Regional Primate Research Center at the University of Washington in Seattle emphasizes neurophysiology, the cardiovascular system, oral-facial growth and development, studies of eye movement and central nervous system control of endocrine responses.

The New England Regional Primate Research Center in Southborough, Mass., investigates infectious diseases, the endocrinology of growth, nutrition, animal behavior and neurophysiology.

The Wisconsin Regional Primate Research Center in Madison studies behavioral and physical development with other studies in brain function, mental retardation, biochemical mechanisms of learning, abnormal behavior and amino acid metabolism.

The Delta Regional Primate Research Center in Covington, La., focuses its activities on infectious diseases and nutrional diseases, with studies in behavioral biology.

In addition to the seven regional centers, the DRR is taking on additional responsibilities by providing resource support for other primate centers. For example, the primate colony at Holloman Air Force Base near Alamogordo, N. M., is now receiving contract support from DRR for its basic operation. Goodwin expects to be giving similar support to other centers in the future and to any new ones that are built. But he does not expect NIH will have funds to build another regional center.

DRR funding for the centers amounted to about $10 million last year and is expected to remain at about that level in the near future. But each center is encouraged to seek outside grants from other Federal and private agencies. This income was about $4.2 million in 1970 and rose to $5 million in 1971. Goodwin says this amount will continue to increase as primate research becomes more sophisticated and valuable, and as more and more primates are used to answer man's questions about himself. □