

rush to the person offended and try to kiss for forgiveness. If held off or repulsed she would cry with great emotion until the disciplinarian relented and accepted her kiss. Then she would heave a great sigh of relief.

Although she would forget admonitions much more quickly than would Donald, she was much more ready to obey when first spoken to. Never would she deliberately persevere in misbehavior, although she did develop a sly way of getting into mischief when not observed.

Throughout the experiment both ape and human infant were given scientific tests of their mental development and the results recorded in precise form in a journal, or scientific diary. Twenty-eight special tests and experiments were devised for comparing the progress of the two babies, and well-known psychological tests for babies were administered to ape as well as child.

On many of these tests, the little ape distinguished herself for her superior ability. When the problem was to secure a bit of apple from beyond a fence by pulling it forward with a hoe, little Gua had no difficulty in getting the idea of making use of the tool. Neither had Donald, but to him the hoe was of more interest as a plaything than as a means for securing the apple.

Donald at 17½ months was able to point to the "bow-wow" in a set of pictures used for testing knowledge of words. Gua at 15 months could point out not only the "bow-wow" but also the shoe. Gua, as well as Donald, would respond correctly to such simple direc-

tions as: "Show me your nose," "Hand me your bib," and "Not in your mouth."

Physically, Gua matured much more rapidly than did Donald. This the Kelloggs expected.

But this superior rate of physical development was also accompanied by a superior ability to learn what we consider human behavior.

This chimpanzee infant was able to eat with a spoon, drink from a glass, walk upright, skip, and practice desirable toilet habits, all much better than the average child of her age.

Does this mean that the chimpanzee infant is more intelligent than is the human child of the same age? Not at all, Dr. Kellogg warns us. We still do not know what the ape's capacity for mental development is—what is the limit beyond which she cannot grow.

What we do know is that when a mental test is given an ape—or a child—more than just native capacity is tested.

This background of training or lack of it, of human or un-human treatment, of confinement and petting, or of freedom with responsibility and respect—this is all a part of what is tested along with the inborn capacity handed down to the creature by heredity.

And if the environment means so much to the development of an ape—a child must receive tremendous influences from his surroundings and early training. This finding, Dr. Kellogg believes, has important applications for education, child psychology, biology, and sociology.

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## PHYSICS

## Cosmic Rays Supply Most of Energy For Universe

**C**OSMIC RAYS are the chief source of energy in the universe. From 30 to 300 times more energy is shooting through celestial space in the form of cosmic rays than in all other radiant energy forms combined. This is the conclusion of Drs. I. S. Bowen, Robert A. Millikan and H. V. Neher of the California Institute of Technology, expressed in a communication to the *Physical Review*.

Their estimates of the energy falling on some body millions of light years away from the earth is based on new high-altitude measurements of cosmic

ray intensities. They conclude that the energy falling on the earth from the stars is only twice as great as that coming from space as cosmic rays.

The earth is located not far from a huge group of stars that astronomers call our galactic system so that the earth is in a region of highly energized space. A body located in inter-galactic space would receive from 60 to 600 times less star-light than the earth.

The California scientists have taken measurements on the decrease in strength of the cosmic rays as these rays plow through the atmosphere. By add-

ing up all the measured energies over all heights from the surface of the earth to the top of the atmosphere they have obtained definite information on the total cosmic ray energy intercepted by the earth.

The estimates of the density of starlight energy in the universe were made by Dr. S. A. Korff, also of the California Institute of Technology. The uncertainty as to the exact amount depends upon the uncertainty as to the exact number and brightness of all the stars and luminous matter in the universe.

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## BOTANY

## Century-Old Collection Yields New Plant Species

**P**LANT species entirely new to science, though they were collected, pressed and dried over a century ago, are being turned up daily at the U. S. National Herbarium. The collection of botanical specimens which is yielding these new scientific treasures has had a romantic history.

In 1783 a noted Spanish botanist and physician, José Celestino Mutis, was sent by his king, Carlos III, to make a great collection of plants in northern South America. Establishing what he called a "scientific factory" in Bogota, with a staff of assistants and artists, he accomplished a tremendous amount of work, but he was interrupted by death in 1808 with his ambitious project still unfinished.

During the Colombian revolution in 1816 the collection and paintings of flowers were sent to Spain. They have been in Madrid ever since, with nothing much done about them, although a couple of abortive attempts were made to resurrect the collection and complete Mutis' work.

Last year Ellsworth P. Killip, of the Smithsonian Institution, visited the botanic garden at Madrid, and together with Dr. Arturo Caballero, director of the garden, made a cursory examination of the collection. It became apparent that there was much material of high scientific interest in it. Mr. Killip brought home duplicate specimens of many of the plants, and is working on them in Washington at the National Herbarium, while Dr. Caballero is examining the specimens in the main collection in Madrid. Thus far, more than a hundred new species have been discovered among the old pressed plants.

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