and Human Services.

(Percentages in this article have been adjusted for the 2.7 percent inflation rate anticipated by the Congressional Budget Office for FY 1996. Figures for 1995 remain estimates because the agencies haven't released final numbers yet.)

R&D budgets for the Department of Defense, the Department of Agriculture, and parts of the Department of Energy have become law. Defense-related R&D at the Departments of Energy and Defense received $39.4 billion, a 1.7 percent increase over FY1995, AAAS reports. Funding for Energy's basic science programs grew by 7.4 percent, while Defense's fell 6.2 percent.

If Congress has its way, the government's nondefense R&D programs will suffer a 5.6 percent decrease overall. "But this figure is by no means final," AAAS warns. In contrast, Congress requested a cut of about 13 percent in the budgets of most other domestic programs.

Agriculture's R&D budget got cut by 6.4 percent. Funding for its basic research declined 3.1 percent, from $594.2 million to $591.5 million, AAAS reports.

The President has not signed FY 1996 appropriation bills that would fund NASA, the Environmental Protection Agency, the National Science Foundation, the Commerce Department, or the Department of the Interior. They are operating on funds that run out March 15.

Congress has proposed some big cuts in those agencies, however (SN: 4/22/95, p. 245; 9/23/95, p. 204), including eliminating Interior's Bureau of Mines (SN: 1/6/96, p. 7). The department's National Biological Service would move to the U.S. Geological Survey. Also in danger of getting the ax is Commerce's Advanced Technology Program, which develops risky, but potentially lucrative, enterprises with industry.

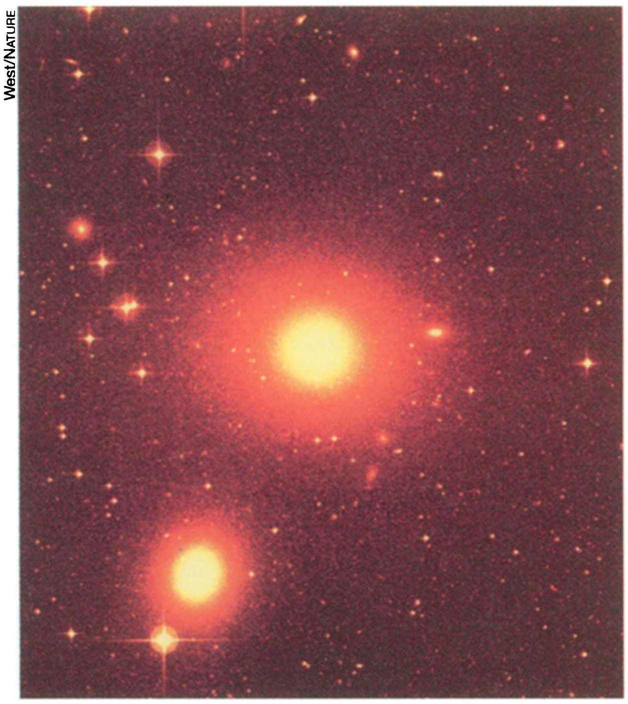
Funding for basic science in 1996 would drop by almost 34 percent at Interior, 25 percent at EPA, and 2.7 percent at NSF. — *T. Adler*

NIH may lead civilian agencies in funding increases.

Tracing the architecture of dark matter

Stars and galaxies set the night sky aglow, but these glittering jewels account for only a tiny portion of matter in the cosmos. For more than half a century, astronomers have gathered evidence that at least 90 percent of the mass in the universe doesn't emit light. This invisible material, known as dark matter, exerts a gravitational tug, just as stars and galaxies do, but has otherwise remained a mystery.

West/Nature



Central region of the Fornax cluster.

Now, a team of Japanese astronomers argues that dark matter has another property in common with visible material. The unseen matter forms small lumps that coalesce into bigger lumps, in the same way that visible stars group into galaxies and galaxies assemble into clusters.

The researchers also speculate that two distinct kinds of dark matter may exist—one that congregates around individual members of a cluster of visible galaxies and another that gathers around the cluster as a whole.

Yasushi Ikebe of the University of Tokyo and his colleagues report their findings in the Feb. 1 NATURE.

To trace the dark matter in a cluster of galaxies, Ikebe and his colleagues measured the distribution of hot, X-ray-emitting gas that resides there. They made the standard assumption that the pressure exerted by the hot gas equals the gravitational attraction of the cluster. Under this condition, regions that have a higher density of dark matter will trap more of the gas.

In July 1993 and January 1994, Ikebe's team used the Japanese X-ray satellite ASCA to map the X-ray-emitting gas within a nearby cluster, Fornax. Instead of being distributed smoothly within and just outside the cluster, the gas clumped into two distinct regions. Some of the gas gathered around NGC 1399, a massive galaxy at the center of Fornax, while a larger amount concentrated around the entire cluster.

From these findings, the researchers conclude that dark matter congregates into lumps on both the galactic scale and the much larger cluster scale. They further propose that dark matter clumps at various sizes in between.

Previous observations had already hinted that clusters of galaxies contain a substructure of dark matter, notes Michael J. West of Saint Mary's University in Halifax, Nova Scotia, in an accompanying commentary. "Nevertheless, Ikebe [and his team] do provide strong additional support for the notion that the dark matter content of the universe is arranged in a continuous hierarchy of structures from small to large scales.

"This hypothesis lies at the heart of most currently popular models for structure formation in the universe, which propose that [the patterns of] galaxies and larger structures originate from small clumps of dark matter that clustered together to form progressively larger objects," says West.

Neta A. Bahcall of Princeton University calls this picture "consistent" with her team's recent finding that the dark matter in clusters consists largely of material contributed by the halos around individual galaxies. When galaxies form a cluster, some of the dark matter gets stripped off and gathers around the cluster as a whole, she speculates.

Ikebe and his collaborators propose an alternative explanation for the clumping. They suggest that they may have seen effects of two kinds of dark matter. Indeed, cosmologists suggest that slower material, known as cold dark matter, might form the smaller, galaxy-sized lumps, while faster material, known as hot dark matter, assembles into the bigger lumps associated with galaxy clusters.

Models in which the universe consists of a mixture of hot and cold dark matter are currently in vogue as astrophysicists try to reconcile old theories with new data about the evolution of the cosmos.

— *R. Cowen*