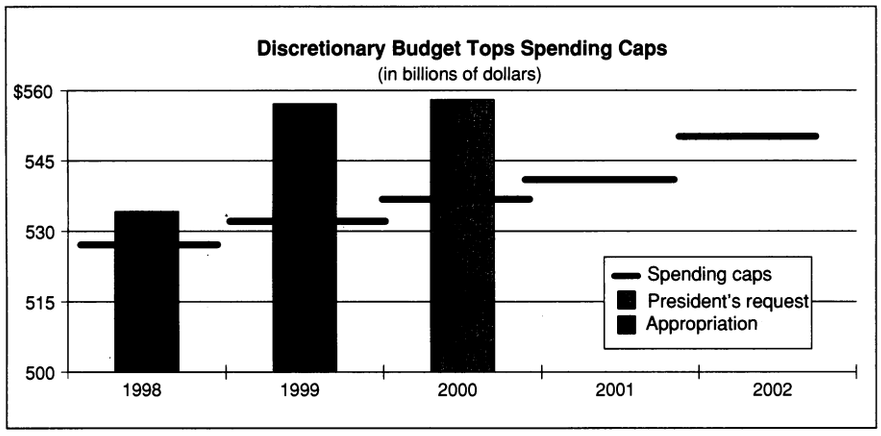

Over the top. Congress once again seems likely to exceed levels set in a 1997 law designed to curb so-called discretionary spending.

penditures as well as a means to negotiate increases in education, transportation, and other popular programs.

How did Congress get itself into such a fix? The problem goes back to a 1997 law that imposed "caps" on specific budget areas. Adopted during a time of deficits, the caps have become a headache now that the government anticipates annual budget surpluses. Last year, Congress and the Clinton Administration retained the caps but circumvented them by labeling many programs as "emergency" measures. That label exempted them from a requirement that any increase be offset by a cut of equal or greater size. As a result, federal outlays officially remained below the caps in 1999. In reality, however, Congress overshot its target by some $20 billion (see table). Analysts say that the same thing is likely to happen in 2000.

Among Republicans, the most outspoken critics of the budget gimmicks are members who draft the spending bills—the chairs of appropriations committees. Early this month, for example, Senator Ted Stevens (R–AK), chair of the Senate Appropriations Committee, said: "I don't think we can live under these caps." On 14 April, Representative John Porter (R–IL), chair of the House subcommittee that writes the appropriations bill for NIH, told the National Health Council, a biomedical interest group, that he wanted to duplicate last year's 15% increase for NIH. Porter said that both Democrats and Republicans want to change the rules to allow hefty increases but that neither wants to be the first to propose it. "In the end," Porter predicted, "the White House and Congress will sit down and quietly raise the caps."

Democrats were even more critical. Senator Jay Rockefeller (D–WV), a member of the Senate Commerce subcommittee for science, described the 15 April vote as a setback for research. "Now is not the time to turn our back" on science and technology, Rockefeller said at a Senate hearing on the Administration's R&D budget request for 2000. Representative George Brown (D–CA), ranking member on the House Science Committee, summed up the prevailing skepticism about the fate of the budget resolution in a press release issued last week. The bad news, Brown said, is that the budget resolution "treats R&D very poorly. ... The good news is that this budget is almost entirely irrelevant."

–ELIOT MARSHALL

ASTRONOMY

Black Holes Enter the Middleweights

Black holes have seemed to come in only two varieties: "supermassive" ones, which power brilliant galaxies called quasars and weigh millions to billions of times more than the sun, and "stellar mass" black holes, which have about the mass of one large star. But at the meeting of the High Energy Astrophysics Division of the American Astronomical Society in Charleston, South Carolina, last week, two groups reported the discovery of a new class of black holes right in the middle.

Astronomers believe that stellar mass black holes form when a massive star reaches the end of its life and collapses to a point of infinite density. Supermassive black holes are more mysterious. "No one really knows" where they come from, says astronomer Richard Griffiths of Carnegie Mellon University in Pittsburgh. One theory holds that they form in so-called starburst galaxies, which contain seething cauldrons of young, hot stars that flare up suddenly in the galaxy's core and burn out just as fast, leaving behind a pile of stellar debris, including stellar mass black holes. These may lump together and feed off the remains of other stars, growing into giant black holes.

To test this hypothesis, astronomers have searched nearby galaxies for the intermediate-size black holes that should form along the way. Black holes are invisible, of course, but the hot, gaseous accretion disks that encircle and feed them are not. The hot gas emits copious x-rays, and its spectrum also has an x-ray "tail," thought to result as ultraviolet photons from deep inside the disk collide with fast-moving electrons at the surface, gaining energy. The total disk luminosity fluctuates dramatically, but theorists think that the maximum luminosity is proportional to the mass of the central black hole. Earlier searches turned up several x-ray sources bright enough to be intermediate-mass black holes, but these sources did not seem to have the expected tail or the rapid variability.

Now, two groups have taken a closer look at several of these x-ray sources. Griffiths and his Carnegie Mellon colleague Andrew Ptak pointed the Japanese x-ray satellite ASCA at one source in the starburst galaxy M82. They found a fluctuating x-ray source whose luminosity and variability pattern matches that of a disk around a black hole weighing 460 times the mass of our sun. X-ray astronomers Ed Colbert and Richard Mushotzky of the Goddard Space Flight Center in Greenbelt, Maryland, examined 39 archived galaxy spectra compiled by the x-ray satellite ROSAT and found the telltale x-ray tail in six sources. The high luminosities of another 15 sources suggest that they are also black holes ranging from 100 to 10,000 times the mass of the sun, although they lack the complete spectral fingerprint of an accretion disk.

"The two studies complement each other nicely," says Griffiths. He adds that the studies, which are appearing in this month's *Astrophysical Journal* and *Astrophysical Journal Letters*, are "a major clue" that the objects are supermassive black holes in their infancy.

The observers "have done a very uncertain exercise very carefully," says astrophysicist Jean-Pierre Lasota of the Meudon Observatory in France. But not everyone agrees that these middle-sized black holes are newly formed from collapsed stars and are on their way to becoming even bigger. Astrophysicist Fred Lamb of the University of Illinois, Urbana-Champaign, for example, thinks it is more likely that both middleweight and supermassive black holes condensed out of primordial material in the early universe.

Sorting out these possibilities will take some time. "No one ever thought much about" middleweight black holes, Mushotzky points out, "because no one had ever seen one."

–MARK SINCELL

Mark Sincell is a free-lance science writer in Tucson, Arizona.

SOURCE: AAAS