and 29%—are not significantly different.

But that is still not quantitative enough for Savage. Given the relatively huge confidence intervals he calculates for most forecasts, he sees no point in ranking risks any more specifically than being low, intermediate (10 to 90% probability), or high. Even the subjective letter system suggests more certainty than there is, he argues.

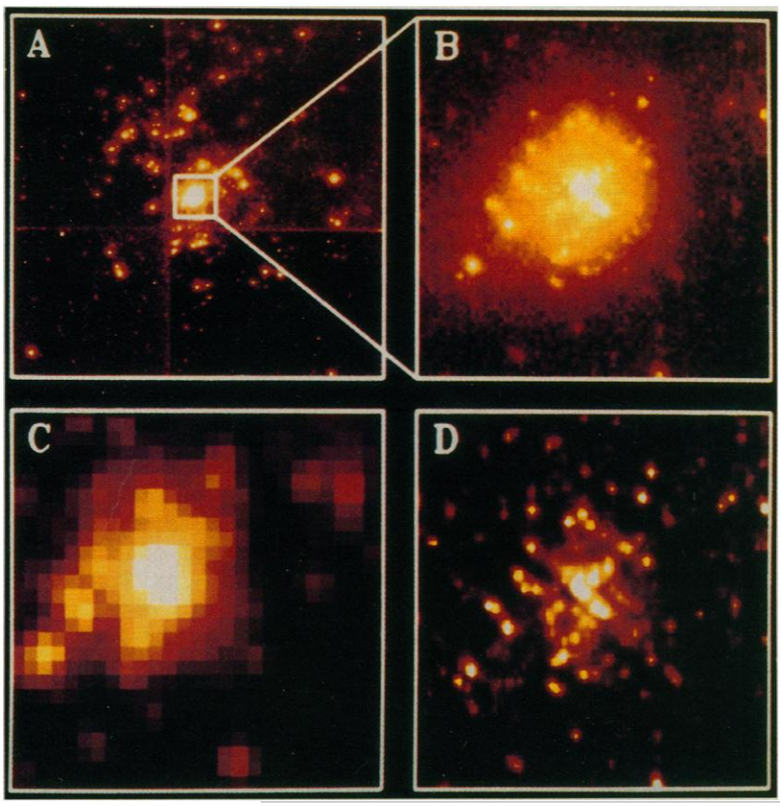
Although Savage has been waging something of a one-man campaign in his appeal for greater rigor, he does have some support among his colleagues. "I have the intuitive feeling that seismologists and geologists can't tell the difference between probabilities of 10% and 40%," agrees John Filson, himself a seismologist at the Survey's Reston, Virginia, headquarters. But Filson, like the USGS group, considers Savage's argument to be academic when it comes to public safety. In that arena, Filson says, "What's important is telling the difference between 0.1% and 10%. I think we can do that."

For the moment, at least, the USGS forecasters seem unlikely to change their practices, despite Savage's criticisms. Even statisticians do not agree on the advisability of placing uncertainties on probabilities, says James Dieterich of the Menlo Park office, who is chairman of the group. And anyone wanting more quantitative measures of uncertainty can find them by digging into the calculations in the report, he says.

While the debate continues on earthquake forecasting, the field's next test may be unfolding on the Parkfield segment of the San Andreas in central California. In 1985 the National Earthquake Prediction Evaluation Council endorsed a prediction that there was a 95% chance that that segment would break in January 1988 ± 5 years in a magnitude 5.5 to 6 shock. Parkfield (population 34) soon became the center of a dense—and expensive—instrument network intended to record and possibly make a short-term prediction of that quake.

More than 2 years past the midpoint of the target range, researchers are still watching and waiting. They could be there a while longer, says Savage. He notes that the reassuring 95% probability was premised on an unproven assumption—that the regular 22-year cycle of Parkfield quakes was back on schedule after one struck 10 years early in 1934. Drop that assumption and the probability falls to 67%, as was pointed out in 1985 by the scientists who first made the prediction. Savage's calculation comes out as a 60 ± 20% chance by 1993. With that kind of uncertainty, the wait at Parkfield could last far beyond January 1993, stretching researchers' patience as well as their budgets.

■ RICHARD A. KERR



Hot Young Stars

Having given astronomers some nasty shocks of late, the Hubble Space Telescope changed its act last week and produced a surpise of the nice kind. NASA astronomers were running routine engineering tests on the telescope when they got top-quality pictures (above) of a stellar nursery in the nearby galaxy called the Large Magellanic Cloud. The images are better than any made on the ground, proving that the $1.6 billion observatory can yield new science even before a rescue mission is mounted.

"The mood's really improved around here," says astronomer Richard L. White of the Space Telescope Science Institute in Baltimore. "There's something real—there's something we can look at and be pleased about."

Taken on 3 August by the Wide Field/Planetary Camera, the pictures show (in false color) an unusual cluster of young stars in the nebula called 30 Doradus, 160,000 light-years from Earth. Panel A shows the initial image of the entire cluster. Panel B is an enlargement of the central portion, showing a smaller cluster designated R136, consisting of very hot and massive young stars. Although the telescope's optical aberration causes each star image to be bathed in fuzz, the images do have bright "cores" no more than 0.1 arc second wide. The Hubble's improved resolution allowed astronomers to see many more stars than in comparable ground-based images, such as the one in Panel C, a photo of the same region where they couldn't discern details less than 0.6 arc second wide. Panel D is a computer-processed version of B, showing how the halos caused by the Hubble's flawed mirror can be reduced.

These images are enlightening stellar science. Astronomers can easily count 60 stars in R136, and they think that hundreds probably exist there. That's in sharp contrast to the view of a decade ago, when it was thought that the light was coming from a single star. In the new Hubble images astronomers can even make out some of the brightest stars at the center of the cluster, which may be 100 times as massive as the sun. And they're already planning follow-up studies to image fainter stars and to use spectroscopy on the brightest ones.

"This now demonstrates HST's ability to conduct crucial and important studies, even with the existing spherical aberration," says Charles Pellerin, director of NASA's Astrophysics Division. Adds Pellerin: "We will continue to study this region over the next few months, and the best is yet to come."

■ ANN GIBBONS