redesigned space station will have cost $16 billion, administration officials said. The original design of Space Station Freedom would have cost $25.6 billion.

In a June 17 announcement, the President cited the station's potential contribution to the continued economic prosperity and scientific prowess of the United States. "I strongly believe that NASA and the space program represent important investments in that future," Clinton said. He also noted the space station's potential for promoting international cooperation.

The President's preferred design for the station is most like NASA's option A, which maintains Freedom's modular configuration: pressurized chambers attached to a central backbone with solar panels mounted at either end. To reduce costs, NASA engineers gave option A simpler electrical and computer systems, shortened its backbone, and made cost-saving changes to the modules in which the station's four-person crew will work and live for extended periods.

The redesigned station will also incorporate features of option B – a more complex, Freedom-derived version of the space station – to enhance the laboratory's capabilities.

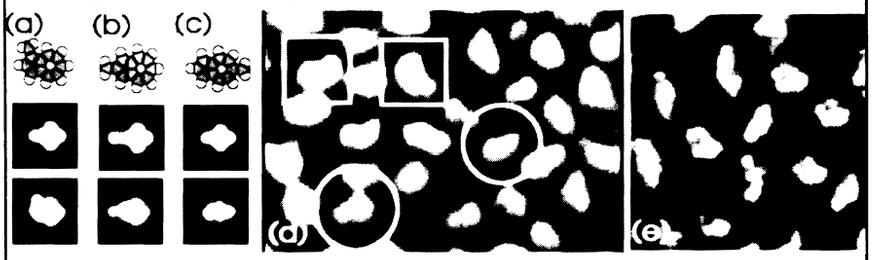
Option A differs from the original Freedom blueprint largely in the amount of electrical power and shelf space it can supply for experiments and equipment. For example, option A offers an average of 31 kilowatts of power per orbit, compared to Freedom's 34, and has seven fewer "racks" for instruments and experiments.

Despite these differences, an independent panel advising the President on space station options declared option A "fully capable" of meeting the basic goals of the space station program. The advisory group, chaired by Charles M. Vest, president of the Massachusetts Institute of Technology, examined the advantages and disadvantages of the space-station design options.

Although administration officials refuse to specify which elements of option B will make it into the new design, the Freedom-derived "alpha joints" are likely candidates for Clinton's hybrid space station. The alpha joints are movable solar-panel mounts that would ensure an unwavering supply of electricity regardless of the laboratory's orientation toward the sun, which changes throughout the year.

Without the joints, NASA would have to shift the station's position periodically with onboard thrusters to maintain power levels. But these shifts would apply forces to the station, possibly compromising experiments that require a "microgravity" environment, says Daniel E. Hastings, a professor of aeronautics and astronautics at MIT. Hastings and other members of NASA's Space Station Advisory Committee worked closely with the agency during the three-month redesign effort. – *D. Pendick*

Shape of things to come: Molecular STM



IBM Research

The scanning tunneling microscope's (STM) needle-like probe enables researchers to image the electron clouds surrounding atoms. Making sense of those images, however, requires detailed calculations that predict the shape of electron clouds for individual atoms. The task is even more difficult for molecules.

Now, a team led by Vickie M. Hallmark and Shirley Chiang at IBM's Almaden Research Center in San Jose, Calif., has come up with a simple calculation technique that provides accurate shapes of the electron clouds surrounding molecules deposited on platinum. They used this prediction method along with high-resolution STM to distinguish among closely related chemicals called isomers – molecules containing the same number and kinds of atoms but built in different geometric arrangements.

As part of a report in the June 14 PHYSICAL REVIEW LETTERS, the group looked at three isomers of monomethylazulene (a-c, top). They calculated the shape of each isomer's electron cloud using a conventional technique (a-c, center) and their new approach (a-c, bottom). In an STM image of a mixture of molecules (d), they marked isomer a with a square and isomer b with a circle; the image of isomer c is shown at right (e). The shapes predicted by the new calculations – which include the influence of the platinum substrate – more accurately reflect those seen in the high-resolution STM images, Chiang and Hallmark assert. This advance brings researchers a step closer to using STM to track the reactants, intermediates, and products of chemical reactions on metal surfaces.

Prolonged nursing and the risk of bone loss

Women who nurse their infants for six months or more lose a significant amount of the mineral calcium from their bones, according to a new report. Although most women make up for that loss shortly thereafter, researchers speculate that such bone loss may put certain new mothers in jeopardy of potentially crippling fractures later in life.

Lactation, or the production of milk, requires a tremendous amount of calcium to ensure that nursing infants form a strong skeleton. But previous investigators disagreed on whether some of that bone-building mineral comes from maternal bone. So epidemiologist MaryFran R. Sowers at the University of Michigan in Ann Arbor and her colleagues decided to take a closer look at the bones of nursing mothers.

The researchers recruited 98 healthy women during the last months of their pregnancy. They measured bone density two weeks after delivery and again at various points after childbirth.

The team discovered that women who nursed their babies for six months or longer showed an average loss of bone density of 5.1 percent from the lower spine and a loss of 4.8 percent from the top of the leg bone. "That's actually a lot of bone," Sowers says.

Women who bottle-fed their infants from birth or breastfed for less than a month showed no such loss, the team reports in the June 23/30 JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION.

Sowers says the bone loss was not explained by differences in age, diet, or physical activity. Indeed, she notes, most of the women in the extended lactation group consumed large amounts of dietary or supplemental calcium.

For most healthy women, any bone mass lost during nursing will quickly be recovered. Moms who weaned their babies between six and nine months of age had recovered all of their lost bone a year after the baby's birth. Women who nursed beyond nine months had not yet rebuilt that lost bone.

The average U.S. woman nurses her baby for just three months and thus is unlikely to lose significant amounts of bone. Yet Sowers worries that teenage mothers and women who are malnourished may lose a critical mass of bone during lactation. This might put them at risk of developing osteoporosis – a bone-robbing disorder – after menopause.

"This isn't to say that women shouldn't breastfeed," says Stephen P. Heyse of the National Institute of Arthritis and Musculoskeletal and Skin Diseases in Bethesda, Md. Young women should make sure they get enough calcium to build strong bones before they get pregnant, he adds. – *K.A. Fackelmann*