Genome Research Institute in Bethesda, Md., found the same change in the gene's DNA sequence in 18 of 20 children with progeria that the team studied.

The lamin proteins are the main structural elements forming the envelope of a cell's nucleus, where DNA resides. Although it doesn't alter lamin C, the progeria mutation shortens lamin A. As a result, the majority of cells from children with the progeria mutation have abnormally shaped nuclei, both research teams found.

It's still unclear how a mutant lamin A and the misshaped cell nuclei lead to the symptoms of progeria, but Huber Warner of the National Institute on Aging in Bethesda speculates that such a defect could prevent so-called stem cells from replacing worn-out or damaged cells and tissues.

"This discovery opens one or two doors for aging research," he says. "Nuclear structure and function now become targets of research."

Ancestors Go South

Some of the oldest fossils in the human evolutionary family—including the skull and upper-arm bone shown above—come from South Africa, according to a study in the April 25 *Science*.

A mix of new and already excavated *Australopithecus* fossils, found in two caves, date to 4 million years ago, reports a team led by Timothy C. Partridge of University of the Witwatersrand in Johannesburg. That's as many as 1 million years earlier than previous estimates for South Africa. The scientists suspect that the bones represent two forms of *Australopithecus*. An *Australopithecus* species of comparable age lived in eastern Africa (*SN*: 5/15/99, p. 315).

The age estimates of the South African fossils hinged on measurements of the decay of radioactive isotopes in cave sediments. —B. BOWER

In terms of progeria, Gordon and Collins predict that within a year, there will be a genetic test that can confirm a diagnosis. Correcting the genetic defect through gene therapy, drugs, or other means is much further off but is now a possibility, say these researchers.

"This is a great springboard," says Gordon. Collins adds that researchers will quickly introduce the progeria mutation into mice to create a model for testing treatments for the syndrome.

In previous studies, researchers have attributed a form of muscular dystrophy and five other human disorders to defects in the same lamin gene. Now with the addition of progeria, Collins calls that tally a record for one gene. —J. TRAVIS

Bone Fix

New material responds to growing tissue

Surgeons routinely harvest fragments from a healthy part of a patient's skeleton to repair wrecked bones elsewhere. This surgical step causes pain and expense that some researchers aim to eliminate by using a new bone-forming strategy that has shown promise in animal studies.

For years, scientists have been devising scaffold materials—both natural and synthetic—that encourage the growth of bone tissue. But the natural materials, primarily cow collagen, have raised worries of disease transmission. On the other hand, synthetic polymers can cause inflammation, and it's difficult to engineer the material to break down in synchrony with bone regrowth.

In the May *Nature Biotechnology*, Jeffrey Hubbell and his coworkers describe a material that could amount to a happy medium: scaffolding that's synthetic yet responds to the body's bone-making cues.

"We were trying to look at how nature evolved [bone growth] and copy that in synthetics," says Hubbell, a researcher at the Swiss Federal Institute of Technology in Zurich and the University of Zurich.

He and his colleagues built their scaffolding with star-shaped poly(ethylene glycol) molecules and added special properties. They adorned the scaffolding with synthetic peptides, or protein fragments, that help bone-forming cells called osteoprogenitor cells adhere to the framework. They also glued together the branched arms of the polymer with other peptides that are susceptible to enzymes secreted by the osteoprogenitor cells. In their three-dimensional mesh, the researchers trapped proteins called BMPs that stimulate the cells to begin bone regeneration.

When osteoprogenitor cells attach to a scaffold implanted at the injury site, they

BUILDING BONES A rat's skull regenerates better with a new bone-promoting scaffold (left) than with a less-sophisticated scaffold (right).

release enzymes that snip through the mesh, destroying the scaffolding. BMPs spill out just where and when they're needed.

Hubbell and his coworkers tested their scaffolding on rats from which they'd removed small circular sections of skull. Disks made of the scaffold material stimulated bone regeneration as well as cow collagen does.

The system is "a clever and unique approach to develop synthetic bone scaffolds that are cell-responsive," comments Kristi S. Anseth of the University of Colorado in Boulder. The work "has wide implications in numerous wound-healing and regenerative medicine applications," she adds.

In the future, Hubbell says, doctors could make the repair less invasive by applying the scaffolding as a liquid—perhaps through a syringe or a small incision—that hardens once it's in place. —J. GORMAN

Blunt Answer

Cracking the puzzle of elastic solids' toughness

Soft, springy materials like rubber and skin don't tear easily because they stretch before breaking apart. For decades, however, detailed understanding of how that stretchiness toughens these materials has eluded researchers.

Now, researchers from the DuPont Company in Wilmington, Del., and Cornell University have come up with a comprehensive explanation—based on both experiments and computer modeling—for the toughness of soft solids.

The new insights have "massive implications," says team member Stephen J. Benison of DuPont. The findings could potentially influence development of materials ranging from adhesives and solid rocket propellants to artificial biological tissues and foods, he says.

The essence of what the team presents in an upcoming *Proceedings of the Royal Society of London A* is this: Cracks that begin in soft solids, having a ratio of stiffness to strength of about one-third or less, stop moving forward through the material. Instead, says Cornell theorist Chung-Yuen (Herbert)

Hui, the crack “just sits there and opens up”—a phenomenon known as blunting.

While materials investigators had previously noted blunting at crack tips in some soft solids, the DuPont-Cornell team has identified a new mechanism of crack propagation that incorporates blunting. “It’s really a fundamental change in [comprehending] the way a crack runs in a material,” Bennison says.

Kenneth R. Shull of Northwestern University in Evanston, Ill., agrees. “I really do think it is potentially one of the key ideas . . . that’s been largely missed before,” he says.

In materials-speak, a tough substance is one that absorbs a lot of energy as it breaks apart. Consider the transparent polymer called plasticized polyvinyl butyral, or PVB, that DuPont makes to cement sheets of glass together in car windshields. PVB puzzled DuPont scientists, Bennison notes, because it was tougher than could be accounted for by the prevailing ideas of how materials fail.

In studies that began in 1995, the DuPont-Cornell team made the startling experimental observation that a slit the length of a paperclip in stretched PVB would open into a hole rather than tear the fabric further. Adding to this unexpected, macroscopic demonstration of crack blunting, computer simulations of fracturing in even more elastic materials pointed to blunting as a barrier to crack growth on a microscopic scale.

To understand what makes these materials give way when they finally do, the team found X-ray evidence that thousands of minuscule voids—the result of blunting of submicroscopic cracks—set the stage for the failure. The scientists contend also that stretching around blunted microcracks eventually stiffens the material to the point that it can’t deform any more, leading to the massive breaking of chemical bonds that sums into ordinary fractures (*SN*: 1/4/03, p. 3).

Manoj K. Chaudhury of Lehigh University in Bethlehem, Pa., calls the new work the first quantitative theory to show that blunting can account for the toughness of rubbery materials. Nonetheless, cautions Shull, many more experiments are needed to see if it’s possible to poke holes in this new theory. —P. WEISS

Out of China

SARS virus’ genome hints at independent evolution

The newly deciphered genome of the pathogen responsible for severe acute respiratory syndrome (SARS) suggests that the virus is the product of a long and private evolutionary history.

Since emerging from southern China in February, SARS has struck at least 4,000 people worldwide and killed more than 200. Disease researchers have launched a massive effort to understand the pathogen and control the epidemic.

On April 16, European scientists announced that they had demonstrated that the agent responsible for SARS is a coronavirus never detected before the cur-

rent outbreak. In experiments on monkeys at the Erasmus Medical Center in Rotterdam, the Netherlands, researchers showed that the new coronavirus alone can cause SARS. Earlier in the outbreak, a member of a separate viral family was also a suspect (*SN*: 3/29/03, p. 198).

On April 12, researchers at the British Columbia Cancer Research Centre in Vancouver reported that they had completely sequenced the virus’ genome. Scientists in the United States presented nearly identical findings on April 14. Chinese researchers also sequenced the SARS virus and found that some samples differ considerably from those decoded in North America, which suggests that the virus mutates rapidly.

Comparisons among the newly sequenced genome and other coronaviruses’ genomes indicate that SARS virus doesn’t belong to any of the three known clusters of related coronaviruses. The 10 coronaviruses that infect mammals fall into two clusters, each of which contains one virus that causes colds in people. The third cluster contains two bird pathogens.

Coronaviruses readily swap genetic material with each other in a process known as recombination. This creates new viruses that share some genetic similarities with each parent virus and occasionally have novel capabilities to cause disease or to infect different hosts.

The largest SARS-virus gene, which makes up a whopping two-thirds of the pathogen’s genome, appears to be distantly related to the corresponding gene in a mouse coronavirus. Another region of the SARS genome shares a few similarities with the avian coronaviruses.

Those observations suggest that recombination may have given rise long ago to an ancestor of SARS virus, says Michael M.C. Lai, a virologist at the University of Southern California in Los Angeles. If recombination had occurred more recently, the genetic similarities would be more striking, he says.

By itself, Lai notes, “recombination was not responsible for [SARS virus’ recent] emergence as a human pathogen.”

The SARS virus may have long had the capacity to infect people but only recently encountered conditions that facilitated its spread, says virologist Shinji Makino of the University of Texas Medical Branch in Galveston. Alternatively, it may have derived from one or more unidentified animal coronaviruses that only recently mutated or recombined to create a human pathogen, he says.

The new pathogen “is very likely from a wild animal,” argues Lai. Future investigations in the region of China that seems to harbor the virus might eventually turn up the mysterious animal host, he says. —B. HARDER

TENSE SCENE In the polymer PVB (left), a horizontal crack transforms into a hole (white). In a similarly elastic but weaker polymer (right), the crack elongates. Colors indicate stress levels.