

morning, typical times for convective storms. Yet the bursts do not come from lightning because they carry much more energy and are much shorter than the radio releases associated with lightning.

Atmospheric physicists wonder whether the enigmatic bursts relate at all to odd flashes of light recently documented high above thunderstorms. Although researchers have long heard anecdotal reports of such features, mainly from pilots, they have obtained confirming evidence only within the last five years. Last year, scientists reported the first detailed measurements of the flashes, made by investigators on the ground as well as by detectors carried by a NASA airplane.

The observations showed that the above-cloud flashes reached roughly 60 km in altitude and covered a vast horizontal distance 10 to 50 km wide, making them distinct from the narrow channels of regular lightning. The flashes resemble glowing auroras more than bright lightning bolts.

Research teams will spend this summer studying the new phenomena. And this week, Holden worked with NASA to obtain simultaneous observations by the ALEXIS radio receiver and video cameras on the space shuttle mission. Such dual observations should resolve whether the radio bursts occur at the same time as optical flashes within or above thunderstorms.

— R. Monastersky

Laser may loosen the buckyball's bonds

The intriguing soccer-ball-shaped molecule called a buckyball continues to tantalize chemists, who wrestle almost obsessively with the question of how to fill the molecule's empty interior.

The problem with this molecule, made of 60 carbon atoms, derives from its stable bonds, which keep the spherical cage dutifully closed. Yet a window does appear to be opening into this otherwise sealed surface. Robert L. Murry and Gustavo E. Scuseria, both chemists at Rice University in Houston, Texas, describe in the Feb. 11 *SCIENCE* a theoretical mechanism to literally "open a window" into the C_{60} molecules, as well as related molecules in the fullerene family.

Tinkering with the tiny carbon cages, the two noticed that certain atomic bonds lend themselves better than others to temporary adjustments. Indeed, the molecule's unique shape comes from an alternating pattern of carbon rings bonded together as hexagons and pentagons — the pattern found on a soccer ball.

Murry and Scuseria realized that the juncture between the pentagons and

hexagons, called a "5-6 bond," yields relatively easily to the prying forces of a laser's energy. When properly irradiated, an opening would temporarily appear in the fullerene.

This method permits the bond to open widely without disturbing the ball's overall structure, thus permitting one or more atoms — perhaps even small molecules — to enter the carbon cage. Furthermore, by opening more than one bond in this way, "multiple windows" are possible.

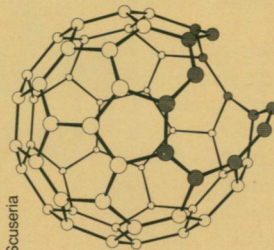
Efforts to "custom-fill the fullerenes' void" continue apace, the researchers say, eyeing potential uses in drug delivery, molecular transport, medical imaging — even superconducting devices.

When "doped," or mixed, with an alkali metal, fullerenes do have the potential to become useful as superconductors.

"We'd like to try to make a fullerene superconductor by putting a lanthanum or scandium atom inside the C_{60} cage," says Scuseria. "This is a very exciting idea, but still theoretical."

"Whether it will work," he adds, "remains to be seen."

— R. Lipkin



Mother's smoking linked to child's IQ drop

Preschool children whose mothers smoked heavily during pregnancy scored significantly lower on standardized IQ tests than kids whose mothers did not smoke, according to a new study.

This isn't the first time that researchers have suggested that a pregnant woman's smoking habits might have an impact on her offspring. Last year, a Canadian researcher reported that children born to women who smoked during pregnancy may have subtle auditory difficulties (SN: 7/10/93, p.23).

David L. Olds of the University of Colorado Health Science Center in Denver and his colleagues wanted to find out whether a maternal tobacco habit had an adverse effect on a child's intellectual ability later in life. From 1978 through 1980, the team enrolled 400 women pregnant with their first child.

The researchers asked each woman about her diet, smoking habits, and alcohol or drug use. To verify self-reported smoking behavior, the team measured a nicotine metabolite in urine samples collected from a subset of smokers enrolled in the study.

After delivery, the team continued to check on mothers and their offspring. When the children in the study reached preschool age, Olds and his co-workers

began measuring intellectual ability with the Stanford-Binet IQ test.

They report in the February *PEDIATRICS* that IQ scores of 3- and 4-year-old children whose mothers smoked 10 or more cigarettes daily during pregnancy averaged 9 points lower than those of kids whose mothers did not smoke. When the team controlled for factors known to influence a child's test scores, such as maternal IQ and alcohol use, they found that they could explain some, but not all, of the difference. The children of mothers who had smoked still scored about 4 points lower than the offspring of non-smoking mothers.

Four points doesn't seem like much, but it is equivalent to the deficit seen in children exposed to moderate amounts of lead, says coauthor Charles R. Henderson Jr. of Cornell University. That doesn't necessarily mean an individual child will have trouble in school, Henderson adds. At the same time, smoke-exposed children may not reach their full intellectual potential, he says.

In a second study, which also appears in the February *PEDIATRICS*, the same research group tried to reduce the risk of childhood cognitive deficits by modifying the behavior of mothers who smoked.

Many of these women were visited fre-

quently during and after their pregnancy by nurses, who counseled them about smoking and diet. The researchers discovered that such women cut back on their cigarette use and improved their diet. Moreover, their 3- and 4-year-old children had about the same average IQ scores as children whose mothers didn't smoke.

Reductions in maternal smoking explain part of the improvement in test scores; however, better nutrition may also play a role. "It would be nice to have a complete biological explanation, but we don't have that," Henderson says.

Further research must confirm the theory that mothers who smoke during pregnancy will impair their children's cognitive abilities. The reported link between maternal smoking and a child's performance on an IQ test years later may simply be a statistical fluke, the researchers note. The team plans to continue to look at IQ differences in the smokers' offspring, who are now in their teens.

On the other hand, something in tobacco smoke may harm the developing fetal brain. Cigarette smoke contains an estimated 2,000 to 4,000 chemicals, some of which could damage fragile fetal cells, Henderson notes. It may be that subtle smoke-induced damage doesn't show up until a child reaches age 3 or 4, when higher-order cognitive skills kick in, he adds.

— K.A. Fackelmann