Cowbirds lay their eggs in other birds' nests; the surrogate mothers raise the baby cowbirds and may neglect their own offspring. Nest predators include raccoons, snakes, and other creatures.

Previous studies have suggested that cowbirds and many nest predators avoid large, dense woodlands and instead frequent the smaller forests near farms and suburbia.

Most wood thrush nests in areas with less than 55 percent forest had several cowbird eggs in them, Robinson and his colleagues report. "In some landscapes, there were more cowbird eggs than wood thrush eggs per nest," they note. Every day, predators threatened the homes of warblers that nested near or on the ground in the most fragmented areas, which have only small patches of forest.

Audubon Naturalist Soc.

Warblers are among the migrating birds suffering from the decline in forests.

"Even the indigo bunting, which prefers forest edges, nests more successfully in less fragmented landscapes," the scientists report.

"Our results suggest that a good regional conservation strategy for migrant songbirds. . . is to identify, maintain, and restore the large tracts [of forest] that are most likely to be population sources," they conclude.

Other studies have also suggested that birds have better reproductive success in larger forests. Researchers see a "consistent, catastrophic loss of forest migrants" in smaller forests but not in woodlands larger than 100 hectares, Robert A. Askins of Connecticut College in New London notes in an accompanying article. Scientists have also found that old-growth forests attract a wider variety of species than do younger stands (SN: 6/18/94, p.399).

However, Askins adds, "although previous studies have suggested a [negative] relation between nesting success and the amount of nonforested habitat . . . Robinson and colleagues now report the first conclusive test of this hypothesis."

No one had previously monitored such a wide swath of the United States, says Ted R. Simons of North Carolina State University in Raleigh. The study by Robinson's team shows that the problem "is not just happening at a few isolated locations," he asserts. — *T. Adler*

New glasses arise from liquid's slow flow

An elegant goblet, a cathedral's iridescent windows, a sculpted dove. Each of these objects embodies a mysterious material: glass.

Seemingly a translucent solid, glass is in fact a fluid unable to flow. Yet a careful look at the molecular properties of this amorphous, highly viscous liquid has spawned a diversity of new glass materials, improved manufacturing and coating techniques, and a better understanding of protein folding, researchers report in the March 31 SCIENCE.

"Structurally, a glass is barely distinguishable from the fluid substance it was before it passed, quite abruptly in some cases, into the glassy state," says Charles A. Angell, a chemist at Arizona State University in Tempe. "Why did this particular substance or solution suddenly undergo a dramatic slowing down in the diffusive motions of its particles?"

"Why do glasses not form a precisely ordered cystalline material at some precisely defined freezing point, like so many other, more 'normal' substances?" Angell wonders.

Investigating these questions, researchers have found alternative methods for forming glass, beyond the traditional techniques of rapidly cooling a liquid, Angell says.

Types of glass forged from metal alloys are giving rise to new kinds of high-strength, corrosion-resistant materials, reports A. Lindsay Greer, a materials scientist at Cambridge University in England. Scientists make the so-called amorphous metallic alloys by rapidly cooling a thick metal liquid, a technique that prevents the molecules from crystallizing.

Metallurgists, for example, can form glass from many types of metal, most easily from iron and palladium. Aluminum, on the other hand, resists forming a glass. But Greer points to recent successes in fashioning glasses from aluminum-based alloys that previously would not produce a glass. Researchers in France and Japan, for instance, have successfully forged light, ductile glass alloys containing more than 80 percent aluminum.

"This opens up all sorts of possibilities for making metal machine parts that are completely glassy," says Greer. "Amorphous metal alloys have no fixed molecular structure, so it's much easier to mold them into fine shapes. These alloys could be used for devices implanted in the human body."

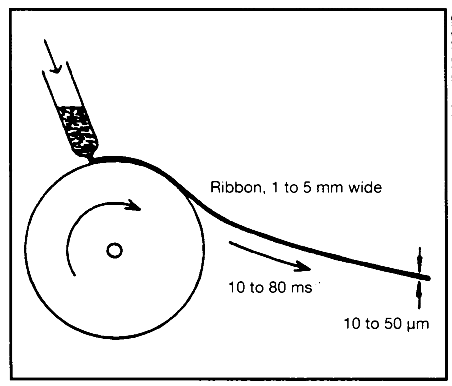
Such new materials promise applications for strong, lightweight, corrosion-resistant engine parts often needed in the aerospace and automotive industries, as well as in microelectronics. Micrometer-sized machines, including small motors and gears, would also find improved performance when fashioned from metallic glass alloys.

New methods for producing metallic glasses efficiently in large quantities may make them more accessible to industry, says Greer. "It has always been thought that, to form a metallic glass, you must cool liquid metal extremely fast, nearly 1 million degrees a second. But some new alloys show that glasses can form by cooling much more slowly."

Wear-resistant coatings for more mundane items, such as kitchen appliances (even frying pans), have an allure for industry, says Greer. Manufacturers could deposit thin metallic glass films from a vapor onto items or try glazing a metal surface with a laser or an electron beam.

"A laser would melt a thin surface layer," says Greer. "It's the sort of thing one might do to the lining of a cylinder in a car engine."

Researchers are gleaning insights into glass formation by observing natural processes, Angell says. Scientists have realized that most of the water in the universe exists in a "glassy state," condensing onto comets from gas in frigid interstellar space without forming the crystals found in ice.



Greer *et al.*/ SCIENCE

In melt spinning, the most common method of making metallic glass, a molten alloy flows onto the rim of a fast-spinning wheel. The process yields a thin metallic glass ribbon.

In addition, studies of food preservation and methods that insects use to protect themselves from droughts are showing how some biological molecules change into a glasslike state, Angell says.

Such observations are leading researchers to see similarities between the chemical transitions of some proteins and polymers and that of glasses, Angell says. Proteins contain so many moving components that materials scientists now liken them to a "many-particle glass-forming system."

Both in computer simulations and laboratory experiments, certain proteins appear to fold into their three-dimensional structures by moving through a glass transition state. — *R. Lipkin*