

## Stretching a stainless steel sandwich

Sandwich a sheet of a special, ultrahigh-carbon steel between thin stainless steel veneers and the result is a new material that when heated stretches easily without cracking yet remains corrosion resistant and retains other important properties of stainless steel. This "superplastic" stainless steel, developed by Oleg Sherby and his colleagues at Stanford University, can be molded into complex shapes and even formed into large structures like steel domes.

The ultrahigh-carbon steel core provides the material's stretchability. This steel, which contains between 1 and 2 percent carbon, has very fine grains that are 100 times smaller than those present in ordinary steel. At moderate temperatures between 600°C and 800°C, this grain size apparently allows the steel to be stretched by as much as 1,800 percent and to be "glued" onto other metals.

## Laser jet streams for gold plating

By firing a thin, powerful laser beam along a stream of gold-bearing liquid, a group of IBM Corp. researchers in Yorktown Heights, N.Y., has found a new way to "write" fine gold lines and deposit tiny gold spots on a variety of surfaces. Gold, an excellent electrical conductor, is used to connect integrated circuit chips and other electronic parts within computers.

In the new IBM process, a gold cyanide electrolyte is squeezed through a tiny nozzle to create a high-speed liquid jet. An argon laser beam travels through the stream, which traps the laser light along its length. Gold is deposited wherever the stream strikes the negatively charged surface of the object to be plated. The laser beam seems to clean the surface and heat it, which speeds up the chemical reactions that deposit the gold.

## Polymer inks for copper circuits

Scientists at the General Electric Research and Development Center in Schenectady, N.Y., have developed a new process for making printed circuits (the copper patterns that connect electronic components on a circuit board). This method involves special metallic "inks" that consist of a liquid polymer loaded with a mixture of powdered iron and nickel. A screen printing process transfers the polymer ink through a stencil onto almost any kind of surface, including glass, paper and most plastics. When the board is immersed in a copper sulfate bath, some of the metal powder in the ink dissolves and is replaced by pure copper. The plating process takes only about five minutes versus the hours needed for conventional plating techniques.

## Acid treatments for fragile fossils

Fossils trapped in hard, well-cemented sedimentary rocks like sandstone are often difficult to recover. Breaking the rocks down mechanically and creating rubber casts, for example, usually destroy fine details, making it hard to get an accurate count of the number of fossils present. Now, two geologists, Henryk T. Zapsnik and Paul A. Johnston of the Australian National University in Canberra, have come up with a method that liberates all three-dimensional fossils embedded in a given sample of rock.

Their three-step process, as reported in the June 29 *SCIENCE*, starts with immersing the rock sample in a hydrochloric acid bath that dissolves all the carbonates present. After the sample is dried thoroughly, it is dipped into a container of liquid plastic. This allows the plastic to impregnate the rock and fill in all the gaps that the earlier acid treatment had created. After the plastic has slowly solidified, the embedded rock is cut through with a diamond saw to expose a large surface. When this cut block is immersed in hydrofluoric acid, the rock dissolves away and frees the plastic replicas of the fossils originally trapped in the rock.

## High-challenge risk for the Type A

The differences between hard-driving, competitive "Type A" individuals and easygoing "Type Bs" are more subtle than is often assumed, at least when physiological arousal is examined.

Highly challenging situations appear to put Type A subjects at a greater risk of experiencing an elevated systolic blood pressure, report psychologist David S. Holmes and his colleagues at the University of Kansas in Lawrence. When working on an extremely difficult memory task, 30 Type A subjects had a higher systolic blood pressure and reported a greater preference for difficult tasks than did 30 Type B subjects. But the two groups had similar measures for diastolic blood pressure, pulse rate, pulse volume and skin resistance. There were no differences on any of the physiological measures when subjects were given easy or moderately difficult memory tests.

Although there is a reliable difference in systolic blood pressure between the Type A and Type B person on the most difficult task, it is not particularly large, explain the researchers in the June *JOURNAL OF PERSONALITY AND SOCIAL PSYCHOLOGY*.

They add that there may be one or more Type A "subtypes" that are physiologically more sensitive to difficult tasks.

## Should schools 'spare the rod'?

Corporal punishment has been used in public schools for many years and has attracted vocal advocates and critics. There are few studies, however, of how physical punishment is used in schools and its effect on students.

A social scientist at the University of North Carolina at Charlotte now reports that corporal punishment of public school students is widespread at every grade level in virtually all regions of the United States. About three-quarters of a national sample of school principals say that they use corporal punishment, notes Terry L. Rose in the June *JOURNAL OF EDUCATIONAL PSYCHOLOGY*.

Rose mailed a survey to 324 principals in 18 randomly selected states representing the nine U.S. Census districts. Questionnaires concerning the use of corporal punishment were returned by 232 elementary, junior high and high school principals.

The results suggest that physical punishment is more likely to be delivered by administrative staff in their offices, rather than by teachers in classrooms. Teachers are most likely to serve as witnesses to the punishment. Most principals report delays of at least 5 minutes between misbehaviors and the delivery of punishment; 28 percent cite typical delays of more than 15 minutes.

Many behaviors that the principals say lead to the use of corporal punishment are broadly defined, explains Rose. Those include "misbehavior" and "refusal to work." Violent behaviors are given more precise labels, such as "throwing rocks on the playground," and are most often punished.

Principals of schools in smaller communities report a significantly higher use of corporal punishment than principals of schools in larger communities. In all regions, however, it is primarily used with male students and no more than 10 times per month. Over 90 percent of the principals say that corporal punishment consists of spanking a student with a paddle. A similarly large percentage feel that corporal punishment effectively maintains general discipline and boosts teacher morale.

But their assessment of corporal punishment is open to question, holds Rose, since there is "virtually no empirical evidence that either supports or refutes its use." His own study is limited by its reliance on a fairly short questionnaire, the lack of a follow-up with nonresponding principals and a relatively small sample size. He "tentatively" concludes, though, that because corporal punishment appears to be common in public schools, systematic investigations of its use and outcome are needed. Teachers, he adds, should be taught to collect data on the effects of corporal punishment on specific behaviors.