BRIAN WILDER

A square silicone stamp with a microscopic raised pattern is cut out of its mold (right) and then coated with gold (above).

Gold Standard

NANOTECH | As researchers engineer everything from computer chips to drug-discovery tools down to smaller and smaller scales, making these devices is becoming excruciatingly difficult. The principal micromanufacturing technique, photolithography, uses light to etch microscopic features onto a silicon surface; but it's expensive and exacting. One promising alternative is called "soft lithography," a technique that uses flexible rubber stamps to fabricate devices with micro- and nanoscale features.

Until now soft lithography has mainly been used to make tiny devices like microfluidic chambers used for biological research. But Harvard University chemists George Whitesides —soft lithography's pioneer—and Heiko Jacobs have found a new application: transferring nanoscale patterns of electrical charge onto electrically conductive polymers. This advance could mean a cheaper and easier way to manufacture very small data storage and optical devices.

The Harvard scientists accomplished the trick by first building a mold made of silicon, using traditional photolithography methods to carve out the pattern. They then poured rubbery silicone into the mold to make the stamps, which they coated with a thin layer of gold. When the researchers pressed one of these stamps against a polymer film and ran a current through them, the pattern was transferred to the polymer as a series of positive and negative charges. A single mold can churn out multiple stamps, and each can be used repeatedly.

Although the new technique is now just a lab demonstration, potential new applications include encoding data on charge-based storage devices such as "smart cards"—credit-card-sized pieces of plastic used to verify the cardholder's identity—or constructing waveguides for optical telecommunications switches. Says Christopher B. Murray, manager of nanoscale materials and devices at IBM's T. J. Watson Research Center, "This is one more step in a number of beautiful efforts to explore nontraditional patterning technology." **—Erika Jonietz**

Mining for Meaning

SOFTWARE | Online newsgroups are popular gathering spots; over the years they've logged millions of opinions on topics ranging from politics to appliances. The largest newsgroup network, Usenet, boasts 500 million messages posted since 1995; unlike postings in chat rooms and online forums, such messages tend to be uncensored—and preserved.

All these postings add up to a trove of public opinion that sociologists, linguists and market researchers would love to analyze; and software projects at IBM and the University of California at Berkeley are beginning to develop the analytical tools they'll need. Unlike Web search engines, which try to find the best matches for any one query, these efforts focus on understanding how communities of individuals interact online, and how their opinions evolve.

To begin taking on this difficult task, IBM's Babble software depicts conversations as dynamic circular graphs in which icons representing frequent talkers cluster at the center, and less chatty participants move toward the circumference. "People do in fact cluster together when talking, then drift apart," says Thomas Erickson, research analyst at IBM.

But that's only a first step. Beyond charting the chatters lies the task of examining what they're saying. At the University of California, Berkeley, computational linguist Warren Sack's software maps how often words or phrases appear, and how close they are to one another. "In effect you're building a thesaurus of terms that relate directly to the conversation being studied," says Sack. "You can see constellations of conversations, and see which topics are being discussed more than others." One test of this Conversation Map tool helped pinpoint when online participants began thinking of Gulf War syndrome as a "disease" rather than a cluster of symptoms.

Sack and others say they're still years away from a commercial product. When the software is available, though, market researchers just might be the customers: with the right tools, they could turn newsgroups containing millions of opinions into the ultimate focus group. —Claire Tristram

JAMES YANG