

## SCIENCE &amp; TECHNOLOGY

## “Typeprinting” America

**THE SOURCE:** “Digital Fingerprints” by Julie J. Rehmeyer, in *Science News*, Jan. 13, 2007.

ILLICIT ONLINE ACTIVITY—from hacking to sexual predation to communication between terrorist cells—requires anonymity. But that same cloak of privacy enables free speech on the Internet and helps protect the identity of whistleblowers. Now researchers are beginning to uncover new ways to identify individuals online, using such unique markers as typing rhythms, punctuation patterns, and Web-surfing habits. While such techniques can increase online security and help law enforcement agencies combat fraudulent activity, they also unlock troubling surveillance possibilities that are raising concerns among civil libertarians.

The ability to identify people through the timing of their keystrokes grew out of a 1980 study by Rand Corporation researchers, according to Julie Rehmeyer, a former *Science News* intern. In the study, seven trained typists keyed in three separate passages, then repeated the task four months later. Without fail, analyzing only “the grids of data showing average pauses between pairs of letters,” says Rehmeyer, researchers were able to correctly match all seven typists with their keystroke profiles. Rehmeyer likens the process to the way British intelligence officers eavesdropped on German radio operators

New “writeprint” technologies can identify messages from terrorists, sexual predators, and digital pirates.

during World War II. Although unable to decipher the coded messages being sent, the British soon learned to recognize operators’ “fists”—signature styles of signal tapping—and were able to track the movements of their military units by triangulating the identified signals.

Online security companies are now developing software tools that utilize “typeprint-security” technology. California-based iMagic Software, for instance, markets a program that asks users to key in their passwords several times; thereafter, reports Rehmeyer, the program “permits access only if the keystroke timing is sufficiently similar to its initial data.” The technology is much cheaper than sophisticated alternative means of identification such as retinal scanning and other forms of biometrics.

Other researchers are developing ways to track malefactors across chatrooms, blogs, and e-mail. Using the same techniques scholars employ to establish authorship of a manuscript—word preference, punctuation, and style—investigators can now identify a person’s unique “writeprint” even if he or she adopts an online alias. The technology has been used to identify messages from terrorists, sexual predators, digital pirates, and others.

Mouse clicking provides other

means to tag online users. On the security side, new programs can map signatures or doodles “drawn” with the mouse; a procedure that pairs such “clickprints” with a password “rejected more than 95 percent of participants who were acting as intruders, while accepting the legitimate users more than 99 percent of the time,” Rehmeyer says. But researchers are also looking at ways of deciphering “clickstream data”—what a user clicks on and when—to verify website visitors’ claimed identities and to prevent fraud online.”

In addition to the privacy concerns raised by such forms of data collection, Rehmeyer points to other “Orwellian possibilities,” such as the potential for governments to “probe political forums or to create a profile of people.” Indeed, while some may welcome the increased security these new technologies provide to company networks or online transactions, and the added tools they give to efforts to nab wrongdoers online, Rehmeyer says it may be “many years before the full impact of digital fingerprints becomes clear.”

## SCIENCE &amp; TECHNOLOGY

## Cradle of Constellations

**THE SOURCE:** “The Origin of the Greek Constellations” by Bradley E. Schaefer, in *Scientific American*, Nov. 2006.

WHOEVER LOOKED UP AT THE seven moderately bright stars scattered across the ancient sky in the shape of a dipper and named them the Great Bear may have

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been the world's first great communicator. Whoever it was certainly lived a long time ago. Even though the seven stars look nothing like a bear, writes Bradley E. Schaefer, a Louisiana State University physicist and astronomer, that's what they were called by long-ago people as dispersed as the Greeks and the Zuni, the Basques and the Hebrews, the Cherokee and the Siberians. All knew versions of the myth of the Great Bear, that the four stars in the bowl of the dipper represent the bear, perpetually being chased by the three stars in the handle, representing hunters. It is virtually impossible that cultures in so many parts of the world would have thought up the story independently, Schaefer says. That means the Great Bear was named at least 14,000 years ago, when there was a land bridge across the Bering Strait that

allowed some ancient group to carry the idea to the Americas.

Constellations are among humankind's earliest creations and can be more revealing in some ways than the pottery and tools



The myth of the Great Bear constellation—seven stars on the hindquarters and tail—traveled across the Bering Strait with ancient migrants.

unearthed by archaeologists, offering a glimpse of what ancient people considered important enough to note in the sky. Through a process called precession, they can even help in dating art and clay or stone tablets. Because the earth wobbles on its axis, the positions of the stars change over the

centuries. The positions of the constellations described in ancient poems or depicted in art has been used to date such artifacts to within about 80 years of their creation.

The oldest known constellations are all named for gods, animals, and farm implements. The sequence of titles changes over time, Schaefer says, moving from religious to folk to practical to scientific. The Great Bear constellation may have been grown out of early religious practice. European cave paintings, artifacts, and ensembles of cave bear skulls date to more than 30,000 years ago and suggest some kind of bear worship. The constellation may have been a folk depiction of an image used by ancient priests or medicine men. Schaefer believes that the Great Bear is quite likely one of humanity's oldest inventions.

## ARTS & LETTERS

# Mozart Meets Dylan

**THE SOURCE:** "Laissez-Faire Aesthetics: What Money Is Doing to Art, or How the Art World Lost Its Mind" by Jed Perl in *The New Republic*, Feb. 5, 2007.

THE MORGAN LIBRARY AND Museum in New York, newly luxurious after a renovation by the famous

architect Renzo Piano, simultaneously featured the following treasures this season: medieval illuminated manuscripts and metalwork, a group of drawings by Fragonard and other artists of the 18th century, a show of Mozart manuscripts, and Bob Dylan's American Journey:

1956–1966. If this were an SAT test, the question would be obvious: Which one of these does not belong? But even to raise the question is to invoke the wrath of the intellectual hipsters, writes Jed Perl, *The New Republic's* art critic.

Amid the gold-rush atmosphere of the current art world, a strange philosophy has emerged: laissez-faire aesthetics, he says. Laissez-faire aesthetes have come to believe that any experience that anyone can have with a work of art is equal to