

## SOCIOLOGY

# Social Scientists Wade Into The Tweet Stream

Depending on your perspective, Twitter is a great way to promote a product, keep up with far-flung friends and colleagues, connect with others who share your passion for Korean boy bands, or maybe even start a revolution. The 5-year-old social media Web site now claims that more than 100 million users post 230 million “tweets” (text messages up to 140 characters long) every day. In that torrent of data, some social scientists see an unprecedented opportunity to study human communication and social networks.

“Human interactions are what social scientists are really all about,” says Michael Macy, a sociologist at Cornell University. But observing large numbers of spontaneous interactions, which are often fleeting and private, has been an obstacle, Macy says. Until now. “Human beings around the globe are now communicating with each other using devices that record those interactions and have open access,” Macy says. “I think this is an extraordinarily exciting moment in the behavioral and social sciences.”

On page 1878, Macy and his graduate student Scott Golder report their effort to use Twitter to study the collective moods of millions of people in diverse cultures around the world in real time. Others have been using Twitter and other social media to investigate how information and persuasion propagate in social networks and to study political cam-

paigns and movements, including the recent uprisings in North Africa.

Golder and Macy used a freely available protocol provided by Twitter to download more than 500 million tweets originating from 84 countries between February 2008 and January 2010. They searched these messages for roughly 1000 words on a tried-and-tested list of words associated with positive (agree, fantastic, super) and negative (afraid, mad, panic) emotion.

Their findings paint a portrait of humanity’s mood swings. Positive emotion runs high in the morning, declines throughout the day, and rebounds in the evening. The same pattern occurs on the weekends, suggesting it’s not just work bringing people down, Golder notes. People are happier overall on weekends, but the morning peak in good vibes is delayed by a couple of hours, suggesting they sleep in. Across the seasons, positive emotion increased from late December to late June as the days got longer and decreased during the other half of the year, lending support to other research suggesting that it’s the change in day length rather than the absolute day length that determines seasonal mood swings.

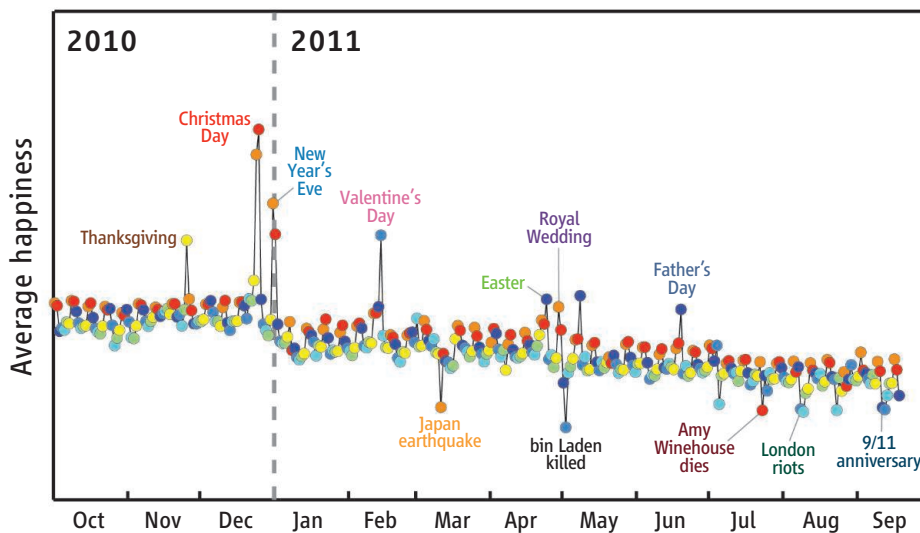
Macy finds it remarkable that these patterns were similar across such distinct cultures and regions, once time zones and latitude were accounted for. Overall, the findings suggest that sleep and the biological clock exert

a powerful influence on mood, Macy says. He and Golder acknowledge that that’s not a new idea, but they note that much of the previous research has been done on college undergraduates, hardly a group that represents the general population when it comes to sleep habits.

Using Twitter to track the mood of nations is analogous to using satellites to track the atmosphere, says Peter Dodds, an applied mathematician at the University of Vermont in Burlington. Dodds concedes that remote sensing of human happiness “sounds a bit Orwellian,” but he says his group has a greater good in mind: developing a measure of a society’s well-being that policymakers could use in parallel with economic indicators such as gross domestic product. In one recent study (available at <http://arxiv.org/abs/1101.5120>), Dodds, Christopher Danforth of Vermont, and colleagues examined 4.6 billion tweets over nearly 3 years. They paid people registered with Amazon’s Mechanical Turk service to rank the emotion evoked by more than 10,000 common words on a nine-point happy face to sad face scale. Analyzing the frequency with which these words occurred in their massive database of tweets, Dodds and colleagues found several patterns reported by Golder and Macy, including happy weekends and a morning peak in mood followed by an afternoon decline—“the daily unraveling of the human mind,” Dodds calls it. The team also examined outlier days: Not surprisingly, unusually “happy” days often coincided with holidays, whereas especially unhappy days tended to coincide with unexpected events, such as the Japanese earthquake and tsunami (see figure). Their findings also hint at a global decline in mood starting in April 2009 that continues at least through the first half of 2011.

Both studies illustrate the power of social media for studying social phenomena on a huge scale, says Duncan Watts, a sociologist at Yahoo! Research in New York City. Watts says it is reassuring that the results generally fit with our intuitions. “It’s hard to imagine a result that we could get from these data that we wouldn’t subsequently be able to reconcile with what we already know about life,” he says. “If your standard for data-driven social science is that it deliver deeply counterintuitive yet still believable results, I’m not sure that’s possible.”

Watts and others think that social media could help break new ground in resolving questions about how information and influence flow through social networks. One example involves the idea of social contagion. In recent years, a string of high-profile papers has suggested that everything from smoking habits to obesity to happiness can



**The year in tweets.** Researchers at the University of Vermont created this timeline of global mood as seen through the lens of Twitter. Fridays (orange dots), Saturdays (red dots), and Sundays (dark blue dots) tend to be happier than weekdays. Holidays are often the happiest days, whereas the unhappiest days often coincide with bad news.

