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Understanding 'Honest Signals' in Business

New research reveals the surprising power of ancient — and largely unconscious — forms of human communication.

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What if you could "see" the rhythms of interaction for people in your work group? In your entire company? Members of my research group and I have done just that by developing technology tools that allow us, for the first time, to gain a dramatically new perspective on human behavior. These tools have revealed subtle patterns in how people interact, enabling us to predict outcomes of situations ranging from job interviews to first dates to business plan pitches.

To illustrate, consider our study on business plan pitches. In that study, a group of rising- star business executives gathered at MIT for an important task: Each executive would present a business plan to the group, and then the group would choose the best ideas to recommend to a team of venture finance experts. It was a great opportunity. The skills the executives required — the ability to clearly formulate ideas, effectively communicate to a group of peers and then persuade others to pursue those ideas — are indispensable in business as well as everyday life. These executives had each spent more than a decade building their strengths.

Not only the other group members were watching and evaluating the business plan pitches, however. A sensitive, specially designed digital device was also monitoring each presentation. This device — we'll call it a sociometer — wasn't recording what each person said in their presentation but rather how they said it.[1] How much variability was in the speech of the presenter? How active were they physically? How many back-and-forth gestures such as smiles and head nods occurred between the presenter and the listeners? This device was measuring another channel of communication that works without spoken language: our social sense. (See "How the Sociometer Works," in the Appendix)

At the end of the meeting, the group selected the ideas that they agreed would sell the best. At least that is what they thought. When the venture finance experts were given the plans to evaluate — on paper, rather than via a live presentation — there was little similarity between the two groups' judgments. Each group had a different opinion of which business plans were most likely to succeed. Why?

Our up-and-coming executives didn't pick different business plans simply because they weren't as seasoned as the venture finance experts. Remember our other observer in the room — the

sociometer. As it turns out, the sociometer was able to predict which business plans the executives would choose with nearly perfect accuracy. Both the sociometer and our executives (even though they didn't know it at the time) were busy measuring the social content of the presentations, quite apart from the spoken, informational part.[2] And which channel of communication — social or spoken — informed more of their final decision? Yes, the social channel.

The executives thought they were evaluating the plans based on rational measures, such as: How original is this idea? How does it fit the current market? How well developed is this plan? While listening to the pitches, though, another part of their brain was registering other crucial information, such as: How much does this person believe in this idea? How confident are they when speaking? How determined are they to make this work? And the second set of information — information that the business executives didn't even know they were assessing — is what influenced their choice of business plans to the greatest degree.

When the venture finance experts saw the business plans, however, this social channel of communication was purposely removed. They saw the plans written on paper only — with no live presentation. With the social sense disconnected from the decision, the venture finance experts had to evaluate the plans based on rational measures alone. Unfortunately for them, research has shown that investments made without that "personal connection" are far more likely to fail.[3] This is why venture capitalists normally invest only in companies they can visit regularly in person, and why many investors pay more attention to the face-to-face interaction among the company's founders than they do to the business plan itself.

This study, along with many others, leads us to a surprising yet illuminating conclusion: people have a second channel of communication that revolves not around words but around social relations. This social channel profoundly influences major decisions in our lives even though we are largely unaware of it.[4]

Historically, our understanding of human society has been limited to relatively sparse observations of individuals or small groups because we have had only simple measurement tools. Recent advances in wireless communications and digital sensors have made it possible to observe natural, everyday human behavior at a level of detail that was previously unattainable. The result has been revolutionary measurement tools, such as the sociometer, that provide us with a "God's eye" view of ourselves.[5]

For the first time, we can precisely map the behavior of large numbers of people as they go about their lives. By using cell phones and electronic badges with integrated sensors, my students and I have, in our research studies, observed hundreds of voluntary participants for periods of up to a year. In the process we amassed hundreds of thousands of hours of detailed, quantitative data about natural, day-to-day human behavior — far more data of these kinds than have ever been available before.[6]

A new measurement tool often brings with it a new understanding of what you are measuring. We have found that many types of human behavior can be reliably predicted from biologically based honest signaling behaviors. These ancient primate signaling mechanisms, such as the amount of synchrony, mimicry, activity and emphasis, form an unconscious channel of communication between people — a channel almost unexplored except among apes.[7]

These social signals are not just a back channel or complement to our conscious language; they form a separate communication network that powerfully influences our behavior. In fact, these honest signals provide an effective window into our intentions, goals and values. By examining this ancient channel of communication — paying no attention to words or even who the speakers are — we can accurately predict outcomes of dating situations, job interviews and even salary

negotiations.[8] A startling finding is that the back-and forth signaling between people is a major factor in even the most important decisions in our lives.

What Are Honest Human Signals?

What are the types of honest signals that humans use? We are familiar with many types of human signals; smiles, frowns, fast cars and fancy clothes are all signals of who we are (or who we want to be). In fact, this sort of signaling is probably the basis of fashion and "current culture.".[9] We are conscious of these types of displays and often carefully plan to incorporate them into our communications. And therein lies the problem: Because these signals are so frequently planned, we cannot rely on them being honest. We need to find signals that are processed unconsciously, or that are otherwise uncontrollable, before we can count them as honest.

If we watch a conversation between two people and carefully measure the timing, energy and variability of the interaction, we can find several examples of honest signals. Four that we will concentrate on here are:

- Influence. The amount of influence each person has on another in a social interaction. Influence is measured by the extent to which one person causes the other person's pattern of speaking to match their own pattern.
- Mimicry. The reflexive copying of one person by another during a conversation, resulting in an unconscious back-andforth trading of smiles, interjections and head nodding during a conversation.
- Activity. Increased activity levels normally indicate interest and excitement, as seen in the connection between the activity level and excitement in children, or when male orangutans shake branches to impress potential mates.
- Consistency. When there are many different thoughts or emotions going on in your mind at the same time, your speech and even your movements become jerky, unevenly accented and paced. The consistency of emphasis and timing is a signal of mental focus, while greater variability may signal an openness to influence from others.

Each of these signals has its roots in our brain structure and biology. This may be why they are such reliable signals of our behavioral tendencies. Our influence measure, for instance, provides an assessment of our brains' attention and orienting systems. These subcortical structures (centered around the tectum, which is also known as the superior colliculus depending on the species) integrate sensory information and produce orienting responses.[10] When your eyes move to a person entering a room or your head turns toward a sudden noise, your behavior is being guided by these ancient brain structures. By measuring the accuracy and consistency of response between people, our influence measure provides an assessment of the functioning of their attentional mechanisms.

In contrast, mimicry is thought to be due to cortical mirror neurons, a distributed brain structure that seems to be unique to primates and is especially prominent in humans.[11] Mirror neurons react to other people's actions and provide a direct feedback channel between people. Newborns, for instance, can mimic their parents' facial movements despite their general lack of coordination. Mirror neurons situated in the part of the brain's motor cortex that controls the face may be key to this surprising capability.

Our activity level is related to the state of our autonomic nervous system, an extremely old neural structure. Whenever we need to react more vigorously — such as in fight-or-flight situations or when sexually aroused — this system supplies a dose of "nervous energy" that manifests itself in our behavior. On the other hand, we act listless and low energy when our autonomic nervous system is blunted, as in depression.[12] The relationship between autonomic nervous system

function and activity level is tight enough that we have been able to use it in clinical trials to accurately estimate the severity of depression and even predict treatment response.[13]

And finally, consistency seems to be a measure of the integration within our brain's action sequence control system, which begins with cortical motor signals that propagate through the cerebellum and basal ganglia.[14] Professional dancers or athletes, for example, exhibit a smoothness and consistency of action that comes from an enormous amount of practice. The effect of all their practice is to "burn" the action sequences into the neural connections in the cerebellum and basal ganglia. The same seems to be true of dialogue segments; their smoothness and consistency is an indication of how well we have integrated them into our behavioral repertoire.

These honest signals influence critical activities such as negotiation, group decision making and project management. For example, mimicry, such as the reflexive copying of smiles, interjections and head nodding during a conversation, is a special type of influence. It is actually rather amusing to watch: when two people are deeply engaged in conversation and on the same wavelength (in contrast to being in a heated debate), they will copy each other. If one person crosses their arms or sits back in their chair, a few seconds later the other person will do the same. If one person smiles or starts nodding their head, so will the other.[15]

People tend to mimic each other automatically and unconsciously — a behavior that is believed to be due to our brains' generous endowment of mirror neurons.[16] But despite being unconscious, this mimicking behavior has an important effect on the participants: It increases how much the conversational partners will say that they like and trust each other. Negotiations where the participants are unconsciously mimicking each other therefore tend to be smoother and more successful, all other factors being equal.[17] Not surprisingly, more empathetic people are more likely to mimic their conversational partners; as a consequence, mimicry is often described as an unconscious signal of empathy.

Mimicry can play a key role in sales as well. For instance, when Jeremy Bailenson and Nick Yee at Stanford University used computer-animated figures to give students a three-minute pitch to encourage them to carry the university identification card whenever they are on campus, they tried it both with and without mimicry.[18] Some of the students just saw a cartoonlike video trying to convince them to carry the identification card. For other students, however, the animated figure moved exactly as they did, but with a delay of four seconds. If a student tilted their head thoughtfully and looked up at a 15-degree angle, say, then the animated figure would repeat the gesture four seconds later.

Despite the rather obvious nature of the copycat animation, only eight of the 69 subjects detected the mimicry (and those mostly because they made a strange movement and then saw the agent making the same unusual motion). The remaining students liked the mimicking agent more than the recorded agent, and rated the former as being friendlier as well as more interesting, honest and persuasive. They also paid better attention to the copycat presenter. In the final analysis, adding mimicry made the sales pitch 20% more effective.

Our Sociometer Data

Using the sociometer, we have been able to measure the same effects in the real world, observing the mimicry that occurs during typical face-to-face interactions. In one experiment, for example, Jared Curhan and I looked at practice salary negotiations between midlevel executives who are just transferring into a new company and their new boss.[19] We used the sociometer to measure the honest signals from both participants during the first few minutes of the negotiation, when people were just getting to know each other and laying out their initial proposals for salary and benefits.

What we found was that the signaling of the new employee was different from that of the boss, and while several of the honest signals predicted the final salary package, our computerized measure of the amount of mimicry was one of the most important signals. For the new employee, the measured amount of mimicry alone accounted for almost one-third of the variation in the final salary.

Moreover, the amount of mimicry was strongly correlated with the feelings both participants had about the negotiation. Negotiations with a lot of mimicry left both the boss and the new employee with a strong feeling that everyone had cooperated to avoid getting stuck in sharp disagreements. Such a feeling of cooperation is obviously critical for starting off their new relationship on a good footing.

In both salary negotiations and sales, we have seen that mimicry functions as an honest and effective signal of the trust as well as empathy required for successful negotiations and financial transactions. What is particularly impressive is the effectiveness of this honest signal: unconscious, automatic mimicry improved financial results by 20% to 30%. The impact of mimicry on these financial interactions dwarfs almost every other factor that has ever been studied.

Signals Change People

It is tempting to imagine that these social signals are some sort of magic incantation that you can use to control people. But there is a fundamental difference between honest signaling and the more familiar medium of language: Signaling inherently changes both people, whereas conscious language can be strictly one-way. When you engage in social signaling, you are often affected just as much as the other person. Signals are two-way communication; pulling on one corner of the social fabric stretches all members of the network.

For instance, in the Stanford University experiment discussed above that used a computer-animated sales agent to mimic people, researchers found that mimicry makes the agent seem both more honest and more persuasive.[20] But this is only half of the story: When someone mimics you, there is a very strong tendency for you to begin mimicking them. This creates a sort of social circuit that reinforces itself, producing a pair of people deeply engaged in mimicking each other, each feeling better and better about the other person.[21]

This happens in the real world, too. When we looked at salary negotiation, a situation that is prone to distrust and conflict, we found that when one person began mimicking, the other person joined in three-quarters of the time. Furthermore, the amount of mimicking was strongly correlated with feelings of trust.[22] The consequence is that by mimicking another person, you can get them to trust you more — but you will end up trusting them more as well.[23]

This strange effect of "self-inflicted brainwashing" works even in the simplest situations. When experimenters ask people to move their heads up and down while listening to a sales pitch or seeing a consumer product, people end up liking the pitch or product more, and they are more likely to buy it. It is as if your brain thinks to itself, "Well, I see that I'm nodding my head, so I guess I must really like this!" Yes, we humans seem to be just this simple.[24]

Honest Signals in Groups

Our research suggests that people's behavior is much more a function of their social network than anyone has previously imagined. Humans are truly social animals, where individuals are best likened to musicians in a jazz quartet, forming a web of unconscious reactions tuned to exactly complement the others in the group. What the sociometer data demonstrate is that this immersion of self in the surrounding social network is the typical human condition, rather than an isolated example found in exceptional circumstances.

Why does this ancient communication channel exist? What does it do? Data from biology show that honest signals evolved to coordinate behavior between competing groups of individuals.[25] For instance, honest signals form a communication channel that helps to create family groups and hunting teams. The social circuits formed by the back-and-forth pattern of signaling between people shapes much of our behavior, as our ancient reflexes for unconscious, social coordination work to fuse us together into a coordinated (but often contentious) whole.

In a family, a work group or even an entire organization, the pattern of signaling within the social network strongly influences the behavior of both the individuals and the group as a whole.[26] Healthy signaling patterns result in good decision making, while bad patterns result in disaster. The social circuitry of a work group, for instance, can insulate the group from problems like groupthink and polarization. Even for large networks of humans, such as companies or entire societies, the pattern of social circuitry influences the "intelligence" of the network.

We are beginning to understand how our ancient patterns of organization and communication translate to electronic media and distributed teams by using the sociometer to examine the behavior of entire organizations. For example, by combining the sociometer sensing of human interactions with the measurement of e-mail, we can detect communication overloads and predict group interaction quality. As a consequence, we expect that our new abilities to sense organizational function will allow us to engineer better workplaces.

We have already made a start on this sort of organizational engineering with an initiative we call our Sensible Organizations program, the goal of which is to uncover the tacit patterns of behavior that lie behind the success of one company and the failure of another.[27] For instance, by giving wirelessly connected sociometer badges to every person within the organization, Sensible Organizations technology allows people to monitor the flow of information within their group so that they can identify information bottlenecks and overloads.

The Implications of Our Findings

The sociometer has given us a different view of human society — one that owes more to our ancient capacity for honest signaling than to our conscious mind, and one in which signaling within our social networks is seen as more powerful than logic or reason. And the sociometer has also given us a new, powerful way to understand and manage human groups, corporations and entire societies. As this new account of human social behavior becomes refined by the use of more sophisticated statistical models and sensor capabilities, we could well see the creation of a quantitative, predictive science of human organizations and human society. Just as we are beginning to be able to engineer our genes, we are also beginning to be able to engineer our society, producing "designer societies" that work dramatically better than today's natural ones. At the same time, these new tools have the potential to make George Orwell's vision of an all-controlling society into a reality. What we do with this new power may turn out to be either our salvation or our destruction.

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Biography: Alex (Sandy) Pentland is the Toshiba Professor of Media Arts and Sciences at MIT and directs the MIT Media Lab's Digital Life Consortium, and is the author of the new book *Honest Signals: How They Shape Our World* (Cambridge, Massachusetts: The MIT Press, 2008). Comment on this article or contact the authors through smrfeedback@mit.edu.

Appendix: How the Sociometer Works

My students and I have built several generations of what we call sociometers, using cell phones and electronic badges with integrated sensors. With a wide range of collaborators, we have been able to observe hundreds of people for periods of up to a year, in the process amassing hundreds of thousands of hours of data.

The first sociometer, which I created with Tanzeem Choudhury along with design help from Brian Clarkson, was able to measure face-to-face interactions between people using an infrared transceiver (to detect when people were facing each other), a microphone (to collect sound) and a two-axis accelerometer (to measure body motion).[i] This badge was used to extract social interactions from sensory data and then model the structure and dynamics of social networks. Following the success of this first sociometer, several generations of badgelike sociometers have been created, each with improved capabilities and hardware design.[ii]

The current sociometer, created by Daniel Olguín and his colleagues, is lightweight and has a small badgelike form factor in order to be comfortable to wear for long periods of time.[iii] It also has a long battery life so that it doesn't need to be charged every day. To achieve this, the badge is designed for low power wake-up directly from sensor stimuli. The main measurement features offered by the current sociometer are:

- capturing face-to-face interactions using an infrared sensor to determine how much time users spend talking face to face
- performing speech feature analysis to measure nonlinguistic social signals and identify the social context
- recognizing common daily human activities by measuring body movement
- performing indoor tracking and user localization
- communicating with cell phones and computers to send and receive information from different users as well as process data
- measuring the physical proximity to other people

Further information about this research is available in the author's book *Honest Signals* (Cambridge, Massachusetts: MIT Press, 2008) and at http://hd.media.mit.edu.

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