MOLECULAR IDENTITY

Crafting our personas at the molecular level

As neuroscience, genetics, and social media collide over the next decade, humans will meet themselves in entirely new ways. Questions abound at this intersection: *How will we manage our new identities that are both more public and more intimate than ever before? How will our understanding of our molecular identities shape the macro personas we cultivate as individuals, as families, as citizens? How will the basic categories of human being shift as we experience our neuro-social selves?*

We stand at a frontier that will challenge all our past identities. As neuroscience shows us how genetics and environment meet in the brain, we will gain extraordinary aptitude in controlling our experience of the world. As we tether our nervous systems to our cybersystems, those systems will also grow in their ability to influence our innermost sense of self. The ways we map these new experiences onto our existing social, economic, and political systems will be the source of much of the innovation and discord over the coming decade.

STARTING WITH BASICS: A SPECTRUM OF GENDER IDENTITY

The most basic identity that we humans wear is our gender identity. The fundamental distinction between male and female is the first definition of who we are. Even before birth, we are typically labeled by our genitals if not our genetics. But our nervous systems give us finer resolution on this distinction. Research shows that gender identity is not binary: while the Y chromosome sets up the conditions for maleness, a range of genetically and environmentally triggered subtleties in the biochemistry of the body define a continuum of gendered experience.

Already, in the virtual worlds of human interaction, people are choosing to experience the diverse possibilities of gender along this continuum. As we learn more about how gender is experienced in the nervous system, we will also introduce the possibility of manipulating our gender across a spectrum of maleness and femaleness. What was once a simple dichotomy becomes a high-resolution, almost pointillist canvas of gender expression. We see this shift already in youth fashion; young men are comfortable venturing into women's clothing departments to put together their own look. The opposite trend is also possible, however: using neurological manipulation, it may be possible for proponents of a stricter dichotomy to use neurological manipulation to suppress variation.

MIND TO MACHINE: THE EVOLUTION OF THE NEURO-SOCIAL SELF

At this intersection of personal neurology and public persona, machines will play an increasingly important role. Even now, new digital devices are showing up in the marketplace to help us manage our brains and nervous systems. With management options come opportunities to achieve specific outcomes—from brain calisthenics for better learning to receptor-specific activities to control our weight and games that help us manage brainwave activity.

Over the next decade, we can expect to see these neuro-digital devices integrated into the social media systems that connect us in increasingly dense networks. And, we may find that our social networks are acting directly and visibly on our individual nervous systems, and vice versa. We will certainly see more use of targeted neuro-stimulants to influence our behavior. Marketers are the early leaders here. But we may find that our friends and families soon develop a similar literacy and use a variety of neuro-social tools to boost us out of depression or assure our continued affection for them. We may find that we ourselves choose our social networks for how they shape our brainwave profiles. And new kinds of analytics will almost certainly portray these new subtleties of identity for an ever-expanding public.

BEYOND PRIVACY: HIGH-RES IDENTITY MANAGEMENT

Among the fierce debates that neuro-social systems will trigger, personal privacy is likely to be the most critical in the near term. Already under surveillance in virtually every public space (and many private spaces), we will surely respond to the mapping and targeting of our neurosystems as a further intrusion into our privacy.

Yet this decade is likely to see the transformation of the privacy debate. Instead of focusing on how we protect our privacy, we will shift to ever more nuanced strategies for managing our identities. We'll game our neurological responses to neuro-messaging. We'll look for, and find, tools to block or modify our neuro-profiles in networks. Instead of just a visual avatar to represent us in the digital-physical worlds we traverse, we'll cultivate sensory avatars that either reveal or mask our most intimate physiological reactions in any situation we find ourselves. These tools will, in turn, offer us a very fluid experience of our own individual identities—so fluid, in fact, that it may challenge the very concept of a distinct personal identity.

SUPERSTRUCTING MOLECULAR IDENTITY:

How will you live this forecast?

The **Superstruct Strategies** emerged from IFTF's 2008 massively multiplayer forecasting game, Superstruct. They suggest innovative ways to respond to this forecast.

EVOLVABLITY:
Nurture genomic diversity and generational differences

EXTREME SCALE:
Layer micro and massive scales for rapid adaptation

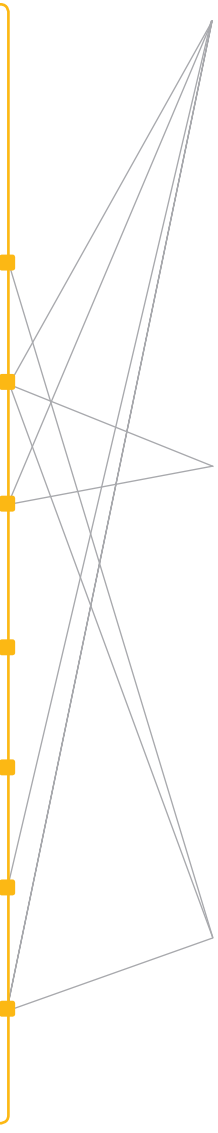
AMBIENT COLLABORATION:
Leverage stigmergy with environmental feedback

REVERSE SCARCITY:
Use renewable and diverse resources as rewards

AMPLIFIED OPTIMISM:
Link amplified individuals at massive scales

ADAPTIVE EMOTIONS:
Confer evolutionary advantage with awe, appreciation, and wonder

PLAYTESTS:
Challenge everything and everyone in fun, fierce bursts



EXTREME SCALE + AMBIENT COLLABORATION + ADAPTIVE EMOTIONS + PLAYTESTS

Conduct massively many brainwave games to explore the 95% "dark identity" space. If indeed human behavior is driven by neurological patterns and activities that happen in the dark—out of our conscious awareness—new neurological tools are great ways to explore that dark identity. While we will undoubtedly learn much by exploring this new frontier individually, we have an opportunity as a social species to see how our dark identities overlap and interact. This kind of knowledge and understanding will be particularly important in the face of the many efforts to influence our neurological responses for good and for bad. The more literacy we have about our responses, and the more control we have over them, the more we can participate in the craft of interacting with our environment.

EXTREME SCALE + AMBIENT COLLABORATION

Analyze the impacts of policy at the molecular scale. The field of social neuroscience is already beginning to uncover the links between our nervous systems and the social structures that we participate in. These are the structures of human collaboration, and understanding the links across the micro-macro scale of human response opens a new frontier for policy analysis. It will now be possible to conduct epidemiological studies at the level of neurological response, measuring everything from happiness and pain to the ability to process information. We know that the next decades will see a rapid shift in our institutions from the familiar large-scale, top-down structures to more emergent and more fluid bottom-up forms of social, economic, and political control. As we make this transition, we may need to work at the scale of neurons to get our policies right.

EVOLVABILITY + EXTREME SCALE + PLAYTESTS

Simulate human speciation using emerging neuroscience and genetics. The science of speciation is barely a science today. But using emerging findings in neuroscience and genetic engineering as inputs to simulations that leverage evolutionary theories such as assortative mating or germ-line mutations, it may be possible for us to anticipate the extremely long-term impacts of our present-day choices about everything from the partners we seek to the genetic interventions we undertake. Simulations allow us to "live" through the multiple generations that are required for speciation to occur and watch the outcomes.

FILLING IN THE CONTINUUM

Human embryos are androgynous in the early weeks of development with ducts for both male and female genitalia. A combination of chromosomes and genes triggers hormones that, in turn, determine whether the male or female organs develop. For some, these hormones fail to be triggered, and in others, the hormones are triggered to different degrees, so that the neurological responses to the world span a range of what we typically think of as male and female behaviors.

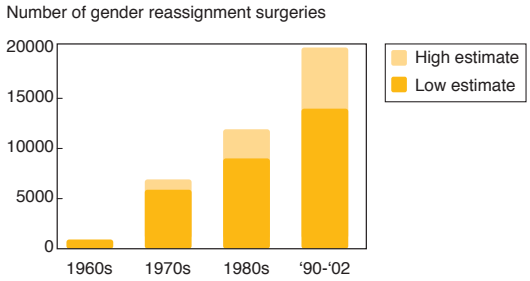
Cultures around the world have long recognized this variability in gender identity. Deborah Blum, author of *Sex on the Brain*, describes a common genetic defect in the Dominican Republic: an enzyme that concentrates testosterone for building male genitals results in children that are raised as "conditional" girls. At puberty, when testosterone spikes, the genitals develop belatedly, and "daughters" turn into "sons" who then take on entirely male identities. India, which has about 6 million "Hijras" (castrated men who dress like women), has recently recognized this group as an official third gender, listed as "other" along with "male" and "female" on electoral rolls and voter identity cards. Australia recently granted—and then almost immediately revoked—a "Sex Not Specified" identity document, using the aspecific Zie. In the United States, sexual reassignment surgeries that realign the internal sense of gender with the physical body have grown at least tenfold in the last half century (Figure 1). Some research suggests that the prevalence of transexualism may be as high as 1 in 500 males. The phenomenon has become visible enough for transexualism to emerge as a workplace issue.

Beyond these biologically obvious gender identities are a range of more subjective and expressive shifts in gender identity. Pushing beyond the bounds of the so-called metrosexual male, today's young people are further blurring the lines of gender identity, with not only androgynous fashions but a growing acceptance of cross-dressing and cross-shopping. In the United States, more young men are showing up in school and at work in skirts. In Japan, a growing group of *soushoku danshi*—or grass-eating boys—is attracting young men who lack interest in sex and a competitive lifestyle. The cluster of behaviors of the grass-eating boys, who are vegetarians, seem to be an accommodation to shifting global resources.

MAPS OF CHANGE AND CONFLICT

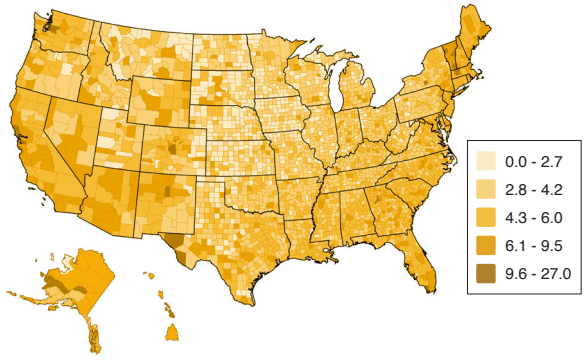
This redefinition of the most fundamental of human distinctions will not unfold without conflict, and we can expect the current debates about same-sex marriage, transgender expression in the workplace, and gender-based human rights to continue to foment cultural, political, and even economic discord over the next decade. This will be a decade of rights gained and rights lost, but by 2020, the debates will be much more subtle, more filtered through the science of mind and body, and more visible in a wider range of gendered expressions and experiences. The geopolitics of this variability will be visible in the maps of the United States and the world. These maps will, in turn, influence patterns of migration and ultimately patterns of wealth. Figures 2 and 3 exhibit the current variability in the United States.

FIGURE 1 Estimates of male-to-female gender reassignment surgeries show a tenfold increase in the last half century.



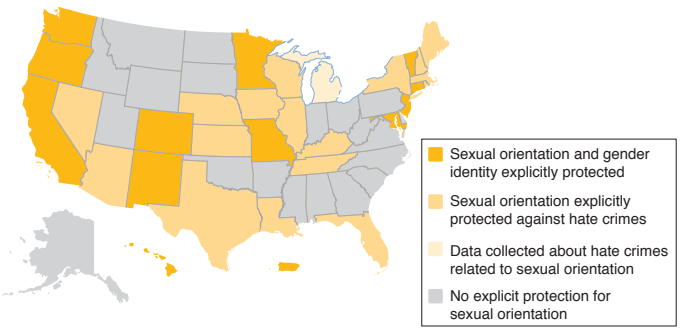
Source: Lynn Conway, "How Frequently Does Transsexualism Occur?", http://ai.eecs.umich.edu/people/conway/TS/TSprevalence.html

FIGURE 2 The 2000 Census Map of households with same-sex partners shown here will be updated in 2010 to include the distinction between same-sex married couples and same-sex partners.



Source: Williams Institute, http://www.law.ucla.edu/williamsinstitute/home.html

FIGURE 3 The map of states with hate-crime legislation that protects sexual orientation points to the "safer havens" for gender-based experimentation. While gender-based hate crimes have increased slightly, race-based hate crimes still outnumber all other hate crimes by a factor of 3 or 4.



Source: http://en.wikipedia.org/wiki/File:Map_of_LGBT-related_hate_crime_law_in_the_United_States.svg

THE RAPID GROWTH OF NEUROSCIENCE

The past decade has seen the unprecedented growth of neuroscience as a discipline that sociologists of science call "comparable to physics or chemistry, economics or law, molecular biology or medicine." From 1995 to 2005, investments in neuroscience research rose from $4.8 billion to $13.6 billion (Figure 4). Citation analysis of science journals reveals that in just seven years, from 2001 to 2007, neuroscience has emerged as a major discipline (Figure 5). This consolidation of neuroscience, according to the analysts, was the biggest structural change in science during this period.

The largest investments have come from medical device firms, who won FDA approvals for over 1600 new devices during the decade from 1995 to 2005. These investments are an important signal. Many of the new medical devices are designed to monitor brain activity or other neurological patterns, analyze them, and even actuate them. Most employ some sort of digital technology. You can now electronically stimulate sections of your brain to control your desire to eat—the ultimate diet aid. But the implications go well beyond personal choices to medically treat oneself neurologically. These devices ultimately have the power to connect our nervous systems socially through the Internet.

THE EMERGENCE OF SOCIAL NEUROSCIENCE

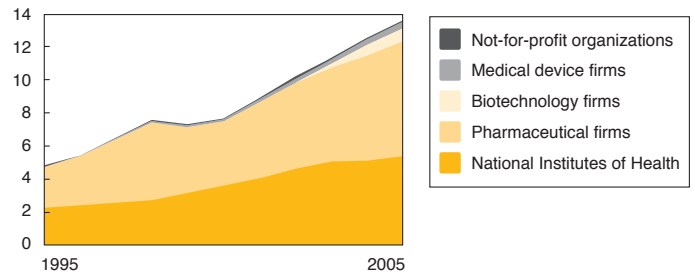
At the leading edge of the young discipline of neuroscience is the even younger subdiscipline of social neuroscience. The first journal, *Social Neuroscience*, launched just six years ago, is already ranked 6th among 61 journals in the field of psychology according to its impact factor.[1] The stated goal of the journal is to "further our understanding of the role of the central nervous system in the development and maintenance of social behaviors." Just this year, in January 2010, an international interdisciplinary Society for Social Neuroscience formed with the following founding statement:

> "… as a social species, humans create emergent organizations beyond the individual—structures that range from dyads, families, and groups to cities, civilizations, and international alliances. Social neuroscience [is] defined broadly as the interdisciplinary study of the neural, hormonal, cellular, and genetic mechanisms underlying the emergent structures that define social species."

Some scientists believe that as much as 95% of human "decision-making" occurs below the level of consciousness, by processes embedded in our neurological systems. At this scale, the in-depth study of these processes opens a frontier of human exploration that trivializes any previous social-psychological studies. It certainly suggests dramatic innovations for marketing, medical, and social behavioral intervention, and with that, the rise of legal and ethical issues. It also vastly expands the domain of human identity that we ourselves can choose to craft. And perhaps most importantly, it draws the visible connections between that personal domain and the larger social and institutional structures we participate in—including social media.

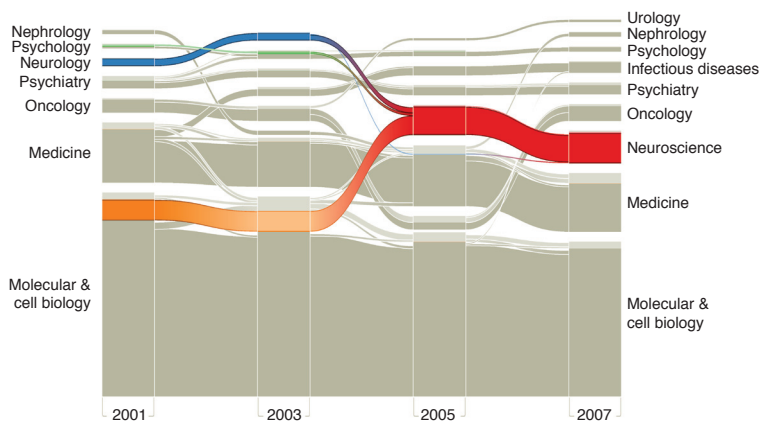
1. Impact factor reflects the number of citations to articles published in science and social science journals and serves as a proxy for the relative importance of a journal in its field. It's worth noting that, overall, the top-ranked science journals by impact factor are biology and physiology journals, reflecting the growing important of biosciences for this century.

FIGURE 4 **Funding support for neuroscience research more than doubled (when inflation is taken into account) from 1995 to 2005.**



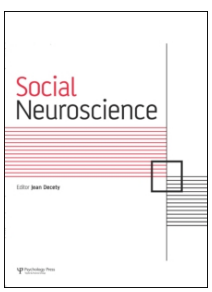
Source: E. Ray Dorsey, et al., Financing of US Biomedical Research and New Drug Approvals across Therapeutic Areas, PLoSONE, http://www.plosone.org/article/info:doi%2F10.1371%2Fjournal.pone.0007015

FIGURE 5 **Studying the citation pattern between about 7000 scientific journals over the past decade, researchers found that neuroscience has transformed "from an interdisciplinary specialty to a mature and stand-alone discipline."**



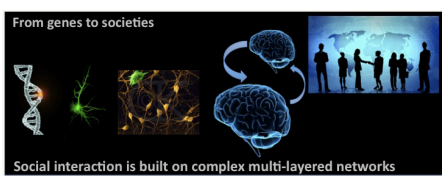
Source: Martin Rosvall, et al, "Mapping Change in Large Networks, PLoS ONE, vol 5, no 1, 2010.

FIGURE 6 ***Social Neuroscience*** **was launched in 2006 and quickly gained a ranking of 5 out of 61 journals in terms of impact on the field of psychology.**



Source: http://www.psypress.com/social-neuroscience-1747-0919

FIGURE 7 **The Society for Social Neuroscience launched internationally in 2010 to advance the understanding of the interplay between social structures and neural mechanisms.**



Source: http://s4sn.org/drupal/

WHY EVEN THINK ABOUT IT?

Speciation is thought to be a very long process, taking place over millennia. But precisely because it is such a long, slow process, it has not been well studied and is not well understood. How long does it really take for a species to branch? And are we seeing the seeds of that branching today?

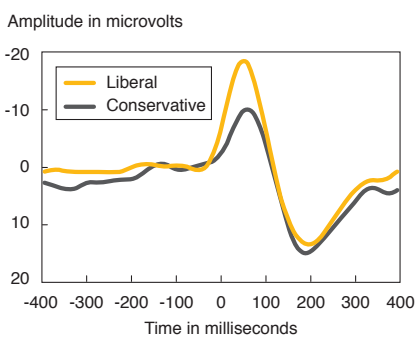
The gold standard for speciation is the inability to cross-breed. Scientists have seen sexual isolation in fruit flies after just 25 generations—the equivalent of about 500 years for humans. Certainly this is beyond the scope of business planning and even most policy. Nevertheless, the early markers of speciation may be visible in the choices we are making today about our personal identities and our networks of social identity. These are important choices that are already shaping the public discourse. And our growing knowledge of genetics and neuroscience are making these choices more visible.

ASSORTATIVE MATING

One of the paths to sexual isolation is selective mating, or assortative mating, as it is often called. Assortative mating occurs when different groups within a species are attracted to different qualities that are then strengthened in the germ-line of each—that is, in their hereditary genetic codes.

Studies of neuroscience are already showing us signals of how this mechanism may be at work in our social networks today. A recent study of the neurological basis of political affiliation suggests that the neurological responses to environmental information differ for conservatives and liberals (Figure 8). Conservatives showed more structured and persistent cognitive styles while liberals were more responsive to complexity, ambiguity, and novelty. With the ability to find politically like-minded people in our global networks—and even to identify biologically like-minded people—are we not only polarizing today's politics but also taking the first steps to much longer-term mating patterns that could lead to speciation along these lines?

FIGURE 8 In studies of self-regulatory conflict monitoring in the brain—that is, the negative electrical charge (ERN) when a habitual response is not appropriate—liberals scored higher negative charges.

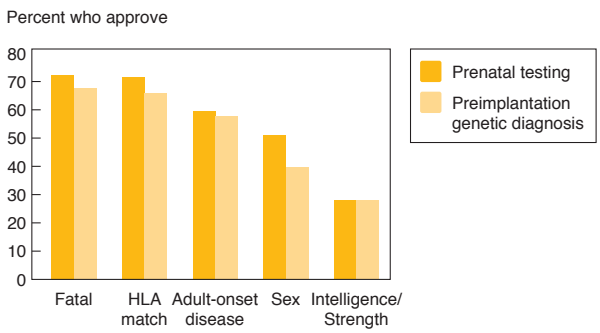


Source: David M. Amodio, et al., "Neurocognitive Correlates of Liberalism and Conservatism," *Nature Neuroscience*, vol 10, no 1, October 2007.

GENETIC ENGINEERING

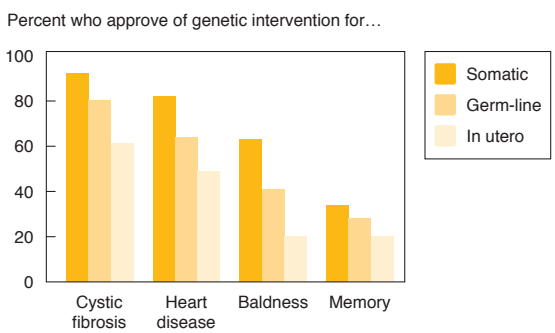
Direct intervention in human genetics is another path toward speciation. Genetic engineering is gaining increasing acceptance as a way to treat disease and pre-screen embryos for what may be thought of as adaptive characteristics (Figures 9 and 10). But at present, most people draw a line between disease-specific interventions and interventions in "desirable qualities" such as intelligence, strength, and even gender. They also distinguish between interventions that treat only an individual and those that pass along genetic modifications to offspring. The latter could very rapidly change the fitness profile of groups of humans and lead to directed human speciation.

FIGURE 9 A US survey of a representative sample of nearly 5000 people showed that Americans support prenatal genetic testing and preimplantation embryonic testing for health-related conditions, but the majority do not approve of either for characteristics such as intelligence or strength.



Source: A. Kalfouglou et al., *Reproductive Genetic Testing: What America Thinks*, Genetics and Public Policy Center, 2004, http://www.dnapolicy.org/pub.reports.php?action=detail&report_id=6

FIGURE 10 People in the UK make slightly stronger distinctions among the various types of genetic interventions, with so-called "designer genes" achieving acceptance among only one-fifth of the population.



Source: "What Do People Think About Gene Therapy?," Welcome Trust, 2005.

MAKING THE CONNECTIONS

In a complex world, forecasts intersect. These are key intersections between Molecular Identity and other 2010 forecasts.

IDENTITY + CARBON

Neuro-Social Carbon Management

At the intersection of neuroscience, technology, and social networks is an emerging opportunity to create persuasive technologies to manage carbon emissions. Already, a host of carbon footprint applications for Facebook allow friends to track one another's carbon footprints (Figure 11). These applications leverage social emotions to encourage people to reduce their footprints. Approaching the problem from the neuroscience side of the equation, designers are also exploring calm technologies to change carbon-related behaviors—for example, by providing aesthetically pleasing experiences to reinforce driving habits that improve miles per gallon. These point to the potential for social systems that track our carbon behaviors and use neuro-targeted cues to help us achieve our goals.

IDENTITY + CITIES + POWER

Gender Politics in the City

Gender identities and the politics of sexual orientation will continue to shape our national dialogue and our urban spaces. Mapping of areas that are friendly to gays and lesbians will continue to draw people to existing "gay villages." These enclaves have historically played a key role in the redevelopment and renovation of poor urban areas. They may pave the way for a boomer "flight to the cities" as an aging strategy—or they may compete. They will also be implicated in the displacement of urban poor to the exurbs and suburbs.

IDENTITY + POWER

Global Leadership in Reinventing the Human Genome

Concerns about tinkering with the human germ line—stem-cell therapy—have raised red flags for scientists and citizens alike, and a number of countries around the world have passed laws restricting stem-cell research. The map of these regulations is also a map of where the science is and isn't happening today, and who could take the leadership in this technology in the coming decades. Those with the most permissive stance are in China, India, Japan, Australia, and Scandinavia (Figure 13). These may also be the countries that set the global policy for this technology.

FOR FURTHER READING

Deborah Blum, *Sex on the Brain: The Biological Differences Between Men and Women.* (New York, Penguin, 1998).

John Decety, Editor, "Social Neuroscience: A New Journal," in *Social Neuroscience,* vol. 1, no. 1, 2006.

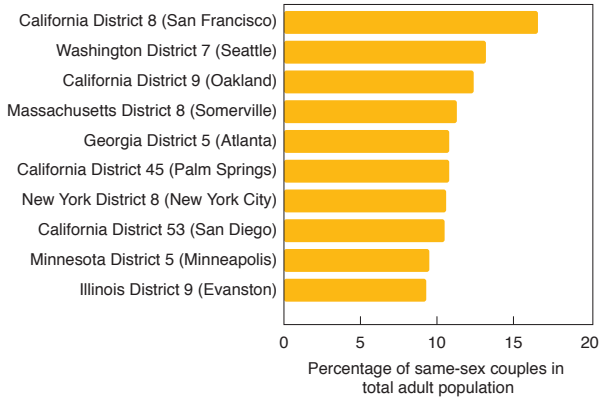
N. Schichor, et al., "Should We Allow Genetic Engineering? A Public Policy Analysis of Germline Enhancement" in Scott Gilbert, *Developmental Biology,* 2006.

Oliver Goodenough, *Law and the Brain.* (New York, Oxford University Press, 2006).

FIGURE 11 **The goBEYOND carbon footprint calculator is one of several Facebook applications designed to link personal carbon tracking to social networks.**

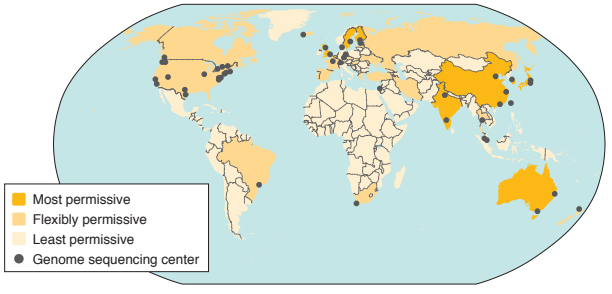
Source: http://www.go-beyond.ca/carbon-footprint-calculator

FIGURE 12 **Cities increasingly have non-traditional gender identities, which can, in turn, influence local and national politics, as these top 10 US gay/lesbian/bisexual congressional districts illustrate.**



Source: Gary J. Gates, Same-Sex Coupes and the Gay, Lesbian, Bisexual Population: New Estimates from the American Community Survey, The Williams Institute, 2006.

FIGURE 13 **A world map of "permissiveness" toward embryonic stem-cell research highlights regions that are likely to take the lead in genetic intervention.**



Source: http://www.mbbnet.umn.edu/scmap.html

GROWTH

Consuming Identities

In a world of continued focus on economic growth, the need to manage identity offers abundant opportunities for new products and services—many of which leverage autonomous networked identities that are created automatically across friend-of-a-friend networks by tracking the details of daily life. With the commercialization of neuro-psychology and the proliferation of neuro-enhancements, people (especially young people) increasingly play with neuro-identities (including gender identities), using targeted drugs and electronic stimulants to shape their personas and experiences. A neuro-enhancement gap emerges.

- Lifestream-like platforms offer increasingly sophisticated services for individuals to aggregate, track, and display their own social media. Tools for searching lifestreams and crafting them into more complex media narratives create a popular new genre of media. These are especially well-developed in India and Brazil.
- Tools for visualizing the interactions of various lifestreams become the basis of all kinds of services, from greeting cards to collective diaries to advertising that targets groups of friends and relatives around shared activities and interests.
- Digital trace technologies construct ad hoc identities for us from our digital interactions. Without ever crossing the "privacy" boundary into the content of our daily lives, they discern everything from sexual preferences to impending events we ourselves may not anticipate (such as a job layoff).
- New social network platforms leverage a combination of these digital trace analyses and emerging semi-autonomous avatars to connect us automatically across a variety of networks, serving as frontline filters for information, people, products, and services that may interest us. The avatars initiate links and even complete transactions in limited domains that we approve.
- Some of these avatars are highly animated and take on celebrity status. A few of them are given physical embodiments as robots. A growing segment of the population games the digital trace algorithms to promote their avatars to celebrity status.
- Access to digital trace technology becomes a growing tool for national security—not just as a means to identify potentially threatening global networks, but also as a way to track attitudinal and behavioral networks within antagonistic nations, to be addressed through diplomacy, propaganda, financial support, or armed conflict. (The same applies, of course, for internal controls.)
- So-called neuro-enhancement technologies—both pharmacological and digital—extend cognitive, physical, and even emotional capacity. Individuals begin to craft their identities around specific enhancements.
- The neurological markers of gender experience become more widely recognized, and people use a combination of drugs and digital tools to create temporary shifts in their internal sense of gender. Similar experimentation with simulated "disabilities"—such as temporary blindness or hearing loss—give people access to a wider range of human experiences.
- Some of these neuro-simulation tools are used medically and even coercively to correct for so-called "gender identity disorders."
- As with any technology, neuro enhancement tools are unevenly distributed and adopted across the population. The resulting "neuro-enhancement gap" creates a host of social interventions, ranging from activity-specific restrictions (like those imposed on the use of steroids in sports) to fund-raising for neural games in underprivileged schools.

SIGNALS OF GROWTH
IN MOLECULAR IDENTITY

NEURO-ENHANCEMENT—AND A NEURO-ENHANCEMENT GAP

Following decades of research on direct interfaces with the brain, a variety of digital tools (and drugs) are emerging to help people tune up their brains for various purposes—to stave off failing memory in old age, to improve study skills and academic performance, and to achieve brainwave states that are optimized for the tasks at hand. Many of these tools have a mind-over-matter component: using focused thought to move cursors on the screen or objects in the physical world is now a demonstrated capacity of ordinary humans. At the same time, even basic neuro-enhancements are not evenly distributed. While 73% of those with hearing disorders now have cochlear implants, only 12% of African Americans have this enhancement.

Source: http://www.mindball.se/product.html

The MindBall game teaches players to control their brainwave activity to move a ball into their opponent's territory. A quiet mind, with high theta wave activity, produces the best result.

GENDER AS A RECREATIONAL EXPERIENCE

It is a well-known fact that players in virtual reality worlds experiment with gender experiences. Male players choose to play female characters as much as 50% of the time—as a "mood modifier." Players cite both practical and emotional motivations—from getting more gifts as women to enjoying "some of the absolutely wonderful interactions you can't get in real life." As the neuroscience of gender advances, people may seek direct-to-brain stimulants that provide a direct emotional and physical sense of how it feels to live in a differently gendered body.

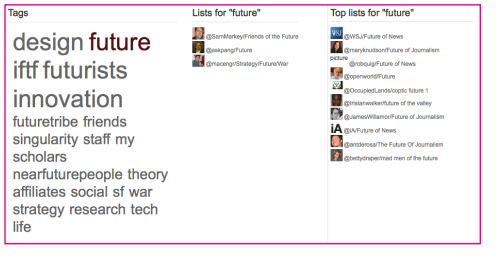
In Nick Yee's analysis of gender swapping in the *World of Warcraft*, men were much more likely to switch genders than women. But in analyzing players across four other games, he found the reverse: 74% of women played male characters and 23% of men played female characters.

From Nick Yee's Gender Analysis of Players in *World of Warcraft*	
Given a hypothetical pool of 1000 players: • 840 would be male players • 160 would be female players	**Of the 840 male players:** • 193 would be playing a female character • 647 would be playing a male character
Of the 160 female players: • 5 would be playing a male character • 155 would be playing a female character	**Totals:** • Of 348 female characters, 193 (or 55%) would be played by males • Of 652 male characters, 5 (<1%) would be played by females

Source: http://www.nickyee.com/daedalus/archives/001369.php

AUTONOMOUS NETWORKED IDENTITIES

Lifestream aggregators are already producing aggregate views of our online social identities: in a single list of all our tweets and Facebook entries, our blog posts, and even social bookmarks, we can see our social activity in a nutshell. But digital trace analysis is taking these identity markers a step further, creating profiles from that data. Ultimately, these profiles can be used as the basis for algorithms that will allow semi-autonomous avatars to act on our behalf in various network settings—perhaps responding to Mom's Facebook post of today's bridge win in an appropriate way. More importantly, these profiles and the agents they generate can begin to filter incoming datastreams and connect us to new networks.



Source: http://lifestreamblog.com/find-out-your-true-identity-according-to-people-on-twitter/

The protoype online service, MustExist, uses Twitter data to compile a profile of anyone with an account—displaying their thematic interests as a tag cloud and the social networks implied by the lists they belong to.

CONSTRAINT

The Sustainable Self

In a world of sustainability targets, self-monitoring is elevated to a science, with personal footprints for mandated domains such as carbon, energy, water, and food, as well as voluntary expressions of sustainability such as fashion footprints, health footprints, and happiness footprints—all linked to environmental goods and services. These footprints, in turn, are linked to personal wellness measures, often monitored at the level of the nervous system, and they feed highly personalized maps of individual health prospects. High-definition simulations of one's future self provide a continuous feedback loop that constantly serves to refine one's overall well-being profile and link it to social and environmental behaviors.

- When environmental footprints define the person, a host of new environmental identities emerge: beyond the stereotypes of treehuggers and rednecks, personal footprints define a range of relationships to the environment, from things like "environmental Bigfoot" to "carbon anorexic." More positive identities fill in the spectrum between these extremes and provide the focus for product and service development and marketing strategies.

- The tools for monitoring and managing personal footprints proliferate—products ranging from energy- and water-monitoring tools to simple systems for evaluating the impacts of daily diet on one's health and on the global food system.

- Advertisers monitor personal footprints to form consumer profiles and uncover clues as to where to target products that cross a range of sustainability criteria. Products are increasingly marketed by the way they impact personal footprints. Alliances emerge between companies that market footprint monitoring tools and those with products that target specific footprint goals.

- The science of footprinting is under constant pressure to refine the links between personal behavior and anthropogenic environmental changes, and the formulas for various footprints keep changing. So do the tools for monitoring those footprints.

- The course incentives and political expressions of the 20th century—tax incentives and bumper stickers—are superceded by more subtle forms of footprint-linked inducements. In particular, a variety of social rewards encourage carbon-neutral footprints, including preferred access to everything from public transportation to rock concerts; top rankings in a variety of online lists; and financial benefits such as access to scholarships and discounts at grocery stores.

- Health and wellness services are similarly linked to a variety of personal environmental footprints, with the rationale that a healthier environment produces healthier people. Even as incentives abound for "healthier" footprints, debates about what constitutes a healthy footprint divide both health consumers and health providers.

- Medical simulations of the future self are routine parts of health care visits, with computer-generated "prescriptions" for behavioral, pharmacological, and neuro-digital interventions.

- Forecasting one's future state of well-being becomes a national pastime in much of the connected world, with a range of timeframes from the very near future (hours or days away) to the very long-term future (decades away). These simulations are often linked to specific assumptions about the future environment in which a person is likely to be living, as well his or her future social networks.

- Future impacts of the present-day environment on personal well-being are constantly updated with mobile devices that provide immediate, context-aware feedback. These feedback systems are often linked to games that challenge people to find ways to improve their scores by intervening in the environment.

- Forecasting the future evolution of social networks, starting from any node in the network, becomes a scientific specialty—and a key strategic tool for product development and marketing.

- A variety of global sustainability and happiness indexes are used alongside more familiar economic indexes to guide policy. People feel a patriotic duty to "be happy."

SIGNALS OF CONSTRAINT
IN MOLECULAR IDENTITY

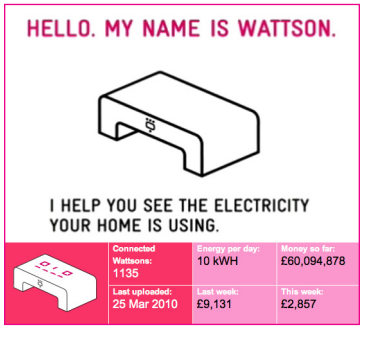
PERSONAL DIGITAL MIRRORS

Online and standalone monitors provide a growing number of digital reference points for our personal identities—for everything from our health to our finances, our participation in the workspace, and in our social networks. These reflect back to us who we are in the world. Already we can monitor how well we're sleeping at night as well as how much energy our houses are consuming while we're awake. Over the coming decade, these kinds of monitors are likely to give us more reference points that reflect who we are in relation to an increasingly volatile natural environment.

Fitbit is a wearable monitor that tracks our daily activity levels and calories burned as well as our sleep patterns at night.

Source: http://blog.fitbit.com/

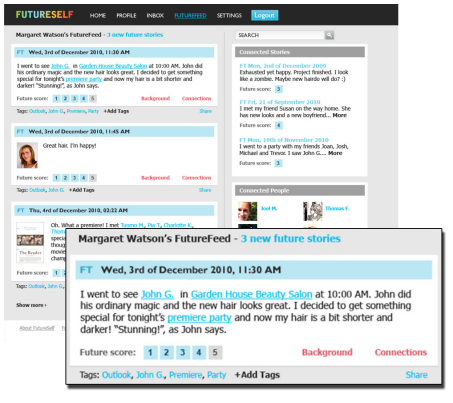
WATTSON monitors electricity consumption, showing not only various levels of use but also the accumulated cost over time. It functions both as a standalone display and an online record.



Source: http://www.diykyoto.com/uk/wattson/about

HIGH-DEF SELF-SIMULATION

A variety of tools exist to simulate age progression under various scenarios concerning diet, exercise, and other health-related parameters. Research studies show that these simulations can be powerful feedback mechanisms for present-day behavior. But now we're starting to see simulations of our social futures. For example, using digital trace analysis, FutureSelf "forecasts" your future on Facebook, showing hypothetical Facebook days set several months in the future. As the trace analysis becomes increasingly sophisticated and the modeling algorithms more detailed, we can expect higher-resolution views of our personal futures in both the near and long term.



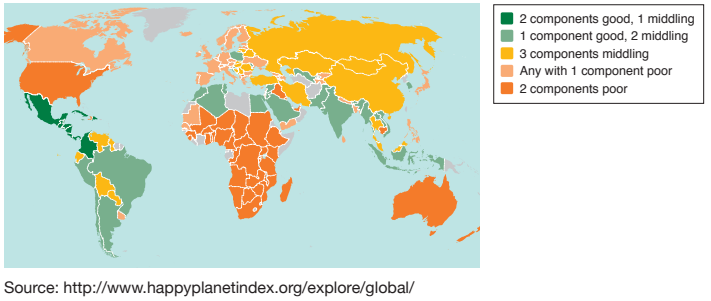
Source: http://www.jarnokoponen.net/portfolio/Futureself-Reflections-on-A-Personal-Future-Simulation-System

FutureSelf is a conceptual design for a hypothetical future Facebook page, created by analyzing your Facebook friends and activities from the past and present.

ENVIRONMENTALLY-LINKED HAPPINESS RATINGS

When economic growth is constrained by sustainability targets, global metrics shift from a focus on GDP to a focus on happiness. Already we see the proliferation of happiness and well-being surveys and indexes. Perhaps the most prophetic for a world of constraint is the Happy Planet Index that combines three indexes—life expectancy, life satisfaction, and ecological footprint—to draw the link between personal well-being and the environmental health of the planet. In the future, these kinds of indexes are likely to be much more closely linked to specific communities, building a high-resolution view of the connection between local environmental health and personal well-being.

The most recent Happy Planet Index shows a predominantly unhappy planet. With a key that ranges from dark green (for happiest) to deep orange (for unhappiest), it is clear that today's environmental impacts cost the planet much in well-being.



Source: http://www.happyplanetindex.org/explore/global/

COLLAPSE

Identity Hacking

Advancing neuroscience opens the door to a new level of identity hacking in a world where local collapses, migration, persistent digital identity trails, and widespread unemployment all make identity management a key to survival. Authorities use neuro-fingerprinting to assure the security and validity of identity; thieves use neuro-hacking to breach these security measures; and ordinary citizens use neuro-hacking strategies to "rewrite" unfortunate personal profiles or histories. Identity management platforms proliferate, with a growing rift between proprietary and open-source platforms. The question of who owns individual identity in the cloud is forefront.

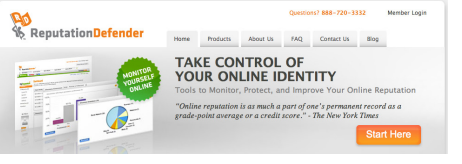
- Present-day brain fingerprinting techniques evolve into sophisticated neural fingerprinting that is used to inform everything from loan approvals to university admissions and job applications to custody hearings. Neural fingerprints are also used for sophisticated identity authentication applications.
- Techniques for hacking neural fingerprints include memory erasure techniques and memory creation techniques. Some consider these valid defenses against intrusive testing; others consider them to be criminal.
- Identity protection is one of the most widespread security concerns, and a host of tools and technologies are designed to help people secure both their basic access to the cloud and their reputations in it.
- Some identity protection approaches focus on securing devices, eliminating the need for passwords and accounts. Others provide proprietary systems for enterprises to assure the security of their employees' interactions in the cloud, across a wide range of applications needed to perform business functions.
- A global debate continues between advocates of open-source authentication protocols and those who promote individual private solutions, targeting not only businesses but communities and government institutions. The open-source solutions are widely adopted in the Global South.
- In a world of cascading collapses, post-traumatic stress is a leading disease. A variety of pharmacological and digital methods for erasing frightening or traumatic memories is available to those who can afford them. A gap between the survivors, who expunge their fears, and those who live in constant fear creates one of the critical drivers for political and cultural discord.
- "Humanitarian" efforts to expunge painful memories of people who have undergone ethnic wars are attacked as attempts to rewrite or entirely eliminate the history of ethnic groups.
- Bio-neural warfare becomes much more sophisticated, using a variety of strategies and targeting specific neurological impacts.
- Neurological and cognitive rights become embedded in human and civil rights platforms worldwide. Europe, Canada, and India lead the way in implementing actual protections for those rights.

SIGNALS OF COLLAPSE
IN MOLECULAR IDENTITY

IDENTITY DEFENSE

A range of tools, strategies, and platform standards are emerging to support individuals and organizations in protecting their identities and data as we move into the era of cloud computing. Some monitor your online identity and create reports, much like a financial spreadsheet. Others provide proprietary methods to authenticate users and protect their data in a variety of online environments, either in software or hardware. Meanwhile, an open-source protocol using standard HTTP, SSL/TLS, and Semantic Web vocabularies promises to provide RESTful authentication: one-click sign-on to websites using existing browsers and no user IDs or passwords.

ReputationDefender is a personal identity management solution that monitors your online identity, allowing users to remove personal data from the Web and control Google search results on user names.



Source: http://www.reputationdefender.com/

CloudIdentity is one of several enterprise solutions that allow organizations to manage their employee identities and data across a range of web-based applications that businesses use. iVerifyID is a hardware-based approach that links a unique global identifier to the users hardware devices.

Source: http://www.cloud-identity.com/index.html?type=HomePage; http://www.iverifyid.com/

NEURAL FINGERPRINTING

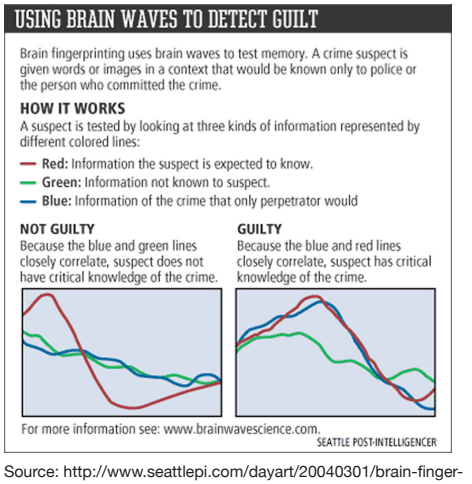
Neural fingerprinting is the use of brainwave analysis to profile an individual. The technique is already used (though contested) in criminal investigations and trials to demonstrate guilt or innocence: much more reliable than traditional polygraph tests, brainwave analyses examine memory functions in the brain to establish whether a suspect has knowledge that only the perpetrator could know. The potential uses and abuses of this kind of testing are great, and in response, civil rights organizations are already establishing ethical rules and lobbying for protections.

Brain fingerprinting has found its first public application as a more precise form of lie detector to establish both guilt and innocence of suspects in crimes.

Source: http://www.brainwavescience.com/

The Center for Cognitive Liberty and Ethics is an international nonprofit organization, founded in 2000, to protect freedom of thought.

Source: http://www.cognitiveliberty.org/issues/mental_surveillance.html



Source: http://www.seattlepi.com/dayart/20040301/brain-fingerprinting.gif

MEMORY ERASURE

In recent years, a growing number of studies of memory in laboratory animals and humans have focused on relieving the symptoms of post-traumatic stress by actually targeting the portions of the brain where traumatic memories are stored. Pharmacological interventions have had some success, but more recently digital protocols are also used to "reprogram" the brain's molecular memory processes to eliminate specific memories. Both procedures raise identity questions for people who choose relief over reliving their past.

Source: http://www.nature.com/nature/videoarchive/memory/index.html

A recent study by scientists at NYU and the University of Texas, Austin, points to digital techniques for permanently banishing memories from the molecular pathways in the brain.

TRANSFORMATION

Neuro-Social Identities

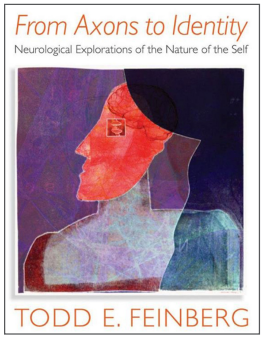
When hyper-connectivity and neuro-enhancement intersect, human neurological systems become an extended network, with explicit and obvious mapping of the impacts of our social interactions on our individual brains and nervous systems. We choose our friends and colleagues based on metrics from our nervous systems, which leads to a kind of assortative mating that may signal future speciation. A science of the neurology of gender challenges our basic understanding of gender identity and sexuality. Even more challenging, neuroscience reconfigures some of our basic notions of an individual self—and also creates a canvas for designing our future selves.

- Early research in the viral nature of emotions leads to a wide range of personal strategies for managing emotions by managing one's social network (or at least one's interaction with that network).
- A variety of neuro-monitoring plug-in applications in social network platforms trigger a wide range of group experiments in viral emotions—for both entertainment and a new form of social therapy. Digital-neuro-happiness "raves" are all the rage in social networks.
- Experiments in collective intelligence are amplified in super-smart networks that connect people who specifically use cognitive neuro-enhancements to boost their collective problem-solving or innovation performance in games, innovation markets, and crisis-response situations.
- A combination of personal genetic testing and neuro-monitoring tools leads to bottom-up networks of health-and-happiness programs that seek to optimize members' daily lives for their particular molecular identities. These lead to a variety of sharply drawn subcultures, some of which are highly visible and some of which remain *sub rosa*.
- Among the subcultures that emerge as a result of genetic and neuro-networking are gender-based networks that span a range of gendered experiences (such as the *soushoku danshi* in Japan). Like other minority networks worldwide, these hyper-connected minorities play a much larger role in the global culture than their mere numbers would suggest.
- Gender-based health solutions are refined as bottom-up health networks like CureTogether, PatientsLikeMe, and 23andMe leverage personal neuro-monitoring to reveal ever more subtle differences in vulnerabilities, symptoms, and therapeutic responses across a range of gender-linked neuro-identities. These advance the science of the endocrine system.
- A growing practice in neonatal medicine is brain scanning to identify potential future health and behavioral problems, as well as basics such as gender. These brain scans trigger a series of medical and educational interventions—or plans for lifelong interventions—that aim for longevity and social well-being.
- At the intersection of disciplines as diverse as urban planning, architecture, neuroscience, and cyber-infrastructure, the art and science of stigmergy—using environmental traces to coordinate behavior—become a focus of urban innovation.
- China and Southeast Asia become global leaders in embedding the insights from social neurology into the built environment as a means to moderate social behavior.
- Likewise, as context-aware technologies and augmented reality begin to permeate the built environment, bottom-up neuro-social networks give rise to neighborhoods that have their own distinctive neuro-social fingerprint. Just as gay communities have aided urban redevelopment, these neuro-social neighborhoods will attract literally like-minded artists and civic leaders to create distinctive enclaves in the urban landscape.

SIGNALS OF TRANSFORMATION
IN MOLECULAR IDENTITY

THE NEUROLOGICAL SELF

For several decades, a question in neuroscience has focused on the roots of consciousness and the sense of a unique and separate self. Modern brain imaging techniques and other forms of brain research have begun to present a picture of how activities at the scale of neurons or even axons translate into the felt sense of self. Over the coming decade, this research is likely to challenge fundamental ideas about human identity, from religious beliefs to social science to political theory. More practically, it is likely to spur a range of tools and processes for acting directly on the neurological underpinnings of identity.



Source: http://toddfeinberg.com/

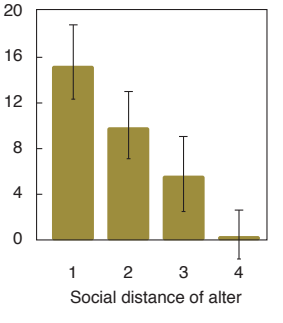
Clinical neurologist and philosopher Todd Feinberg seeks to answer the question of how diverse and distributed functions in the brain construct a unified sense of identity.

VIRAL EMOTIONAL NETWORKING

The viral effects of social networks have been among the most transformative impacts of the Internet on global society—in every domain from politics to innovation to marketing. Now it appears that viral effects also shape our basic emotions. Happiness tends to cluster in networks, and the happiness of our friends—even at three degrees of separation—has an impact on our own happiness. What's more, we are more likely to share certain emotions than others, with awe as the top-ranked emotion. In fact, awe may be the emotional glue that binds humans together. Recognizing these effects, we can now expect them to be leveraged across all the other domains we've already been tracking.

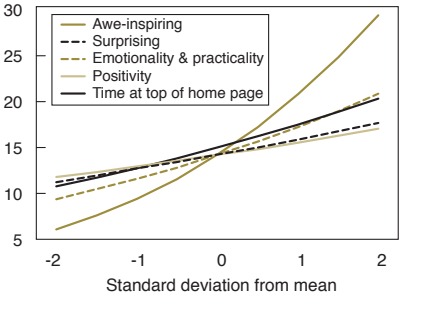
In a study of more than 12,000 people connected by a heart study, researchers found that individual happiness in a network was positively correlated with the happiness of others—with the highest probability of a happiness "contagion" at the first degree of separation. In another study looking at triggers for the sharing of *New York Times* articles, the researchers found that awe-inspiring content was the best predictor for whether or not an article would be shared.

Percent increase in ego happiness



Source: James Fowler et al, "Dynamic Spread of Hppiness in a Large Social Network," http://www.bmj.com/cgi/content/full/337/dec04_2/a2338

Percent probability of making the top sent article list



Source: Johan Berger et al., "Social Transmission and Viral Culture," http://marketing.wharton.upenn.edu/documents/research/Virality.pdf

NEURO-SOCIAL ENVIRONMENTS

One of the most significant findings of recent neuroscience research is the tight coupling between the abstract reasoning functions that we take as unique to our human identity and the activities of the physical body. A corollary of these findings is that our physical environments directly shape our identities at the neurological level. Already, we see the emergence of an Academy of Neuroscience for Architecture. The recent appropriation of the term stigmergy from insect science to discussions of human social environments—both physical and digital—points to a growing literacy of our neuro-social environment. (Stigmergy is the study of how traces left in the environment of social animals influences their future behavior.)

The Academy of Neuroscience for Architecture was founded in San Diego in 2003 in order to "advance knowledge that links neuroscience research to a growing understanding of human responses to the built environment."

Source: http://www.anfarch.org/index.php/content/about/index.html