Mirror Neurons

A compilation of articles and news stories from around the world, book excerpts, concepts, key phrases & brief explanations.

Originally compiled on November 12, 2006 by Teka Luttrell, www.soulconnection.net.

Psychology Today

http://www.psychologytoday.com/articles/pto-20050617-000010.html

Excerpt from:

Ability to read minds of others is natural

Buried deep inside your skull are special brain cells that read the minds of others and know their intentions.

Dubbed mirror neurons, these cells fire in response to the "reflection" of another person. Whether you lift your coffee cup or watch your coworker lift his, the neurons respond to both actions as if they were the same. Neuroscientists believe these cells are what allow humans—and some primates—to feel empathy and compassion for others.

A study by researchers at the University of California, San Diego, links improper function of these tiny cells to a mild form of autism known as Asperger's syndrome. A brain imaging study of 10 autistic boys found their mirror neurons fail to fire in response to the movements of another person.

Autism is a brain disorder characterized by deficits in social interaction and communication skills.

Medical News Today
http://www.medicalnewstoday.com/medicalnews.php?newsid=52223

Strong Mental Link Between Actions And Words

Neuroscience is tackling a problem that obsessed Hamlet: What is the difference in our minds between talk and action?

Less than you would expect, an international research group reports in the Sept. 19 issue of Current Biology.

The brain's premotor cortex shows the same activity pattern when subjects observe an action as when they hear words describing the same action, the study's authors said.

"If you hear the word 'grasp,' it's actually the premotor cortex that's active, not just a separate, abstract semantic area in the brain," said lead investigator Lisa Aziz-Zadeh, assistant professor of occupational sciences with a joint appointment in the Brain and Creativity Institute of the USC College of Letters, Arts and Sciences.

The premotor cortex has long been identified as a center of activity for actions. The notion that it could also process verbal descriptions of those actions has met some resistance.

"Neuroscience is coming around to this idea, but there hasn't been much data supporting it,"Aziz-Zadeh said.

To change that, Aziz-Zadeh recruited 12 volunteers and used functional magnetic resonance imaging (fMRI) to compare the same areas of the premotor cortex in the same subject as the person observed an action and heard language describing the action.

The premotor area involved during observation of a specific action, such as kicking, also lit up when the subject heard the corresponding word. This was the first study to make such a direct comparison, Aziz-Zadeh said.

Other studies found activity in the same areas during execution of an action, Aziz-Zadeh added, offering indirect evidence for the existence of "mirror neuron" systems that activate both when a person performs a task and when the person watches someone else perform the task.

"The study does demonstrate the intimate linkage between the way we talk about actions and the neural machinery that supports those actions. That's very intriguing," said USC University Professor Michael Arbib.

Arbib also noted the sharp difference between the subjects' responses to literal action statements (such as "biting the peach") and metaphorical actions ("biting off more than you can chew" or "kicking off").

"Metaphor seems not to activate the action areas as much as a direct action statement," he said, predicting that in future studies the premotor cortex will respond more strongly to novel images than to "frozen metaphors," otherwise known as clichés - a finding unlikely to floor anyone, knock their socks off or cause their jaw to drop.

Arbib carried out one of the first studies of mirror neurons in humans with Giacomo Rizzolatti of the Universita di Parma in Italy.

In 1998, he and Rizzolatti co-wrote "Language Within Our Grasp," a frequently cited article that proposed mirror neurons

are involved in language. (Arbib also edited "From Action to Language Via the Mirror System," an upcoming book from Cambridge University Press.)

Rizzolatti, who discovered mirror neurons in 1996, collaborated with Aziz-Zadeh on her current study. The other co-authors are Stephen Wilson and Marco Iacoboni from UCLA.

European Science Foundation, Interdisciplines

http://www.interdisciplines.org/mirror/papers/5

Excerpt from:

The shared circuits model. How control, mirroring, and simulation can enable imitation and mind reading

By Susan L. Hurley, 15 February 2005

Imitation and mind reading are human socio-cognitive skills, which contribute in many ways to what it is like to be a person. The shared circuits model explains how they could be enabled in subpersonal functional terms, that is, in terms of mechanisms of control, mirroring and simulation. Neural mirror systems may provide part of the implementation of this functional model. The model connects a shared information space for perception and action with a shared information space for self and other, while at the same time illustrating how the distinctions between perception and action, self and other, and possible and actual can be overlaid on these shared information spaces. In this model, information about

intentional agents arrives in the first person plural: without distinction or inference between self and other. The model avoids the common conception of perception and action as separate and peripheral to central cognition. Rather, it develops the implications of an active view of perception for the perception of action, and shows how informational resources for embodied social cognition can be built on those for active perception.

Seed, the magazine that connects science & society
http://www.seedmagazine.com/news/2006/09/mirror_neurons_also_respond_to.php

Mirror Neurons also respond to language and sound

By Jeanene Swanson, September 21, 2006, 12:32AM

Mirror neurons continue to light up neuroscientists' imaginations, as several new studies show that the nerve cells respond to more than just visual stimuli.

In multiple reports published in the Sept. 19 issue of *Current Biology,* neuroscientists provide evidence that mirror neurons are multimodal — they are activated by not just by watching actions, but also by hearing and reading about them.

An effort led by Lisa Lisa Aziz-Zadeh, a neuroscientist at the University of Southern California, found that the brain's premotor cortex shows the same activity when subjects observe an action as when they read words describing it.

"The mirror areas that responded most to observation of

mouth actions also responded most to reading sentences about mouth actions," Aziz-Zadeh said. "This indicates that in addition to execution, action observation, and the sounds of actions, these neurons may also be activated by abstract representations of actions, namely language."

Until now, researchers had only speculated that mirror neurons might be important for language, she added.

Aziz-Zadeh's study was co-authored by Giacomo Rizzolatti of the University of Parma in Italy, who, in 1996, accidentally discovered the intriguing subset of neurons, which are located in the brain's premotor cortex. Rizzolatti found that these cells in the brains of macaque monkeys fire not only when the monkeys actually performed an action, but also when they watched another monkey perform it.

For the recent study, Aziz-Zadeh and Rizzolatti's team located mirror neurons in human subjects using functional MRI, and then compared which cells' activated when the subjects observed an action and which responded when subjects read about the action. They found that reading about hand movements activated the same mirror neurons that making the movements did.

A second study co-authored by Aziz-Zadeh and led by Valeria Gazzola and Christian Keysers, cognitive scientists at the University of Groningen in The Netherlands, found that mirror neurons also respond to noise. For instance, the mirror neurons that fire when someone eats a chip also fire when he simply hears someone else eat the snack.

Simone Schütz-Bosbach, a neuroscientist at the University College London, said that research on mirror neurons sheds new

light on the relationship between sensing and doing.

"Research in the last few years seems to suggest that perception and action are tightly linked rather than separated," she said.

Her own study on the role that mirror neurons play in differentiating self from other—which also appears in Current Biology issue—echoes what some neuroscientists have inferred: A network of mirror neurons plays a role in humans' capacity to learn through imitation, use semantics in language, and feel empathy.

"Understanding others' actions is a key function in social communication," Schütz-Bosbach said.

Re-enactment through mirror neurons, she said, "probably helps us to understand what another person is doing and why, and most importantly, what the person will be doing next."

Scenta: science, engineering & technology news
http://www.scenta.co.uk/scenta/news.cfm?cit_id=1140773&FAArea1=widgets.content_view_1

Excerpt from:

Why we get lost in a good book

Scientists have found the part of brain that keeps us fascinated into the wee hours with a good book, thumbing through a page-turner.

New brain imaging from UCLA demonstrates that specialised brain cells, known as mirror neurons, activate both when we observe the actions of others and when we simply

read sentences describing the same action.

When we read a book, these specialised cells respond as if we are actually doing what the book character is doing. [NOTE: This new groundbreaking science is remarkable support for why and how our Stories for Transformation work.]

The researchers used a brain-imaging technique called functional magnetic resonance imaging (fMRI) to identify how written phrases describing actions performed by the mouth or the hand influenced mirror neurons that are activated by the sight of those same actions.

For example, when individuals read literal phrases such as "biting the peach" or "grasping a pen,' certain cortical areas were activated that were also stimulated when the same participants later viewed videos of fruit being bitten or a pen being grasped.

Together, the findings suggest that mirror neurons play a key role in the mental 're-enactment' of actions when linguistic descriptions of those actions are conceptually processed.

Mirror neurons have been hypothesised to contribute to skills such as empathy, socialised behaviour and language acquisition.

Cognitive function in the mirror

The new data therefore suggests that we use mirror neurons not only to understand the actions of other people but also to understand the meaning of sentences describing the same action.

"Our study provides the first empirical evidence in support of the long hypothesised role of mirror neurons in language," said Marco Iacoboni, director of the Transcranial Magnetic Stimulation Lab at the Ahmanson-Lovelace Brain Mapping Center of UCLA's Semel Institute for Neuroscience.

"Indeed, some scientists think that we humans developed the ability to use language from mirror neurons."

Live Science
http://www.livescience.com/humanbiology/050427_mind_readers.html

Excerpt from:

Scientists Say Everyone Can Read Minds

Empathy allows us to feel the emotions of others, to identify and understand their feelings and motives and see things from their perspective. How we generate empathy remains a subject of intense debate in cognitive science.

Some scientists now believe they may have finally discovered its root. We're all essentially mind readers, they say.

"Mirror neurons suggest that we pretend to be in another person's mental shoes," says Marco Iacoboni, a neuroscientist at the University of California, Los Angeles School of Medicine. **"In fact, with mirror neurons we do not have to pretend, we practically are in another person's mind."**

Natural mind readers

Simulation theory states that we are natural mind readers.

We place ourselves in another person's "mental shoes," and use our own mind as a model for theirs.

Gallese contends that when we interact with someone, we do more than just observe the other person's behavior. He believes we create internal representations of their actions, sensations and emotions within ourselves, as if we are the ones that are moving, sensing and feeling.

Many scientists believe that mirror neurons embody the predictions of simulation theory. "We share with others not only the way they normally act or subjectively experience emotions and sensations, but also the neural circuits enabling those same actions, emotions and sensations: the mirror neuron systems," Gallese told LiveScience.

Turkish Daily News
http://www.turkishdailynews.com.tr/article.php?enewsid=57426

Another secret of the human brain revealed

The most significant finding was the discovery of "mirror neurons," a widely dispersed class of brain cells that operate like neural WiFi. Mirror neurons track the emotional flow, movement and even intentions of the person we are with, and replicate this sensed state in our own brain by stirring in our brain the same areas active in the other person.

Mirror neurons offer a neural mechanism that explains emotional contagion, the tendency of one person to catch the feelings of another, particularly if strongly expressed. This brain-to-brain link may also account for feelings of rapport,

which research finds depend in part on extremely rapid synchronization of people's posture, vocal pacing and movements as they interact. In short, these brain cells seem to allow the interpersonal orchestration of shifts in physiology.

Emotional closeness allows the biology of one person to influence that of the other. According to these findings, potentially, we are each other's biological enemies or allies.

Daily Mail, Health

http://www.dailymail.co.uk/pages/live/articles/health/healthmain.html?in_article_id=410783&in_page_id=1774

The proof that visiting people in hospital really does them good

By Angela Epstein, Daily Mail, 16th October 2006

Though it might seem like a chore to you, visiting a sick friend or relation in hospital really could make a difference to their health. Recent research has shown it's what your visit does to their brain that helps.

It's already well known that emotions have a powerful effect on a patient's health.

A close relationship with a friend, partner or relative has been found to halve the risk of heart patients having another cardiac arrest — while a lack of a close confidant puts sufferers at a greater risk of having further heart attacks.

Positive emotions have also been shown to increase a person's resistance to illness. Now scientists have discovered why this might be so. The answer seems to lie in a group of

brain cells known as **mirror neurons**.

These are activated when we experience an emotion. However, more crucially, they also fire off when we watch others experience feelings we can identify with, leading us to mimic these sentiments and become infected by the mood.

So during and after a visit from a loving and cheerful friend or relation, mirror neurons will stir similar positive feelings in the brain of the person in the hospital bed, lifting their spirits and making them feel better.

Mirror neurons enable us to copy each other, allowing us all — even babies — to get our emotional cues from others.

Dr Matthew Ratcliffe, senior lecturer in philosophy at Durham University, says that mirror neurons partly explain why we are so influenced by other people's gestures, actions and general manner.

"By being with someone who has a smiling face — such as a hospital visitor — mirror neurons motivate a similar response in our own brain, leading us to make a similar gesture and even directing us towards a similar emotional reaction," he says.

In the same way, if we are with someone who is awkward or socially clumsy, mirror neurons cause us to begin to behave in a similar fashion.

According to Daniel Goleman, author of *Social Intelligence: The New Science Of Human Relationships,* mirror neurons enable emotions to spread like a contagion, allowing one person to infect another with their mood, particularly if these feelings are strongly expressed.

"The most potent exchanges occur with those people with whom we spend the greatest amount of time, day in day out. Particularly those we care about the most," he says.

"My hostility bumps up your blood pressure, your nurturing love lowers mine. Potentially, we are each other's biological allies — or enemies."

Where brains lack mirror neurons, it is difficult for a person to establish an emotional link with others.

Last year, researchers at the University of California found that mirror neurons are more dysfunctional in autistic children.

The more severe the autism, the more silent the mirror neurons, suggesting that activity of this brain region is a direct measure of how empathetic someone is.

This lack of active mirror neurons could explain why autistic children have such difficulty making emotional connections.

And if mirror neurons can make patients in hospital feel happier, then they could contribute to an improvement in their recovery.

The University of California research also suggests that we were genetically programmed to act this way to encourage sociability, which was vital for survival in prehistoric times.

Ronnie Nathan, Chief Barker of the Variety Club, endorses the idea that love and kindness can help us recover from ill health.

"The Variety Club Children's Charity introduced Hospital Walkabouts last year, and the impact on children, parents and even staff is undeniable," he says.

"Love and caring are critical tools for helping patients get better. If it were a form of medication, we would prescribe it."

Meanwhile, friends failing to turn up for a visit could actually be bad for the patient.

Not only are they deprived of the benefits of loving contact, says Daniel Goleman, but their feelings of rejection activate the very areas of the brain that generate the sting of physical pain.

So even if you have nothing to say, your presence at a sick friend's bedside is enough.

Softpedia News > Science > Humans
http://news.softpedia.com/news/How-Do-Mirror-Neurons-Work-39171.shtml

Excerpt from:

How Do Mirror Neurons Work?

By: Vlad Tarko, Sci-Tech News Editor

The mirror neurons are the brain feature that makes empathy possible. Some neurologists have hailed their discovery in the 1990s as the equivalent for the science of the mind of what the discovery of DNA has been for biology. Mirror neurons are activated both when one does something and when one observes somebody else doing the same thing. Thus, they represent the neurological mechanism that allows us to put ourselves in the shoes of others.

Philosophers have wondered for a long time about what is

known as "the problem of other minds." Why are we so certain that all the other people are conscious? It was usually assumed that we inferred somehow the others' consciousnesses from their behavior. They look and behave like us and so they must also have an "inner self" and feelings similar to our own.

One problem with such an idea is that we are experiencing consciousness only as a private feeling and we are hardly experiencing our body from an outsider's perspective. Think about how it feels when you see yourself videotaped; the person you observe on film doesn't really feel the same way as you feel yourself. In other words, on one hand, we see others moving but we don't experience their minds, and on the other hand, we experience our minds but we don't see ourselves moving (from an external point of view).

Moreover, how much time have you spent trying to learn how you look like when you have certain emotions? How many times when you felt disgust for instance have you ran to a mirror to see how an expression of disgust looks like — so you will be able to recognize it in others? Even so, you are able to acknowledge what others feel pretty easily. How can this be done? There is not much "empiric data" on which we could really base our inference from our own mind to others' minds. Nonetheless, this is one of the things about which we feel most confident about. Where does this confidence come from?

The discovery of mirror neurons solves this issue and the

details of how they work show that we don't actually make such complex and improbable inferences as philosophers have assumed. Nature's way of building empathic creatures capable of complex socialization is much more straightforward and simple.

"When I see the facial expression of someone else, and this perception leads me to experience that expression as a particular affective state, I do not accomplish this type of understanding through an argument by analogy. The other's emotion is constituted, experienced and therefore directly understood by means of an embodied simulation producing a shared body state. It is the activation of a neural mechanism shared by the observer and the observed to enable direct experiential understanding," explained Vittorio Gallese from the Department of Neurosciences at Parma University, Italy.

SignOn SanDiego, of the Union Tribune
http://www.signonsandiego.com/news/science/20061026-9999-lz1c26rama.html

Excerpt from:

V.S. Ramachandran is changing minds about the brain

A working brain consists of 100 billion neurons (more than all the stars in the Milky Way), each connected to as many as 10,000 other neurons, the entirety combining to produce more possible states of mind than the estimated number of elementary particles in the known universe.

The hidden self

The Holy Grail of neuroscience is human consciousness. That is, a scientific understanding of what creates and fuels the totality of one's thoughts, feelings and impressions.

While Ramachandran concedes there are aspects of consciousness that probably lie beyond the investigative powers of science, he thinks consciousness ultimately will be explained.

Currently, Ramachandran is investigating mirror neurons, brain cells (first discovered in the 1990s) that are found abundantly in humans and to a lesser extent in other primates. These cells specialize in mimicking and understanding not just the actions of others, but also the underlying intentions, emotions and social meaning of behavior.

"Mirror neurons break down the barriers between people," says Ramachandran. "They are the basis of empathy. They're involved in imitation and learning. They allow you to put yourself in other people's shoes, to adopt their point of view. No other species can do that."

But Ramachandran posits that mirror neurons do even more: They permit the brain/mind to examine itself. "Just as mirror neurons allow you to take another's perspective, they allow you to see yourself, to reflect. This, I believe, is a part of what we call self-awareness."

Wikipedia

http://en.wikipedia.org/wiki/Mirror_neurons

Mirror neuron

A mirror neuron is a neuron which fires both when an animal performs an action and when the animal observes the same action performed by another (especially conspecific) animal. Thus, the neuron "mirrors" the behavior of another animal, as though the observer were himself performing the action. These neurons have been observed in primates, in some birds, and in humans. In humans, they have been found in Broca's area and the inferior parietal cortex of the brain. Some scientists consider mirror neurons one of the most important findings of neuroscience in the last decade.

Introduction

In the monkey, mirror neurons are found in the inferior frontal gyrus and inferior parietal lobule. These neurons are active when the monkeys perform certain tasks, but they also fire when the monkeys watch someone else perform the same specific task. Researchers using fMRI, TMS, and EEG have found evidence of a similar system (matching observations with actions), in the human brain.

The function of the mirror system is a subject of much speculation. These neurons may be important for understanding the actions of other people, and for learning new skills by imitation. Some researchers also speculate that

mirror systems may simulate observed actions, and thus contribute to our theory of mind skills, while others relate mirror neurons to language abilities. It has also been proposed that problems with the mirror system may underlie cognitive disorders, in particular autism.

Discovery

In the 1980s and 1990s, Giacomo Rizzolatti was working with Leonardo Fogassi and Vittorio Gallese at the university in Parma, Italy. These scientists had placed electrodes in the inferior frontal cortex of the macaque monkey to study neurons specialised for the control of hand actions, for example, grabbing objects, picking items up etc. During each experiment, they recorded from a single neuron in the monkey's brain while the monkey was allowed to reach for pieces of food, so the researchers could measure the neuron's response to certain movements.

As with many other notable discoveries, mirror neurons were found by chance. Rizzolatti explains; "I think it was Fogassi, standing next to a bowl of fruit and reached for a banana, when some of the neurons reacted. How could this happen, when the monkey did not move? At first we thought it to be a flaw in our measuring or maybe equipment failure, but everything checked out OK and the reactions were repeated as we repeated the movement."[citation needed]

This work has since been published and confirmed with mirror neurons found in both inferior frontal and inferior parietal regions of the brain. Recently, evidences from fMRI,

TMS and EEG and behavioral strongly suggest the presence of similar systems in human, where brain regions which respond during both action and the observation of action have been identified. Not surprisingly, these brain regions closely match those found in the macaque monkey.

Mirror neurons in monkeys

The only animal where mirror neurons have been studied individually is the macaque monkey. In these monkeys, mirror neurons are found in the inferior frontal gyrus (region F5) and the inferior parietal lobule.

Mirror neurons are believed to mediate the understanding of other persons' behavior. For example, a mirror neuron which fires when the monkey rips a piece of paper would also fire when the monkey sees a person rip paper, or hears paper ripping (without visual information). These properties have lead researchers to believe that mirror neurons encode abstract concepts of actions like 'ripping paper', whether the action is performed by the monkey or another person.

The function of mirror neurons in macaques is not known. Adult macaques do not seem to learn by imitation. Recent experiments suggest that infant macaqes can imitate a human's face movements, only as neonates and during a limited temporal window. However, it is not known if mirror neurons underlie this behaviour.

In adults monkeys, mirror neurons may enable the monkey to understand what another monkey is doing, or to recognise the other monkey's action.

The mirror neuron system in humans

It is not normally possible to study single neurons in the human brain, so scientists can not be certain that humans have mirror neurons. However, the results of brain imaging experiments have shown that the human inferior frontal gyrus and inferior parietal cortex is active when the person performs an action and also when the person sees another individual performing an action. Therefore, these brain regions are likely to contain mirror neurons and have been defined as the human mirror neuron system.

The significance of mirror neurons

Since the discovery of mirror neurons, grand claims have been made for their importance (e.g. by Ramachandran). In particular, there has been much speculation about the evolution of mirror neurons, and their relationship to language evolution.

In humans, mirror neurons are found in the inferior frontal cortex, close to Broca's area, a language region. This has lead to suggestions that human language evolved from a gesture performance/understanding system implemented in mirror neurons. Mirror neurons certainly have the potential to provide a mechanism for action understanding, imitation learning, and the simulation of other people's behaviour. However, like many theories of language evolution, there is little direct evidence either way.

Studies also link mirror neurons to understanding goals and intentions. Fogassi et al. (2005) recorded the activity of

41 mirror neurons in the inferior parietal lobe (IPL) of two rhesus macaques. The IPL has long been recognized as an association cortex that integrates sensory information. The monkeys watched an experimenter either grasp an apple and bring it to his mouth or grasp an object and place it in a cup. In total, 15 mirror neurons fired vigorously when the monkey observed the "grasp-to-eat" motion, but registered no activity while exposed to the "grasp-to-place" condition. For four other mirror neurons, the reverse held true: they activated in response to the experimenter eventually placing the apple in the cup but not to eating it. Only the type of action, and not the kinematic force with which models manipulated objects, determined neuron activity. Significantly, neurons discharged before the monkey observed the human model starting the second motor act (bringing the object to the mouth or placing it in a cup). Therefore, IPL neurons "code the same act (grasping) in a different way according to the final goal of the action in which the act is embedded" (664). They may furnish a neural basis for predicting another individual's subsequent actions and inferring intention.

Macleans.CA, Science

http://www.macleans.ca/topstories/science/article.jsp?content=20061030_135457_135457

Excerpt from article about Daniel Goleman, neuroscientist:

The social brain

"The classic unit of analysis in psychology and neuroscience has been one brain in one person in one body,"

Goleman explained recently in a phone interview from his home in Connecticut. “About three or four years ago, in the scientific journals, I started to see reports of a two-person psychology, what goes on in interactions as opposed to what goes on within an individual.”

Scientists have discovered that our interactions don’t just shape our experiences. They actually alter our biology. Fulfilling relationships promote good health, while bad ones “can act like slow poison in our bodies.” Neuroscientists have discovered something even scarier, for anyone trapped in a miserable relationship: long-standing relationships can actually change our brains. It's called “neuroplasticity” and, Goleman writes, it means that “repeated experiences sculpt the shape, size, and number of neurons and their synaptic connections.’ Or, to put it another way: your rotten husband isn't just wrecking your life — he’s actually wrecking your brain, too.”

Key, apparently, is a recently discovered class of brain cells called mirror neurons, that Goleman likens to a form of Wi-Fi in our brains. Mirror neurons “tune into the brain of the person you're with, and create in you the internal state of that person.” They are not only the basis of empathy and social skills, but explain why emotions are contagious, why we can “catch” someone else's bad mood even if we don't share his reasons for being angry. “Our emotions are experienced not merely by ourselves in isolation but also by those around us,” Goleman writes.

Daniel Goldman

http://www.danielgoleman.info

From the prologue to the book *Social Intelligence*

The most fundamental discovery of this new science: We are wired to connect.

Neuroscience has discovered that our brain's very design makes it sociable, inexorably drawn into an intimate brain-to-brain linkup whenever we engage with another person. That neural bridge lets us impact the brain—and so the body—of everyone we interact with, just as they do us.

Even our most routine encounters act as regulators in the brain, priming emotions in us, some desirable, others not. The more strongly connected we are with someone emotionally, the greater the mutual force. The most potent exchanges occur with those people with whom we spend the greatest amount of time day in and day out, year after year—particularly those we care about the most.

During these neural linkups, our brains engage in an emotional tango, a dance of feelings. Our social interactions operate as modulators, something like interpersonal thermostats that continually reset key aspects of our brain function as they orchestrate our emotions.

The resulting feelings have far-reaching consequences, in turn rippling throughout our body, sending out cascades of hormones that regulate biological systems from our heart to immune cells. Perhaps most astonishing, science now tracks

connections between the most stressful relationships and the very operation of specific genes that regulate the immune system.

To a surprising extent, then, our relationships mold not just our experience, but our biology. The **brain-to-brain link** allows our strongest relationships to shape us in ways as benign as whether we laugh at the same jokes or as profound as which genes are (or are not) activated in t-cells, the immune system's foot soldiers in the constant battle against invading bacteria and viruses.

That represents a double-edged sword: nourishing relationships have a beneficial impact on our health, while toxic ones can act like slow poison in our bodies.

Virtually all the major scientific discoveries I draw on in this volume have emerged since *Emotional Intelligence* appeared in 1995, and they continue to surface at a quickening pace. I intend this book to be a companion volume to Emotional Intelligence, exploring the same terrain of human life from a different vantage point, one that allows a wider swath of understanding of our personal world.

When I wrote *Emotional Intelligence*, my focus was on a crucial set of human capacities within an individual, the ability to manage our own emotions and our inner potential for positive relationships. Here the picture enlarges beyond a one-person psychology — those capacities an individual has within — to a two-person psychology: what transpires as we connect.

Take, for example, empathy, the sensing of another

person's feelings that allows rapport. Empathy is an individual ability, one that resides inside the person. But rapport only arises between people, as a property that emerges from their interaction. Here the spotlight shifts to those ephemeral moments that emerge as we interact. These take on deep consequence as we realize how, through their sum total, **we create one another**.

The Soul Connection Network, In the News

http://www.soulconnection.net/news_and_more.html

Groundbreaking Mirror Neurons research provide remarkable support for Stories for Transformation

Have you heard of mirror neurons?

Neuro scientist have discovered specialized cells in the brain that allow people to make a brain-to-brain link with others, so that your brain waves and chemistry literally mirror the brain waves and chemistry of people that you are communicating with, reading stories about, or simply just thinking about. This allows people to naturally and instantly read the minds of others ... to empathize with others and know what they are feeling and experiencing.

Not only is this news a fascinating realization of how humankind is telepathically wired to communicate with each other, but one can easily think that young children must have their mirror neurons fully in-tact and operating at very high, but normal, levels of performance. Then as they grow up, we parents turn them into little clones of ourselves (so they can

eventually think, feel and act like the grownups) ... and in the process their mirror neurons slowly shut down.

As they shut down, then they begin to feel like individuals who are separate from others and who are not connected to the universe. Then, they are unable to read people's feelings and thoughts — just like the average adult.

However, enlightened parents who allow kids to be kids — parents who honor their children's natural insight, empathy, subtlest feelings and wisdom — parents who allow children to flourish — those parents are not putting the brakes on their offspring's mirror neurons. These children stay consciously connected and intertwined with others, the human family, their surroundings, the planet and the universe.

Also available in the Video section, is a 14-minute movie about mirror neurons that you can watch through your computer. It was produced by NOVA ScienceNOW, a PBS program, and is available at this link: http://www.soulconnection.net/galleries_video.html#mirror

Current news stories from around the world about mirror neurons can be found in this website's "In the News" section: http://www.soulconnection.net/news_and_more.html

Pass it along.

Freely share with friends.

the Soul Connection Network™

www.soulconnection.net