

HEALTH AND STRESS

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WHERE DO EMOTIONS AND BEHAVIORS ORIGINATE?

KEYWORDS: *Foehn*, genes and criminality, Kretschmer, Sheldon, somatotypes, Descartes, Darwin, James-Lange, Cannon-Bard, Freud, Jung, Adler, Eysenck, memes.

Why do we feel the way we do? Distressful events and experiences might obviously cause us to feel sad, angry, anxious or fearful depending on their nature. Conversely, other situations will induce joy, pride, exhilaration and a range of other pleasurable sensations. The intensity of any of these feelings can vary considerably depending on past experiences, future expectations and other influences that could be genetic, acquired or some combination of both.

Certain individuals seem to be happy, cheerful, enthusiastic, and bubbly most of the time while others have dispositions that are quite the opposite, or exhibit mood swings that vacillate between feeling up or down. A few with flat affects are in a neutral category.

Time of day can be important. We categorize some people as larks because they arise early, spring out of bed full of

energy, turn on the radio or TV and are eager to tackle the world even before they have their first cup of coffee.

Owls take forever to wake up, much less get into gear, remain grumpy until mid morning and feel and function better in the late afternoon or evening hours. Larks often view workers who are owls as being slow or lazy. Owls just getting into the swing of things in the evening may perceive larks as party poopers.

Astrologers believe that the time and date you were conceived or born may determine temperament as well as the likelihood of being a lark or an owl. In one study, Italian investigators found that college students born in the autumn or winter were more apt to be active in the morning and those born in spring and summer tended to be night people. Further analysis revealed that this only applied to men and that females followed their own pattern of behavior regardless of when they were born.

Hormonal influences undoubtedly play an important role. Males tend to be more aggressive and women seem much more sensitive to monthly changes that occur in relationship to their menstrual cycle. They are also more likely to suffer from seasonal affective disorder (SAD) syndrome during the winter

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months when there is less exposure to daylight. Behavior, particularly madness, has also been linked to phases of the moon in animals as well as humans. A full moon has long been associated with mental and emotional aberrations that often result in violent activities and lunatic is derived from Luna, the moon goddess.

Winds And Being "Under The Weather"

Temperature, humidity and barometric pressure can also affect the way we feel and perform. People with arthritis claim they can often feel in their bones when it is going to rain or that their symptoms vary with the weather. Researchers have confirmed that changes in barometric pressure and humidity can affect tension in muscles and ligaments that could explain this, as well as reports that stress related tension headaches are worse preceding abrupt weather changes.

Peculiar animal behavior has been observed prior to earthquakes and catfish have been used to predict these and other natural disasters in China and Japan.

Over 25 centuries ago, Hippocrates, the Father of Medicine, taught that different winds and sharp weather changes were largely responsible for disease and mental health and described many examples in detail in his *Airs, Waters and Places*. His influence was so great that in the second century B.C., the octagonal Tower of the Winds was erected in Athens. Each of its eight sides faced one of the principal wind directions of Greece and was decorated with a sculpture of a human figure depicting the personality of the wind coming from that direction.

Sultry winds with high humidity have a long history of inducing irritability, headaches, anxiety and other psychophysiological complaints. The *Sharav* or *Hamsin* (Israel and the Middle East), *Sirrocco* (Italy), *Sharkije* (Egypt), *Santa Ana* (California) and *Foehn* (Central Europe) are hot but dry winds also associated with depression, mood changes and insomnia. Other winds include *Churada* (Mariana Islands), *Elephanta* (India), *Simoon* in the Sahara, *Zonda* (Argentina), *Mistral* (France), *Suestado* (Brazil), *Bora* (Hungary), *Kona* (Hawaii), *chinook* (Rocky Mountains), *Williwaw* (Aleutians), *Willy-willy* (Australia) and *Cape Doctor* (South Africa).

There are many other winds that occur during different seasons all over the globe that vary considerably with respect to their intensity, duration, temperature and moisture content. Yet, according to local lore, all produce certain consistent changes in mood and behavior. While such anecdotal reports may represent self-fulfilling prophecies that have been handed down and progressively exaggerated, they do have some scientific support. One common denominator could be effects on positive ion concentrations.

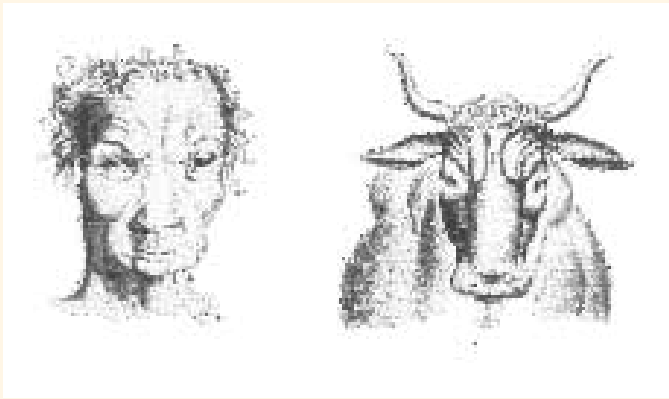
Probably the best studied is the *Foehn*, a dry southerly wind that blows out of the Alps in the spring or fall. During the Middle Ages it was called *Phoenecius*, since it was believed to have originated in Phoenicia. It has also been referred to as "Witches' Wind" because of the havoc it can create, particularly in Austria and Germany. This includes a marked increase in accidents, violent behaviors, suicides, fluctuations in electrolyte balance, blood pressure and blood clotting. **When the *Foehn* prevails, elective surgery has been canceled in the Munich area because of the sharp increase in postoperative deaths due to thrombosis.**

The term "*Afoehn*" is used not only to describe an ill wind but also a "condition" that exists due to a heavy positive-ion charge even when the wind is not blowing. Although we are able to predict weather, wind-chill factor, and heat/humidity indices more accurately, why sudden weather changes affect behavior and health are still not fully understood.

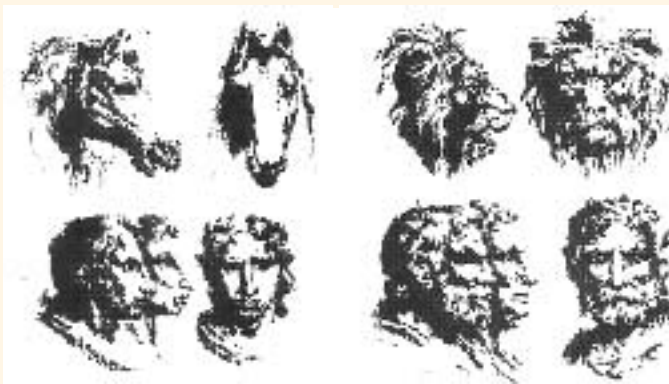
How Important Is Heredity In Determining Emotions or Behavior?

Since mood and behavior can be difficult to quantify, much of the research in this area has been devoted to determining if there is a genetic predisposition to violent or criminal activities. The Kallikak and Juke families were often cited as examples. Martin Kallikak's illegitimate son's descendants had a high incidence of criminality over several generations and Ada Juke's progeny included 7 murderers, 60 thieves and 50 prostitutes! Early investigators like Lombroso proposed that criminals were primitive creatures that had not fully evolved and since they were

more like animals than humans, they could be identified by their animal-like features. The notion that those who resembled certain animals tended to behave like them was hardly new, as noted below.



**From the Italian physiognomist
Gianbaptista della Porte, 1586**



**From Charles le Brun, who painted the
great murals at Versailles for Louis XIV**

[Eating certain animals was also widely believed in some cultures to transfer some of their traits. In Madagascar, soldiers were forbidden to eat an ox's knee, "*lest like an ox he should become weak in the knees and unable to march. They may not taste hedgehog, as it is feared that this animal, from its propensity of coiling up into a ball when alarmed, will impart a timid shrinking disposition to those who partake of it.*" Rabbits were also avoided to prevent timid behavior.]

In the early 1900's, Goring's extensive studies found no significant difference in skull size, hair or eye color in criminals compared to the population in general and no evidence for any sort of criminal physique. In the 1930's, Hooten proposed that criminals were a product of environmental influences on genetically or biologically inferior individuals and a variety of studies in twins seemed to support this. In one, criminality for identical

twins showed a concordance of 60-70% compared to only 15-30% for fraternal twins. Karl Christiansen's study of 3,586 sets of twins born between 1881 and 1910 found a similar ratio, with 35% of identical twins having criminal convictions with only 12% concordance for fraternal twins. Adoption studies provided further support and were based on the premise that if biological factors predominated, adult crime rates of adopted children reared in different environments would be higher in those whose parents were criminals. The Danish Adoption Study of 14,000 boys found that those likely to be convicted of a crime were more likely to have criminal biological parents. However, the link between parent and child criminality was much stronger for property crime than for violent activities. **Although it is impossible to rule out the influence of environmental factors, a recent analysis of 38 such studies showed a statistically significant link between criminality and heredity.**

Attempts were made to bolster this by chromosomal studies. Males normally have an XY chromosome but one in a thousand have an extra Y, or XYY pattern. It was claimed that this increased the tendency to violent behavior based on preliminary studies but this was later refuted. Aggressive and hostile behavior has also been linked to excess testosterone; low serotonin; an imbalance between serotonin, dopamine and norepinephrine; hypoglycemia; food allergies and additives; Attention Deficit Hyperactivity Disorder; dyslexia and other learning disabilities. Nor does biological research explain the geographical, temporal and social variations in crime rates.

Humours, Physiognomy & Phrenology

Attempts to classify people into different personality types are as old as the history of medicine. One of the earliest was the Greek philosopher Empedocles, who believed that the universe was composed of four elements - air, earth, fire and water. Emotions as well as health were determined by the balance of these cosmic constituents in any individual - air (with its associated qualities, warm and moist), earth (cold and dry), fire (warm and dry), and water (cold and moist). Hippocrates

and Galen extended this by relating personality with four "humours" that emphasized these elements.

Blood represented a sanguine temperament: warm, cheerful, enthusiastic and active.

Phlegm signified a colder personality that was apathetic, lethargic and sluggish.

Black Bile referred to a sad, brooding, or melancholy disposition.

Yellow Bile excess caused an irritable, excitable, or choleric temperament.

Emotional stability and physical health depended on maintaining a proper balance between these four humors; an excess of one could cause certain emotions or temperaments to prevail or even produce a particular illness. Galen wrote that women with an excess of black bile who were melancholic (Gr. *melas* and *chole*) were particularly predisposed to cancers of the reproductive organs, and recent observations support this. An increased secretion of yellow bile would tend to make individuals more angry, irritable, and quick-tempered. We still describe people as being phlegmatic, sanguine, or having a "jaundiced" view of life.

The concept that "body chemistry" can determine temperament has survived in some form for over 2,500 years. Primitive notions have been progressively replaced by research on the psychophysiologic effects of male and female steroids like testosterone and estrogen, thyroid hormone, and a host of neurotransmitters and of chemical messengers produced in the brain and central nervous system such as the endorphins, serotonin, dopamine, and norepinephrine. Excesses, deficiencies or imbalances of these have all been associated with different emotions and in some cases, seems like putting old wine in new bottles.

Some took other approaches. Physiognomy (from Greek roots meaning nature and interpretation) refers to judging a person's temperament by certain physical characteristics, particularly those of the face and skull. The practice dates back to antiquity and Aristotle devoted a treatise with six chapters attempting to correlate personality with such things as color,

amount and distribution of hair, gait, vocal qualities, jaw shape and other facial features. For example, noses with thick bulbous ends were found in persons who were insensitive or brutal; sharp-tipped noses in those who were quick tempered, and like dogs, could be easily provoked; people with rounded, large obtuse noses were more apt to be generous and courageous, while slender, hooked noses belonged to those who were "eagle-like".

Phrenology attempted to obtain similar information from feeling the shape and particularly the peaks and valleys of the skull. It was very popular during the Victorian era, and like physiognomy, was believed to be useful in detecting criminal behavior. Cesare Lombroso visited Italian prisons and classified the inmates by their physical characteristics. Among the most common cited in his 1897 book, *The Criminal Man*, were a slanting forehead, flat nose, and large jaw. Although there is no scientific support for either physiognomy or phrenology, some still claim that both can have correlations with certain types of crime.

In the early part of the last century, Ernst Kretschmer, a German physician, also explored the possible relationship between body build and criminality. However, he became more impressed with an apparent link to mental disorders. His patients suffering from the same psychiatric diagnosis also seemed to resemble each other physically. To test his theory, he visited asylums "for the criminally insane" and carefully interviewed, examined and obtained detailed physical measurements on hundreds of inmates with various mental disorders. After analyzing all this data, he became even more convinced that schizophrenia and what is now called bipolar disorder did indeed occur more frequently in individuals with specific but very different physical characteristics.

Body Type And Personality

In his book *Physique and Character*, first published in 1921, Kretschmer proposed that patients who exhibited marked mood swings were apt to have a short, rotund (pyknic) frame. Schizophrenics, on the other hand, tended to have a rather weak (asthenic) body build. Individuals with a

muscular (athletic) physique who became mentally ill were also more likely to exhibit schizophrenic symptoms, but to a lesser degree. He subsequently tried to relate these three body types to certain personality traits in everyone. Slim physiques were allegedly associated with being introverted and reserved, while rounder, heavier and shorter people were more likely to be extroverted and jovial. Critics pointed out that Kretschmer's schizophrenic patients were younger and therefore thinner than his roly-poly manic-depressives and that there were other flaws in his theories. Nevertheless, **the belief that some behaviors could be related to certain body builds gained popular acceptance** and stimulated William Sheldon to pursue this possibility in a more meticulous manner.

Sheldon started by scrutinizing 4,000 photographs of college-age men that showed front, back, and side views. He concluded that there were three fundamental types of physique he named endomorphy, mesomorphy and ectomorphy, since they seemed related to the three layers of the human embryo: the endoderm, mesoderm and ectoderm. Endomorphy centered on the abdomen and digestive system, mesomorphy on the muscles and the circulatory system, while ectomorphy related more to the brain and the nervous system. Just as we all have digestive, circulatory and nervous systems, we also have elements of each of these types of body build, although usually one or two tend to predominate.

He assembled a checklist of characteristics to rate various components numerically on a scale of 1-7 for each, so that every human frame could be classified by three numbers. Independent observers could thus obtain very similar results for what he called somatotypes; Santa Claus might be 6-2-2, Mr. Universe 2-6-3, and Abe Lincoln 3-3-6.

Sheldon believed these three types were also associated with different emotions and behaviors. As explained in his 1941 *The Varieties of Human Temperament: A Psychology of Constitutional Differences*, the three types were:

Endomorph - soft, round shaped body; underdeveloped muscles; overdeveloped digestive

system; has trouble losing weight; jovial; enjoys eating and sensual pleasures; and tends to be extraverted.

(Viscerotonic)

Mesomorph - firm, muscular, rectangular shaped body; upright posture; thick skin; mature appearance; gains or loses weight easily; competitive; aggressive; enjoys athletics; and tends to be ambiverted.

(Musculoskeletal)

Ectomorph - thin; tall; flat chest; delicate build; young appearance; lightly muscled; stoop shouldered; large brain; trouble gaining weight; serious; intellectual; enjoys reading; and tends to be introverted.

(Cerebrotonic)

Sheldon also developed a list of 60 behavioral characteristics that could be used to rate temperament in an effort to demonstrate correlations with physiques. These three somatotypes would presumably tend to respond to stressful situations differently. If approached by a bandit demanding his money or his life, the viscerotonic endomorph would tend to express himself via his gastrointestinal system with nausea, vomiting, abdominal pain, or more commonly, diarrhea. A mesomorph's musculoskeletal reaction might be to punch the assailant or run away, depending on which seemed preferable under the circumstances. In contrast, the cerebrotonic ectomorph would try to reason his way out by persuading the bandit that he was taking a very great risk and wouldn't get much money anyway.

We can all think of somebody who would fall more into one these prototypes than another, but many people have combinations that are not distinctive and therefore precludes predicting their temperament, such as a 4-5-5. It is important to note that Sheldon's conclusions were primarily based on men. Women have less mesomorphy and more endomorphy. In addition to biologic differences, his approach neglects the role of learning and sociocultural factors in shaping personality characteristics.

Are Emotions An Evolutionary Response?

In 1649, the French philosopher René Descartes defined emotions as "the passions of the soul". He believed that there were only six basic emotions: wonder, love, hatred, desire, joy, and sadness. All other emotions were composed of combinations of these that had developed during the course of evolution. Three decades later, Baruch Spinoza, a Portuguese-Dutch philosopher, disputed this in *The Ethics*, which claimed that there were only three basic emotions: desire, pleasure, and pain. In 1872, Charles Darwin's *The Expressions of the Emotions in Man and Animals* put the evolutionary theory of emotions on a solid footing by demonstrating the importance of emotions for human survival.

Darwin proposed three general principles to explain the involuntary gestures, facial expressions and other body language animals and humans employ to express their emotions. The first principle is that **when any activity had been found to be necessary or useful during some emotional state, it would continue to be automatically performed whenever that emotion was experienced, even if it served no purpose.** "As an instance, we may take the case of dogs turning round several times before they lay down to sleep even on a carpet or floor, and sometimes giving a few scratches, a practice which was no doubt useful when the wild animal slept among herbage out of doors, and which is continued now as a habit when of no such use."

The second principle is that **when certain reactions are associated with a specific emotion, when an opposite feeling is experienced, it will invoke an attitude or response that is also as much as possible directly opposite.** He explained that "a dog will crouch and hold down its tail when licking its master's hands or jumping on his knees. However, a cat, while rubbing against its master's leg, stands erect with a somewhat arched back, and its tail is up. In each case, this is opposite to the attitudes assumed when these animals assume a fighting posture. The dog will stand erect, hold up his tail and the hairs on his back and shoulders will bristle."

Conversely, a cat will crouch down with paws out and its tail laid flat on the ground, gently waving from side to side, when preparing to pounce on a mouse. Darwin argued that in humans, as well as animals, when the opposite emotions of gentleness, submission, and affection occur, the attitudes assumed are as remote as possible from those associated with anger and pugnacity.

His third principle was that **specific reactions accompanying certain emotions automatically evoke nervous system responses we cannot control and are unrelated to prior experiences.** One example cited was trembling when experiencing severe fear, rage, as well as joy. Trembling serves no purpose in such situations but is probably related to some nervous system response that once was useful. Another example was the firm closure of the eyes by screaming infants that disappears later in life. Darwin explained that it was probably "a provision to prevent injury to the delicate vessels of the eyes by the increased flow of blood to the head during violent screaming." He believed that certain emotions and how they were expressed had survival value over the lengthy course of human evolution. Some of these expressions that still persist were derived from actions that originally served adaptive functions. Thus, preparation for biting became the bared teeth to express anger. Humans raise a lip to expose their canine teeth when they want to sneer. Darwin considered the continuity or similarity of expression in animals and humans as proof of human evolution from lower forms as well as what he called the "unity of the several races".

Over the past few decades, Paul Ekman has confirmed that **certain facial expressions are common in all humans and represent a means of communication regardless of culture or ethnic origin.** Although there are only a few words to describe these (smile, frown, furrow, squint), over ten thousand different facial expressions have been identified. Ekman also showed that while these can reflect feelings, voluntarily making a face that is characteristic of certain emotions will generate that emotion, as in "put on a happy face."

Feelings & Physiology - Chicken Or Egg?

This raises an important issue that has been debated for decades. Do emotions give rise to physiologic reactions such as facial expressions, or is it that our physiologic responses are responsible for generating emotions? For example, you are walking through the woods and are suddenly confronted by a ferocious bear. This scares the daylights out of you and you try to escape from the scene as fast as you can. Do you run because you are afraid or are you afraid because you are running?

One of the first attempts to answer this question was made by the Harvard psychologist and philosopher William James, in his 1890 classic *Principles of Psychology*. In it, he propounded the theory that emotions arise from an awareness of our physiological responses to emotion-arousing stimuli. Thus, **people are afraid because they run, happy because they smile, sad because they cry and angry because they frown**. Karl Lange, a Danish physician, reached the same conclusion a few years later, and this view became known as the James-Lange theory.

James explains the sequence of events as follows: Your perception of the event in the cerebral cortex instantaneously and automatically sends a signal down through prescribed pathways that "alter the condition of muscle, skin, and viscus; and these alterations, perceived, like the original object, in as many portions of the cortex, combine with it in consciousness and transform it from an object, simply-apprehended into an object-emotionally-felt." In other words, the brain interprets a situation in such a way that physiological responses are evoked. Such responses could include palpitations, sweaty palms, a sinking feeling in the stomach, or changes in facial expression. The interpretation of the situation does not become conscious until physical or physiologic responses occur.

These reflexive peripheral responses **PRECEDE** the experience of emotion. The appreciation or conscious aspect of emotion arises later, when the cerebral cortex observes these peripheral responses. There is no emotion that is generated solely by activity of the central nervous system and

"no central experience of emotion in a special brain center".

Walter Cannon, who developed the "flight or fight" hypothesis of responses to stress, felt the James-Lange theory went against common sense. In his view, you feel fear at the sight of the bear without ever taking a step and **you run because you are afraid**. As far as signals being sent down the spinal cord to initiate visceral responses that give rise to different feelings, he pointed out that a woman with a broken neck can still feel emotion. He showed that animals who had their viscera separated from the nervous system still expressed emotions. His "fight or flight" responses could be evoked by different stressors, so when heart rate increases, how do we know which emotion to feel?

Based on research conducted by Philip Bard in his laboratory, Cannon believed emotions originated in the thalamus, a brain structure that relays information from sensory organs to the cortex. Bard determined this by removing larger and larger portions of the brain until he was able to eliminate the response to rage. The 1927 Cannon-Bard Theory was that the brain interprets an emotional situation through the thalamus, which sends signals to the autonomic nervous system and to the cerebral cortex, where the emotion becomes conscious. When you see the bear, the brain receives sensory information it interprets as danger, and directly creates the experience of fear, while **SIMULTANEOUSLY** sending messages to the heart, lungs, and legs to initiate running.

Which explanation is correct? In the 1960's, the Schacter-Singer theory agreed with both; that emotions can arise from feedback of bodily responses and also as cognitive appraisal and labeling of what caused those responses. When you see the bear you interpret the stimulus as dangerous, which causes physiological arousal. This gives rise to a particular emotion, which could be fear, surprise, excitement, astonishment, or some combination of these, depending on how you label the arousal.

The story is far from over, since there is no definition of "emotions" or "feelings" or how these differ that is universally accepted.

Some Psychological Perspectives On Traits, Temperament And Personality

To add to the confusion, there are terms like trait, temperament, personality and behavior that overlap with emotions and feelings. **There are several thousand words representing traits alone**, many of which seem similar but have subtle differences, such as meticulous, careful, or conscientious. Traits are essentially names that describe regularly observed behaviors without attempting to explain them. They are usually determined by a self-report questionnaire that requires describing yourself by checking off relevant adjectives or answering questions about typical behaviors you are conscious of displaying. These responses are then assigned to different clusters of traits and it is this collection of traits that makes up what we refer to as personality. **Temperament is somewhere between personality as a whole and a particular trait in terms of its breadth. It refers to the characteristic peculiarities of people as manifested by their reactions.** The word derives from the Latin verb *temperare* (to mix). The noun 'temper' was used by medieval alchemists to refer to a mixture of elements and later led to temperament to describe a mixture of mental traits. There are various theories as to how traits contribute to temperament. One proposes that each of the dimensions of temperament is rooted in a particular emotion that forms the basis for personality characteristics. Thus, being anger prone would favor the development of aggressiveness, and an intense interest would account for the temperament trait of persistence.

Varied attempts to get at the roots of personality and emotional disorders by psychologic characteristics were made in the early 20th century. The most influential was Sigmund Freud's concepts of id and ego and the use of psychoanalysis. Carl Jung questioned the degree of importance Freud assigned to sexual drive, and focused more on distinguishing between two basic means of modulating basic drives: introversion, a preoccupation with one's inner world at the expense of social interactions, and extroversion as a preference for social interplay in living out inner drives or libido. Alfred Adler introduced compensation, a coping strategy in which a person with a feeling of inferiority related to a physical or mental inadequacy would compensate by exaggerating some other behavior. Shortness of stature, for example, could lead to developing a domineering, controlling behavior. Freud's developmental concept of sexual, aggressive, and self-preservative drives in children was subsequently modified by Erik Erikson, who integrated psychological, social, and biological factors. My good friend, the late Hans Eysenck, later reduced everything into just three clusters of traits he called introversion-extroversion, neuroticism, and psychoticism, and attempted to explore the biological roots for each.

While humoral and morphologic theories emphasized heredity, psychological approaches focused on environmental influences. The latest is Richard Dawkins' 1976 *The Selfish Gene* concept of memes, or contagious attitudes and feelings that are acquired from others. Stay tuned for more.

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