

Emotions

12 Things to Know

By Randolph M. Nesse

Natural selection shaped capacities for emotions to adjust many aspects of organisms to cope with the challenges of situations that have recurred over evolutionary time. Understanding the origins and utility of normal emotions is essential for understanding and treating emotional disorders. They are not simply innate responses to cues, they are sophisticated special states aroused by the situations that arise as organisms pursue their idiosyncratic goals.



1. Emotions are useful

Emotions are useful states shaped by natural selection.

Emotions are apps for the mind. In the same way that different apps facilitate different computing tasks, such as writing, drawing or calculating, different emotions adjust the body and mind to cope with different situations. The situations are ones that posed adaptive challenges over the course of evolutionary history, such as confronting a predator (panic 😱) or being betrayed (anger).

2. Aspects of emotions

No one aspect of emotions is primary, feeling, physiology and behavior all interact.

The different aspects of an emotion --subjective experience, cognition, physiology, vocal changes, facial expressions and action tendencies-- are all components of integrated responses. No aspect is primary. Individuals who respond to situations of life threatening danger with panic have a selective advantage. Individuals who respond to mating opportunities 😊with panic do not; a whole different kind of emotion is useful in this situation! Emotions are not useful or useless except in relation to a certain situation

3. Different emotions

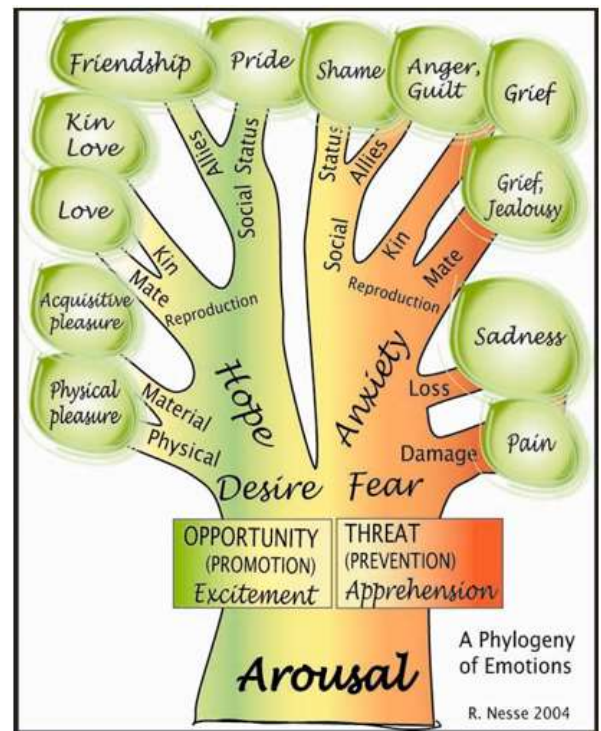
Emotions are distinguished not by having different functions, but by being useful in different situations.

Emotions are sometimes explained by saying, "The function of emotion X is Y." This is generally a mistake. One emotion may have many functions, such as motivation, changes in cognition, arousal, communication, etc. A better way to state the evolutionary explanation for an emotion is, "The situation in which emotion X is useful is Y, and the emotion helps meet adaptive challenges A, B and C that arise in that situation." For instance, panic does indeed motivate flight, but it also warns others, changes physiology, etc. Emotions are distinguished from each other by the situations in which they are useful.

4. Specificity of emotions

Different emotions were differentiated from more generic precursors to cope with specific kinds of situations.

Many studies have found that basic emotions, such as happiness, sadness, fear, anger, love, disgust and surprise, are similar everywhere in the world. Another approach locates each emotion in a space with two dimensions, one low to high arousal, the other negative to positive. These approaches are useful, but they do not reflect how emotions were gradually differentiated over the course of evolutionary time. Emotions are more like groups of overlapping leaves on a tree. At the root of the tree, opportunities to get food and threats of danger shaped special states, even in one-celled animals. Organisms with special states that get them to rewards and away from danger more quickly have a selective advantage. These primal response states have been gradually differentiated into more specific emotions that improve the ability to cope with many different situations. Thus, different emotions are neither all basically the same, nor are they all fundamentally separate from one another. Instead, they are partially differentiated. This is particularly clear in the subtypes of anxiety, each one shaped to cope with a particular kind of dangerous situation.



5. Evolution of emotions

The situations that arise in goal pursuit have shaped specific emotions.

Anticipation of an opportunity arouses excitement and desire. Anticipation of danger arouses anxiety. In the course of pursuing goals, we experience optimism 😊, pessimism ☹, frustration 😞, and eventual satisfaction 😊 or disappointment 😞. These emotions fit nicely into a simple table

Table 1. Emotions Shaped to Cope with the Situations that Arise in Goal Pursuit

	Anticipation	Progress	Obstacle	Success	Failure
Physical opportunity	Desire	Anticipation	Frustration	Pleasure	Disappointment
Social opportunity	Excitement	Flow	Frustration	Happiness	Disappointment
Physical threat	Fear	Confidence	Despair	Relief	Pain
Social threat	Anxiety	Confidence	Despair	Relief	Sadness

6. Social emotions

The challenges associated with recurring social situations have shaped special social emotions.

For instance, trading favors with someone over a long time builds friendship and trust. Anticipating that the other person might betray you causes suspicion, and if your fears are fulfilled, anger. When the shoe is on the other foot and you are tempted to defect, you are likely to experience anxiety. If you go ahead and do something that makes the other person angry, you are likely to feel guilty.

Table 2. Emotions shaped to cope with social situations

	Other cooperates	Other defects
You cooperate	Trust Friendship	Suspicion (before) Anger (after)
You defect	Anxiety (before) Guilt (after)	Disgust Rejection

7. Negative and position emotions

Emotions are positive or negative because they can be useful only in situations with opportunities or threats.

Only situations that involve threats, opportunities, losses or gains can shape special states. Happiness, sadness, anger, fear, boredom and other emotions are readily recognized as desirable or undesirable. Each is associated with gain or loss. The exceptions, such as surprise, arise in situations that are nonetheless associated with the possibility of gain or loss.

8. Useful negative emotions

Negative emotions are just as useful as positive emotions.

This is hard to fathom because it seems so obvious that anxiety and sadness are bad. Studies even show that people who experience a lot of negative affect have worse health and shorter lives. Nonetheless, anxiety and sadness are useful or they would never have evolved. How can this be? The answer comes from recognizing that no emotion or affect state is always useful. Whether an emotion is useful or harmful depends entirely on the situation in which it is expressed. Experiencing calm relaxation is a good thing, unless, that is, a tiger is rapidly approaching. In the natural environment, people who lack a capacity for panic had shorter than average lives. But panic is useful only in certain situations. Experiencing a panic attack in the grocery store is useless. When settling down for an evening with your lover, feeling, dizzy, short of breath and a need to flee is much worse than useless.

9. Clinician's illusion

Negative emotions seem abnormal because of the "clinician's illusion."

Aversive feelings such as pain or anxiety are usually experienced in disadvantageous situations so they seem to be abnormal. But the aversive emotion is a useful response to an unfavorable situation. The subjective experience is aversive because unpleasant feelings motivate escaping and avoiding such situations. However, it is possible to safely block aversive feelings; aspirin relieves pain, codeine relieves cough, and benzodiazepines relieve anxiety, usually with great safety. Does this prove that these negative experiences are unnecessary? Hardly. There is a good reason why most expressions of such defensive responses are as unnecessary as they are normal

10. Smoke detector principle

The "smoke detector principle" explains why unnecessary instances of negative emotion are so common.

Natural selection shaped systems to regulate expression of the emotions in ways that maximize the benefits, not our satisfaction. Negative emotions are expressed whenever they are worth it, so false alarms are common for inexpensive emotions that protect against great harm. For instance, the cost of a panic attack is only a few hundred calories and a few minutes wasted, while being caught by a lion is expensive indeed, even if it is not fatal. If the noise you hear behind a tree might be a lion or might be a rat, what should you do? It depends on how loud the noise is. What if the noise is loud enough that there is a 10% chance that it was made by a tiger, then what action is optimal? Flight, headlong flight, along with all the aspects of panic that speed it. The flight will be unnecessary in 9 out of 10 instances, but all of them will be normal. This is called the "smoke-detector principle" because we tolerate false alarms in our smoke detectors in order to ensure that the alarm sounds every single time there is a fire

11. Influence on fitness

Major individual differences in emotional tendencies don't much influence fitness.

Some people get anxious at any small noise, while others only feel fully alive when climbing a sheer cliff. Some people get embarrassed whenever anyone looks at them, while others love being the center of attention. These individual differences arise from differences in genes, in experiences, and from complex interactions among genes and experiences. Our question is why selection has left us with substantial emotional experiences. Does this mean that natural selection has made a mistake, or that mutations are creeping in? Not at all. Instead it points out that there is no such thing as one normal genome and there is not even such a thing as one normal personality. Environments differ from generation to generation. Even at one point in time, different individuals exist in different social niches. Selection forces vary considerably, thus maintaining much genetic variation. This evolutionary view fosters respect for individuality, and recognition that the genes that are good in one situation may be disadvantageous in another.

12. Emotional disorders

Most mental disorders are emotional disorders.

We can't really know what is and what is not a disorder until we know the situations that shaped each emotion, and how they are regulated. The dividing line between normal and abnormal emotions does not depend on whether they feel good or bad. Even intense negative emotions may be valuable. Every emotion can be abnormal by being excessive or deficient. Disorders of excessive negative emotion are readily recognized and deficits of positive emotion are hardly studied. However, disorders of excessive positive emotions and deficits in negative emotions have been sadly neglected. People do not usually complain about problems caused by lack of a capacity for anxiety or negative mood, but lack of anxiety certainly causes risk-taking and increased injuries, and those born with a complete lack of ability to experience physical pain die in early adulthood. An evolutionary perspective calls attention to these neglected emotional disorders

Further reading

Ekman, P., & Davidson, R. J. (Eds.). (1994). *The Nature of Emotion: Fundamental Questions*. New York: Oxford University Press.

James, W. (1962 [1880]). *Psychology: A Brief Course* (p. quote, Trans.). New York: Collier.

Marks, I. M., & Nesse, R. M. (1994). Fear and fitness: An evolutionary analysis of anxiety disorders. *Ethology and Sociobiology*, 15, 247-261.

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Nesse, R. M. (1998). Emotional Disorders in Evolutionary Perspective. *British Journal of Medical Psychology*, 71, 397-416.

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Barrett, L. F. (2017). *How emotions are made: The secret life of the brain*. Houghton Mifflin Harcourt.

Carver, C. S., & Scheier, M. F. (2014). The experience of emotions during goal pursuit. *International Handbook of Emotions in Education*, 56.

Damasio, A. R. (1995). Toward a neurobiology of emotion and feeling: Operational concepts and hypotheses. *The Neuroscientist*, 1(1), 19-25.

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Fessler, D. M., & Haley, K. (2003). The Strategy of Affect: Emotions in Human Cooperation. In P. Hammerstein (Ed.), *Genetic and Cultural Evolution of Cooperation: Dahlem Workshop Report* (Vol. 29, pp. 7-36). Cambridge, MA: MIT Press.

Fredrickson, B. L. (2001a). The Role of Positive Emotions in Positive Psychology. *The American Psychologist*, 56(3), 218-226. In this article, the author describes a new theoretical perspective on positive emotions and situates this new

perspective within the emerging field of positive psychology. The broaden-and-build theory posits that experiences of positive emotions broaden people's momentary thought-action repertoires, which in turn serves to build their enduring personal resources, ranging from physical and intellectual resources to social and psychological resources. Preliminary empirical evidence supporting the broaden-and-build theory is reviewed, and open empirical questions that remain to be tested are identified. The theory and findings suggest that the capacity to experience positive emotions may be a fundamental human strength central to the study of human flourishing. Fredrickson, B. L. (2001b). The role of positive emotions in positive psychology: The broaden-and-build theory of positive emotions. *American Psychologist*, 56(3), 218. Fridlund, A. J. (1992). Darwin's Anti-Darwinism in the Expression of the Emotions in Man and Animals. In K. T. Strongman (Ed.), *International Review of Studies of Emotion* (Vol. 2, pp. 117–137). West Sussex, England: John Wiley & Sons. Frijda, N. H. (1986). *The Emotions*. Cambridge: Cambridge University Press. Gilbert, P. (2015). An Evolutionary Approach to Emotion in Mental Health With a Focus on Affiliative Emotions. *Emotion Review*, 7(3), 230–237. <https://doi.org/10.1177/1754073915576552> Emotions evolved to guide animals in pursuing specific motives and goals (e.g., to find food, avoid harm, seek out sexual partners, rear offspring). They function as short-term alertors and regulators of behaviour and can be grouped into their evolved functions (evolutionary function analysis). Emotions can coregulate/influence each other, where one emotion can activate or suppress another. Importantly, affiliative emotions, that arise from experiencing validation, care and support from others, have major impacts on how people process and respond to threats and emotions associated with threats. Hence, exploring how affiliative emotional experiences change and transform the capacity to cope with threat and pursue life goals, are salient research issues. Haselton, M. G., & Ketelaar, T. Irrational Emotions or Emotional Wisdom? The Evolutionary Psychology of Emotions and Behavior. In J. Forgas (Ed.), *Hearts and minds: Affective influences on social cognition and behavior*. New York: Psychology Press. Keltner, D., Haidt, J., & Shiota, M. N. (2006). Social functionalism and the evolution of emotions. In M. Schaller, J. Simpson, & D. Kenrick (Eds.), *Evolution and Social Psychology: Frontiers of Social Psychology* (pp. 115–142). Madison, CT: Psychosocial Press. Ketelaar, T. (2015). Evolutionary Psychology and Emotion: A Brief History. In *Evolutionary Perspectives on Social Psychology*. Although William James' writings on instinct and emotion and Charles Darwin's writings on emotional expression were among the first modern scientific accounts of human emotion, these writings did not constitute "adaptationist" approaches to emotion in the sense that evolutionary psychologists use that term today. The first modern evolutionary accounts of human emotion would have to wait almost another century for evolutionary biologist Robert Trivers's (Q Rev Biol 46:35–57, 1971) groundbreaking paper on reciprocal altruism in which he speculated about the evolutionary functions of moral sentiments, such as guilt and gratitude. Almost a half century after Trivers's writings on emotion, sophisticated evolutionary accounts are more common and new empirical findings on the evolutionary functions of emotion appear almost every year (for reviews, see Cosmides and Tooby, *Handbook of emotions*, Guilford, New York, pp. 91–115, 2000; Ketelaar, *Evolutionary psychology, public policy and personal decisions*, Lawrence Erlbaum Associates, Mahwah, pp. 145–168, 2004, *Social psychology and economics*. Lawrence Erlbaum Associates, Mahwah, pp. 97–116, 2006; Ketelaar and Clore, *Personality, emotion, and cognitive science*, Elsevier, Amsterdam, pp. 355–396, 1997; Nesse, *Understanding depression: a*

translational approach, Oxford University Press, Oxford, 2009, pp. 17–36; Nesse and Ellsworth, *Am Psychol* 64:129–139, 2009; Tooby and Cosmides, *Handbook of emotions*, Guilford, New York, pp. 114–137, 2008). This chapter provides an historical review of evolutionary thinking on emotion from Charles Darwin and William James to Robert Trivers and Randy Nesse, along with a summary of promising areas of future research into the evolutionary functions of emotion. Kitayama, S., Mesquita, B., & Karasawa, M. (2006). Cultural Affordances and Emotional Experience: Socially Engaging and Disengaging Emotions in Japan and the United States. *Journal of Personality and Social Psychology*, 91(5), 890. Nesse, R. M. (1990). Evolutionary explanations of emotions. *Human Nature*, 1(3), 261–289. Nesse, R. M. (1999). Proximate and evolutionary studies of anxiety, stress and depression: synergy at the interface. *Neuroscience & Biobehavioral Reviews*, 23(7), 895–903. Nesse, R. M. (2005a). Twelve Crucial Points about Emotions. *Psychological Review*, 11(4), 12–14. Nesse, R. M. (2005b). Twelve crucial points about emotions, evolution and mental disorders. *Psychology Review*, 11(4), 12–14. Nesse, R. M., & Ellsworth, P. C. (2009). Evolution, emotions, and emotional disorders. *Am Psychol*, 64(2), 129–39. <https://doi.org/10.1037/a0013503> Emotions research is now routinely grounded in evolution, but explicit evolutionary analyses of emotions remain rare. This article considers the implications of natural selection for several classic questions about emotions and emotional disorders. Emotions are special modes of operation shaped by natural selection. They adjust multiple response parameters in ways that have increased fitness in adaptively challenging situations that recurred over the course of evolution. They are valenced because selection shapes special processes for situations that have influenced fitness in the past. In situations that decrease fitness, negative emotions are useful and positive emotions are harmful. Selection has partially differentiated subtypes of emotions from generic precursor states to deal with specialized situations. This has resulted in untidy emotions that blur into each other on dozens of dimensions, rendering the quest for simple categorically distinct emotions futile. Selection has shaped flexible mechanisms that control the expression of emotions on the basis of an individual's appraisal of the meaning of events for his or her ability to reach personal goals. The prevalence of emotional disorders can be attributed to several evolutionary factors. Oatley, K. (1992). *Best Laid Schemes: The Psychology of Emotions*. Cambridge: Cambridge University Press. Oatley, Keith, & Jenkins, J., M. (1996). *Understanding Emotions*. Cambridge, MA: Blackwell. Öhman, A. (2008). Fear and anxiety. *EMOTIONS*, 709. Plutchik, R. (2003). *Emotions and Life: Perspectives from Psychology, Biology, and Evolution*. Washington DC: American Psychological Association. Wierzbicka, A. (1986). Human Emotions: Universal or Culture-Specific? *American Anthropologist*, 88(3), 584–594. The search for “fundamental human emotions” has been seriously impeded by the absence of a culture-independent semantic metalanguage. The author proposes a metalanguage based on a postulated set of universal semantic primitives, and shows how language-specific meanings of emotion terms can be captured and how rigorous cross-cultural comparisons of emotion terms can be achieved.