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Focus

What makes humanity humane

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Abstract

Scientific and popular lore have promulgated a connection between emotion and the limbic forebrain. However, there are a variety of structures that are considered limbic, and disagreement as to what is meant by "emotion". This essay traces the initial studies upon which the connection between emotion and the limbic forebrain was based and how subsequent experimental evidence led to confusion both with regard to brain systems and to the behaviors examined. In the process of sorting out the bases of the confusion the following rough outlines are sketched: 1) Motivation and emotion need to be distinguished. 2) Motivation and emotion are processed by the basal ganglia; motivation by the striatum and related structures, emotion by limbic basal ganglia: the amygdala and related structures. 3) The striatum processes activation of readiness, both behavioral and perceptual; the amygdala processes arousal, an intensive dimension that varies from interest to panic. 4) Activation of readiness deals with "what to do?" Arousal deals with novelty, with "what is it?" 5) Thus both motivation and emotion are the proactive aspects of representations, of memory: motivation, an activation of readiness; emotion, a processing of novelty, a departure from the familiar. 6) The hippocampal-cingulate circuit deals with efficiently relating emotion and motivation by establishing dispositions, attitudes. 7) The prefrontal cortex fine-tunes motivation, emotion and attitude when choices among complex or ambiguous circumstances are made.

Introduction

Reviewing what I wrote more than three decades ago [1] makes me exclaim: It's pretty damn good. Who wrote this? I'm sure many of you have had this feeling about something that you composed some time ago.

Almost everything I wrote back in 1970 I'll vouch for today – and in some cases the earlier statements express my ideas better than I am doing currently. A case in point, one that I am going to pursue in this essay, concerns the topic "coding". I had forgotten that, what today I have been subsuming under the rubrics "complexity", "nonlinear dynamics" and "chaos theory" is in fact what codes are all about.

In the original essay I failed to distinguish novelty from information. Daniel Berlyne based a good deal of his career on the commonly held idea that novelty provides information in the arts and sciences. Here I want to draw a distinction between these two concepts because I can discern different brain systems that are involved in one process that can be defined as "novelty" and another that can be defined as "information."

I am going to use the term "novel" much as we use the term to describe a literary novel. The essence of a novel is its complexity, its restructuring of the familiar. In contrast, I will use the term "information" in the restricted fashion as it was defined by Shannon and Weaver: that is, as a