

The Origins of Representations: Cognitive and Brain Development

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Abstract : In this paper, an attempt is made to explain the evolution or development of human's representational arsenal from its humble beginnings to its modern abstract symbols. Representations are physical entities that represent something else. To represent a thing (in a general sense of "thing") means to use in the mind or in an external medium a sign that stands for it. The sign can be used as a proxy of the represented thing when the thing is absent. Representations come in many varieties, from signs that perceptually resemble their representative to abstract symbols that are related to their representata through conventions. Relying the distinction among indices, icons, and symbols, it is explained how symbolic representations gradually emerged from indices and icons. To understand the development or evolution of our representational arsenal, the development of the cognitive capacities that enabled the gradual emergence of representations of increasing complexity and expressive capability should be examined. The examination of these factors should rely on a careful assessment of the available empirical neuroscientific and paleo-anthropological evidence. These pieces of evidence should be synthesized to produce arguments whose conclusions provide clues concerning the developmental process of our representational capabilities. The analysis of the empirical findings in this paper shows that Homo Erectus was able to use both icons and symbols. Icons were used as external representations, while symbols were used in language. The first step in the emergence of representations is that a sensory-motor purely causal schema involved in indices is decoupled from its normal causal sensory-motor functions and serves as a representation of the object that initially called it into play. Sensory-motor schemes are tied to specific contexts of the organism-environment interactions and are activated only within these contexts. For a representation of an object to be possible, this scheme must be de-contextualized so that the same object can be represented in different contexts; a decoupled schema loses its direct ties to reality and becomes mental content. The analysis suggests that symbols emerged due to selection pressures of the social environment. The need to establish and maintain social relationships in ever-enlarging groups that would benefit the group was a sufficient environmental pressure to lead to the appearance of the symbolic capacity. Symbols could serve this need because they can express abstract relationships, such as marriage or monogamy. Icons, by being firmly attached to what can be observed, could not go beyond surface properties to express abstract relations. The cognitive capacities that are required for having iconic and then symbolic representations were present in Homo Erectus, which had a language that started without syntactic rules but was structured so as to mirror the structure of the world. This language became increasingly complex, and grammatical rules started to appear to allow for the construction of more complex expressions required to keep up with the increasing complexity of social niches. This created evolutionary pressures that eventually led to increasing cranial size and restructuring of the brain that allowed more complex representational systems to emerge.

Keywords : mental representations, iconic representations, symbols, human evolution

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