1999

Distinctive features

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1999

The MIT Encyclopedia of the Cognitive Sciences

EDITED BY
Robert A. Wilson and
Frank C. Keil

A Bradford Book

The MIT Press
Cambridge, Massachusetts
London, England

ory (Bem 1967, 1972) and other nonmotivational alternative explanations. Others have emphasized the importance of the self-concept in cognitive dissonance, arguing that dissonance effects may depend on threats to one's self-concept and may be alleviated by procedures that affirm the SELF (e.g., Steele 1988; Thibodeau and Aronson 1992).

Most recently, computational models of dissonance reduction have sought to quantify dissonance more precisely and have simulated many of the subtleties of psychological findings (e.g., Read and Miller 1994; Shultz and Lepper 1996). These models use artificial NEURAL NETWORKS that treat dissonance reduction as a gradual process of satisfying constraints imposed on the relationships among beliefs by a motive for cognitive consistency. Their success suggests that dissonance, rather than being exotic and unique, may have much in common with other psychological phenomena (e.g., memory retrieval or analogical reasoning) that can also be understood in constraint-satisfaction terms.

The general success of dissonance theory—and the particular power of the "reevaluation of alternatives" and "insufficient justification" paradigms—seems to derive, in large part, from the breadth of the theory and from the ways that apparently "rational" consistency-seeking can, under certain conditions, produce unexpectedly "irrational" changes in actions and attitudes.

See also ATTRIBUTION THEORY; DECISION MAKING; MOTIVATION; MOTIVATION AND CULTURE; SOCIAL COGNITION

—*Mark R. Lepper and Thomas R. Shultz*

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Distinctive Features

Every speech sound shares some articulatory and acoustic properties with other speech sounds. For example, the consonant [*n*] shares nasality with [*m*], complete oral closure with the set [*pbmtdkg*], and an elevated tongue-tip with the set [*tdsz*].

Most contemporary theories of PHONOLOGY posit a universal set of distinctive features to encode these shared properties in the representation of the speech sounds themselves. The hypothesis is that speech sounds are represented mentally by their values for binary distinctive features, and that a single set of about twenty such features suffices for all spoken languages. Thus, the distinctive features, rather than the sounds built from them, are the primitives of phonological description. The sound we write as [*n*] is actually a bundle of distinctive feature values, such as [+nasal], [–continuant] (complete oral closure), and [+coronal] (elevated tongue-tip).

Three principal arguments can be presented in support of this hypothesis:

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Perspectives on Cognitive

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expect. The notion "possible speech sound" is defined by higher-level cognitive requirements (the distinctive features) and not lower-level physiological considerations.

2. Distinctive features help to explain the structure of sound systems. For example, many languages have no sounds from the set [*bdg*], but if a language has one of them, it is likely to have all of them. These sounds are all [+voice] (referring to the presence of vocal fold vibration); having the full [*bdg*] set together in a language maximizes the cross-classificatory effect of that distinctive feature.
3. PHONOLOGICAL RULES AND PROCESSES depend on the classes of sounds defined by distinctive feature values, and so the notion "possible phonological process" is, in part, determined by the universal feature theory. The English plural suffix is a typical example. This suffix agrees in the value of [voice] with the sound at the end of the noun: [–voice] in *caps*, *chiefs*, *cats*, *tacks* versus [+voice] in *labs*, *shelves*, *pads*, *bags*. This suffix is pronounced with a vowel if the noun ends in a [+strident] consonant, characterized by turbulent airflow and consequent [s]-like hissing noise: *passes*, *roses*, *lashes*, *garages*. Classes like these—[+voice], [–voice], and [+strident]—are frequently encountered in the phonological processes of the world's languages. In contrast, logically possible but featurally arbitrary classes like [*pbsk*] are rarely or never needed to describe phonological processes.

These considerations not only support the claim that there must be *some* set of universal distinctive features; in their particulars, they also serve as the principal basis for determining what is the *correct* set of distinctive features. Primarily, arguments in support of a feature theory turn on how well it explains the observed structure of sound systems and of well-attested phonological processes. Secondarily, the correct feature theory should support a plausible interface between phonology on one hand and the PHONETICS of ARTICULATION and SPEECH PERCEPTION on the other. This prioritization of phonological evidence over phonetic is appropriate because a theory of distinctive features is, above all, a claim about the mind and not about the mouth or the ear.

The idea that speech sounds can be classified in phonologically relevant ways goes back to antiquity, but the concept of a universal classification is a product of the twentieth century. It emerges from the work of the prewar Prague School theorists, principally N. S. Trubetzkoy and Roman JAKOBSON, who sought to explain the nature of possible phonological contrasts in sound systems. The first fully elaborated theory of distinctive features appeared with the publication in 1952 of Jakobson, Fant, and Halle's *Preliminaries to Speech Analysis*. The *Preliminaries* features are defined in acoustic terms; that is, they are descriptions of the spectral properties of speech sounds. This model was largely superseded in 1968 by the distinctive feature system of Chomsky and Halle's *The Sound Pattern of English* (*SPE*). Nearly all of the *SPE* features are defined in articulatory terms; that is, they are descriptions of vocal tract configurations during the production of speech sounds. Despite these differences of definition, the empirical consequences of the *SPE* model do not differ dramatically from the *Preliminaries* model.

There has been no single broad synthesis of feature theory since *SPE*, but there have been many significant developments in specific areas. The most important is the emergence of autosegmental or nonlinear phonology, with its fundamental thesis that distinctive features are, like TONES, independent objects not necessarily tied to any particular speech sound. In the South American language Terena, the feature [+nasal] is, by itself, the first person prefix; for example, [*owoku*] "house" becomes "my house" by attaching [+nasal] to the initial [*owo*] sequence. This freeing of distinctive features from individual speech sounds has yielded new insights into the nature of the most common phonological process, assimilation (where one sound takes on features from a nearby sound).

A further evolution of the autosegmental view is the theory of feature geometry, which asserts that the distinctive features are hierarchically organized into functionally related classes. The features that characterize states of the larynx, for instance, appear to have a considerable degree of functional cohesion in phonological systems. This leads to the positing of a kind of metafeature [Laryngeal], which has within its scope [voice] and other features.

Along other lines, an improved understanding of feature theory has been achieved through the study of particular types of features (such as those pertaining to the larynx or to degree of oral constriction) and of particular groups of speech sounds (such as the various [*l*]- and [*r*]-like sounds of the world's languages). Much has also been achieved by considering alternatives to binary features, in the direction of both single-valued features (marked only by their presence) and ternary or higher-order features (which are particularly useful for characterizing some natural scales, like degree of oral constriction or tongue height).

Finally, research on SIGN LANGUAGES has showed that they too have representations composed of distinctive features. Thus, while the distinctive features of spoken languages are modality-specific, the existence of a featural level of representation apparently is not.

See also AUDITION; INNATENESS OF LANGUAGE; PHONOLOGY, ACQUISITION OF; PHONOLOGY, NEURAL BASIS OF

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