

**COGNITIVE MODELING OF MUSIC PERCEPTION AS A  
FOUNDATION FOR INTERSTELLAR MESSAGE COMPOSITION**

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Most proposals for interstellar messages have begun with systematic expositions of presumably universal mathematical and scientific concepts, presented in an incremental manner from simple to complex. For example, Freudenthal's *Lincos* progresses from basic arithmetic to discuss such varied notions as time, space, and human behavior. Music has also been proposed as having potentially universal characteristics, by virtue of the connection between acoustics and mathematics. Indeed, recordings onboard two Voyager spacecraft included musical selections from a range of human cultures, in the hope that ETI would be able to glean something from their structure. The implicit assumption behind these recordings was that the innate characteristics of music may be sufficiently universal to allow for comprehension across interstellar space.

The current paper takes a more skeptical stance and assumes that music as experienced by humans may need to be *taught* in order to be intelligible to ETI. Messages using this didactic approach can be based on an expressly *cognitive* model of human music perception, which has several advantages: a cognitive model is empirically testable, it may be linked to parallel messages providing an account of human perception and cognition, and it provides multiple levels at which decryption might occur. By illustrating progressively more complex rules that specify how terrestrial musical melodies are generated, and by doing so through radio signals that directly mimic these melodies, ETI are presented with two means of understanding human music perception. First, ETI may be able to comprehend the *musical content* we attempt to convey, because they can follow our intended "chain of reasoning," or in this case, the "musical tutorial." However, if ETI cannot comprehend this content as an artistic expression, they may still be able to infer something about our cognitive and perceptual systems based on the *patterning* of the message we send. Thus, even without comprehending the musical intent of such a message, the recipients might gain some understanding of human information-processing capabilities, because we are providing a message that is meant to describe our cognitive processes, by making the form of the message reflect these capabilities. This is an extension of the author's earlier proposal that the *form* of the message should reflect its *meaning*. In the current proposal, the patterning of the

message acts as an *icon* of our cognitive and perceptual processes, in addition to serving as a musical expression.