Eleven theses on music, language, and the brain.

Bjorn Merker, for the Ernst Strungman Forum, Frankfurt, May 8-13, 2011.

The following summarizes my own positions on the "dimensions of discourse" sketched in a separate pre-forum comment of mine.

1. The most fundamental property shared by human language and music is their membership in the small class of systems employing the so called 'particulate principle' for the generation of unlimited pattern diversity (defined by William Abler in 1989). This, rather than recursion (which is dependent upon it), is the key to the unbounded generativity of music and language (Merker 2002).

2. Natural selection is but one - and possibly the least important one - of three agencies likely to have driven the genesis of music and language. The other two are sexual selection (in accordance with Zahavi's 'handicap principle', and the 'developmental stress hypothesis' in particular, Merker in press) and the power of transgenerational iterated learning to turn random strings into a shared grammar without natural selection or reinforcement of outcomes (as modelled by Kirby).

3. Humans are the only primate with a capacity for vocal production learning. That capacity is an absolute requirement for spoken language and song in that it allows us to shape vocal output to match auditory models. How and why we alone added that capacity to the primate brain holds the biological key to the riddle of music and language.

4. As a uniquely derived trait (autapomorphy) of humans, vocal production learning has no primate homologs. This makes convergently evolved vocal production learning in birds and a few mammals the sole sources of insight into the biological significance and origin of the trait.

5. In vocal learners vocal output is shaped by learning, using feedback of their own voice to match their production to heard models. This relegates the shape of the vocal tract to a negligible factor in production, as demonstrated by the ability of bird mimics to duplicate the human voice with their utterly different vocal apparatus (Nottebohm 1976).

6. There is no natural path from the semantics of animal calls to the syntax of language, but there is one from the syntax of learned animal song to the semantics of language. Thus, our path to language is likely to have traversed a stage of learned, unsemanticized, and complex song based on vocal learning. Our current proclivities for song and music are remnants of that stage once many of its resources were co-opted by human language.

7. Human language originated in a process whereby transgenerational transmission of complex learned song by our non-seasonally breeding ancestors resulted in situation-specific differentiation of a large song repertoire, with subsequent analytic semantization of song-strings through segmentation and generalization over shared contextual content, with words as a late

rather than early product of the process (Merker & Okanoya 2007).

8. Given the productive powers of iterated transgenerational learning traditions (as in 7 above), a biological endowment for human language does not take the form of an innate, universal grammar, but rather presents as the singularity of a cerebral mechanism dedicated to vocal production learning in a primate brain.

9. Vocal learning requires a lengthy period of unreinforced practice to achieve duplication of heard patterns. A motivational mechanism must therefore sustain practice till a match is achieved. This "conformal motive" (Merker 2005), once in place, provides a pivot for generalization to other imitative abilities, and may account for the unique imitative and ritual propensities of humans, including their ready acceptance of arbitrary words as the obligatory names of things.

10. In contrast to vocal production learning, a learning capacity for manual dexterity is common in mammals, yet no species save humans has ever deployed it for communicating by means of a system of conventional gestures. Since conventional gestures are inherently imitative, this human peculiarity is likely to have arisen secondarily to our capacity for vocal production learning.

11. Language alone "means" in the sense of mapping semantic content onto strings of conventional (arbitrary) symbols (Staal 1989). There is no corresponding device in music, whose patterns do not provide a vehicle for another domain of content, but represent themselves alone (Hanslick 1854).

References:

Abler, W. L. (1989). On the particulate principle of self-diversifying systems. *Journal of Social and Biological Structures, 1:* 1-13.

Hanslick, E. (1854). *Vom Musikalisch-Schönen. Ein Beitrag zur Revision der Aesthetik der Tonkunst.* Weigel, Leipzig.

Merker, B. (2002). Music: The missing Humboldt system. *Musicae Scientiae, 6:* 3-21.

Merker, B. (2005). The conformal motive in birdsong, music and language: An introduction. In *The Neurosciences and Music II: From Perception to Performance*, G. Avanzini, L. Lopez, S. Koelsch and M. Majno (Eds.), pp. 17-28. Annals of the New York Academy of Sciences (vol. 1060), New York.

Merker, B. (in press). The vocal learning constellation: Imitation, ritual culture, encephalization. In *Music, Language, and Human Evolution,* N. Bannan (ed.), Oxford University Press, Oxford.

Merker, B. & Okanoya, K. (2007). The natural history of human language: Bridging the gaps

without magic. In *Emergence of Communication and Language*, C. Lyon, L. Nehaniv & A. Cangelosi (Eds.), pp. 403-420. Springer-Verlag, London.

Nottebohm, F. 1976. Discussion paper. Vocal tract and brain: A search for evolutionary bottlenecks. In *Origins and Evolution of Language and Speech*. S.R. Harnad, H.D. Steklis & J. Lancaster (Eds.), pp. 643–649. Annals of the New York Academy of Sciences (vol. 280), New York.

Staal, F. 1989. Rules without Meaning. Ritual, Mantras and the Human Sciences. Peter Lang. New York.