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10/16 Reading Response

Definition of Pitch

Pitch has no commonly agreed-upon definition, and Plack and Oxenham don't try to create one. They mostly deal with pitch from a great distance.

This is apparent starting with the first sentence of *Pitch Theory in a Nutshell*, which is indicative of their general approach: "Pitch-evoking stimuli usually are periodic, and the pitch usually is related to the period." This statement is about as close as we get to a definition of pitch, and it tells us nothing about pitch's nature, nothing about the differences between experiencing pitch vs reading a musical score or mathematical formula, nothing about what pitch *is*. The authors' only recourse is to approach pitch via extreme indirection, in this case by naming a single characteristic of "pitch-evoking stimuli" (periodicity), to which "pitch" is usually somehow related.

Instead of studying pitch head-on, Plack and Oxenham mostly treat it as a perfectly predictable response to a stimulus, and remain content to define the stimulus. In other words, they stick to explanations of strategies for *dealing* with this "pitch" phenomenon, whatever that phenomenon may actually be. This would be disastrous if they were attempting to explain or define pitch scientifically, but I believe that this is not truly their goal.

Their strategies for dealing with pitch are still many steps removed from the pitch-strategies that would bring them closest to this thing that are claiming to examine. For example, their strategies cannot teach one to reliably *know* whether some thing or experience is pitch or not-pitch (not to be confused with knowing whether some thing will or won't *produce* pitch). What their strategies do teach is, given that something is *already* "pitch," how can one determine *which* pitch that something is, if one cannot necessarily hear the thing in question yet can analyze its visual representation.

Their pitch-matching strategies involve estimating the period of a periodic frequency. This is typically done by either "waveform" (analyzing a time representation of a signal for peak patterns via autocorrelation) or "spectrum" (analyzing a frequency representation of a signal for partial patterns via partials' subharmonics).

Plack and Oxenham do not approach the question of, "what makes our strategies more legitimate than, say, 'play notes on a piano and match the pitch of what you hear'?" I am not suggesting that the "piano" method is useful for the same purposes as their proposed methods. I am suggesting that earnestly investigating that question could result in a better understanding of what Plack and Oxenham are actually doing, if not developing of a theory of pitch.

Place Theory

"Place theory" suggests that what we experience as a sound/pitch is "actually" a combination of multiple, simultaneous sounds/pitches. This self-referential idea does not approach a definition of sound nor pitch, but this does not make it not useful.

Plack and Oxenham trace place theory back to Pythagoras' proposed correlation between the "subjective" quality of interval and the "objective" quality of ratio. The authors track the theory through Aristoxenus,

Euler, Fourier, Ohm, and Helmholtz, among others. Ohm and Helmholtz developed Fourier's theory into a more sophisticated understanding of pitch, period, and partials: basically, within a periodic vibration, shorter periodic inner-vibrations will evoke pitch if and only if they contain a nonzero fundamental partial. The "nonzero fundamental" requirement was eventually disproven, and theorists dealt with this by creating various "pattern matching" schemes for how we psychoacoustically reconstruct this missing fundamental. Similar systems of pattern matching are used in modern signal processing methods, and can be used to explain the entirety of human experience by certain high schoolers.

Time theory

"Time theory" suggests that what we experience as sound/pitch is actually a combination of multiple, *non-simultaneous* sounds/pitches. Plack and Oxenham originate time theory with Boethius, about a millennium after place theory. Autocorrelation is an example of a time-theory technique, and is used both as a potential explanation for how pitch perception works and as a common signal-processing strategy (i.e. for pitch detection). The concepts of impulse response and convolution can also be thought of as having descended from time theory.