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Sound Impressions. Sound Guidance.

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With her characteristic elegance and infectious enthusiasm, **Nina Kraus** often presents her extensive work on subcortical responses to sound in terms of a conceptual framework that focuses on three fundamental aspects of complex sounds: pitch, timbre, and timing.[1–3] I can think of no better way to celebrate Nina's research and mentoring contributions than through these three aspects of sound.

First is pitch, the sound attribute that allows us to place sounds on a scale from low to high. Nina seems to love huge pitch swoops. In her life outside the lab, she loves hiking up mountains and skiing down slopes. In her life with her research group, she always takes deep dives into data (of which there is always a huge amount in Nina's lab) and then challenges everyone to find the higher-order generalizations that make meaning of the data. Next is timbre, the perceived quality or "color" of a sound distinct from its pitch and intensity. Since timbre is quite hard to define, we usually appeal to adjectives that evoke some overall qualitative impression, such as *light*, *bright*,

rough, or *smooth*. Within this descriptive tradition, I would describe the timbre of Nina's approach to scientific practice as *bright*, *fluid*, and, perhaps most of all, *joyous*. Those of us who are lucky enough to be associated with Nina's research group know that a major component of the Brainvolts group's unique quality – its timbre – revolves around communal feasts, including the legendary annual holiday party and the dissertation completion parties at Nina's house. The third and final aspect of sound is timing, the sound attribute that describes event durations and relations. One of Nina's most remarkable scientific talents is her seamless integration of short-term patterns into long-term designs. Nina's work connects variation in short-term cortical responses (e.g., the frequency following response) to the variation in long-term experience with sound (e.g., by comparing musicians and non-musicians, monolinguals, and bilinguals). In Nina's Brainvolts research group, one can trace through-lines that connect series of studies over decades. As a prime example of this extended research timeline, consider the early studies on sound processing by children with learning disabilities from the *Listening, Learning, and the Brain Project* of the 1990s (e.g., Kraus, McGee, Carrell, Zecker, Nicol, and Koch, 1996) to recent work on rhythm, reading, and sound processing in pre-school children (Bonacina, Huang, White-Schwoch, Krizman, Nicol, and Kraus, 2021). Nina also has impeccable timing in selecting research topics, always managing to push the envelope of understanding current scientific and social relevance issues, ranging from learning disabilities to autism, sports-related concussion, access to music education, and bilingualism.

The world of sound is exciting and marvelous because it is a world with infinite combinations of pitch, timbre, and timing. In Nina's research group, this sense of endless possibility is the predominant strain. I was lucky enough to enjoy this wonder for three years in the mid-1990s, which turned out to be a pivotal point in my career as a linguist and speech scientist. Thank you, Nina, for all of the sound guidance (pun fully intended) that your life as a scientist, mentor, and friend represents.

References

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