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Nina Kraus and the Art of Mentorship

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> *"Mentoring is a **brain to pick**, an **ear to listen**, and a **push in the right direction**."*
>
> *– John C. Crosby*

There is much to consider and admire regarding Nina Kraus's incredible scientific accomplishments, which have been disseminated in hundreds of original research papers, book chapters, reviews, television and radio appearances, and guest lectures. While these accomplishments are available for most anyone to peruse, none of these communications provide any information about Nina's incredible mentorship to her students and staff in the Auditory Neuroscience Lab. We argue that Nina's mentorship is the crucial component for how her group has maintained such incredible productivity throughout her career. This brief paper will reflect on observations accumulated during our tenure in the Auditory Neuroscience Lab in support of this hypothesis. At the same time, we pursued our postdoctoral research (B.C.) and doctorate (D.A.A.) that speak to Nina's mentorship and how it has contributed to decades of innovative basic and clinical auditory brain research.

"A Brain to Pick…."

Nina has pursued excellence over a long and highly productive career. Trained during an era when the norm in neuroscience was hyper-reductionism, Nina stands out in her relentless pursuit of the big picture in auditory neuroscience. This search has allowed her to traverse across the auditory system: from the cortex to the cochlea, across levels: from single-neuron activity to systems-level function, across timescales: from rapid emergent plasticity induced via classical conditioning to lifelong music and language experience-dependent plasticity, and across translational tiers: from basic science leveraging animal models to translation to clinical practice and science/health/education policy.

Nina has a voracious appetite for science and is a firm believer in our ability to be lifelong learners. This broad and deep love for science has not only led her work to an unusually diverse collection of topics, including music, reading, development, brain injury, and learning, but also instilled in her trainees the importance of thinking about, and communicating, our science in the broadest way possible. A consequence of Nina's breadth as a scientist and keen sense of observation is that Nina's brain is fertile ground for a mentee to pick, and her encouragement of a "big picture" perspective is extremely important for her trainee's development. Consequently, her trainees are now influential across a broad range of fields. The ability to traverse across timescales, translational tiers, and systems to arrive at holistic perspectives has shaped the viewpoint that the

ear is a critical doorway to the brain and cognitive function. This stems from intensive neuroscience training focused on the auditory system and an acute and keen observation of her world. As an example, her immense contribution to music neuroscience stems from personal insight and experiences rather than theoretical training in the music sciences. Unafraid to forego the path of least resistance to pave her own pathway and make it substantially easier for others to follow. A trailblazer in the truest sense.

"…An Ear to Listen…"

Nina's academic excellence is easily discernable by the scientific community as well as the layperson. As trainees with Nina, we had the opportunity to directly benefit from an underappreciated skillset, her ability to be an active listener, empathize, and discern others' perspectives. Nina's mentorship is underscored by a unique combination of leadership, intellectual curiosity, excitement for collaboration and exploration of new ideas, an infectious love of science, with a sprinkling of tough love. Nina has a unique leadership style: viewing herself as a member of the *Auditory Neuroscience Lab* who shapes rather than dictates terms. She typically eats lunch at the lab's conference table, where she makes herself available to talk with lab members and visitors about any number of scientific and non-scientific topics. Making herself available in this way enabled us to learn from her and experience her remarkable scientific mind in ways that might not be available otherwise. Her leadership style also makes her approachable to her trainees, which is critical for maintaining good communications throughout the scientific process. Nina worked hard to create a *collaborative* lab environment bonded by her passion for science and a focus on the big picture. Nina has an incredible ability to protect trainees from the worst things about science and academia while preparing us in the best possible way to contribute to science. She is a lifelong mentor, lending a non-judgmental ear, offering sage advice ranging from mundane everyday academia to dealing with conflicts to work-life balance.

"…A Push in the Right Direction"

The process of designing and performing experimental brain research is a dance with the unknown, and the questions and anxieties surrounding this process are most pronounced in young researchers. Is this the right question to ask and the correct experimental design to address that question? Can we trust that the equipment is functioning correctly, the data is clean, and noise is kept to a minimum? Is the analysis sufficient to comprehensively test our hypotheses, and what claims can be made based on the findings? While young researchers thirst for immediate and definitive answers to their questions, the mentor's job is not always to simply provide this information to the mentee. Instead, it is often more beneficial if the mentor pushes their mentee in the right direction to think of ways to answer these questions themselves. A key aspect of Nina's mentorship is her incredible ability to direct her students in this way. Nina struck a perfect balance in mentorship, never too much into the weeds of a trainee's research project, yet never allowing trainees to lose track of the right direction, redirecting/aligning trainees whenever necessary.

To conclude, Nina has placed the highest emphasis on training future scientists, a fact attested by her impressive training record. She has served as the primary mentor for 14 postdoctoral fellows and more than 30 doctoral students and inspired countless trainees. While it is challenging to measure her training impact, we posit that it has left an indelible mark in the field of auditory neuroscience and has impacted how generations will think about how sounds profoundly shape our brains throughout our lifespan.