Shape of the ASA: Similarity Relationships Among the Society’s Technical Areas

The shape of the Acoustical Society of America (ASA) has grown, from its early conception toward decentralization of control over the functions of the Society to 13 separate technical areas (see Table 1). These technical areas, which are in charge of constructing the biannual conference program, have evolved over the years into constituencies with fairly distinct cultures of practice.

The ASA meetings draw members from different disciplines but with a common interest in various aspects of acoustics. This, after all, is why there is one society for all things acoustic. As organizers of the Fall 2014 ASA meeting in Indianapolis, we were tasked with placing the 13 areas in different rooms of the conference venue. Beyond finding space for each area, there was the additional challenge that members generally attend sessions in more than one technical area.

This logistical challenge actually presents a larger intellectual puzzle. How do these different technical areas coexist in the same society? In one room, one can find papers on tongue motor control in speakers of poorly documented languages and in the next room, talks on the acoustics of ship propellers.

Such conceptual cohesion problems are very common in cognitive psychology, and their structures are commonly encountered in various experimental paradigms. Dating from the 1950s, the concept of a psychological space inhabited by

Table 1. Counts of members’ primary and secondary interests in the 13 technical areas of the Acoustical Society of America

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Columns are primary interests and rows are secondary interests. AA, architectural acoustics; AB, animal bioacoustics; AO, acoustical oceanography; BA, biomedical acoustics; EA, engineering acoustics; MA, musical acoustics; N, noise; PA, physical acoustics; PP, psychological and physiological acoustics; SA, structural acoustics and vibration; SC, speech communication; SP, signal processing; UA, underwater acoustics.
categories with various distances from one another was popularized, most notably by Shepard (1957), and has been utilized in a large body of subsequent research. This literature has afforded the mathematical operations of multidimensional scaling (MDS), developed by Togerson (1952) and others. MDS takes the measures of association between individual categories and distills them into a low-dimensional representation of the space inhabited by the categories, with their relative locations within this lower dimension space (Kruskal and Wish, 1978). (See Hout et al. [2013] for an overview of this technique and its applications.)

This was exactly what we needed to situate the technical areas in the conference venue, projecting the relationships between the 13 technical areas onto the (at most) 3 dimensions of the hotel space.

As input, we took ASA membership information concerning the primary and secondary areas of interest of 7,126 members, summed up in Table 1. Members choosing primary and secondary areas of interest indicated a proximity of the two areas.

The counts were submitted to an MDS analysis using the ALSCAL scaling algorithm (Takane et al., 1977) in SPSS. ALSCAL calculates the optimal distances between categories in an $n$-dimensional stimulus space by minimizing a stress value (“Kruskal's S-Stress”). The stress value is used to choose the optimal number of dimensions where any added dimension does not significantly improve the fit.

For our analysis, this process conveniently yielded two dimensions, shown in Figure 1. In the resulting target-shaped space, similar technical areas are located close to one another and dissimilar technical areas are further apart. Around the perimeter is a circular progression running (starting at bottom left) from Speech Communication to Psychological and Physiological Acoustics to Musical Acoustics to Architectural Acoustics and Noise to Structural Vibration and Engineering Acoustics to Physical Acoustics to Underwater Acoustics to Acoustical Oceanography to Biomedical Acoustics to Animal Bioacoustics and then back to Speech Communication.

The orientation of this perimeter yields two dimensions, each with a general interpretation. The vertical dimension corresponds to the distinction between a disciplinary focus on artificial and engineered entities at the top and organic entities in the wild at the bottom. On the horizontal axis, the areas vary from human and cultural to the left (e.g., music and architecture) and nonhuman (e.g., oceans) to the right.

In terms of how the ASA itself coheres, the MDS analysis suggests an answer. All disciplines are connected by a chain of disciplines made up of pairs of neighbors, each of which have very obvious and important shared interests. They are further connected by Signal Processing, which sits in the center and apparently shares members with all other technical areas.

Armed with these results, the sequence of technical neighbors was laid out on the two floors of the Indianapolis Marriott, roughly as in the top and bottom halves of the MDS plot in Figure 1. More generally, what our analysis shows is how such a diverse organization hangs together. It is a network of allied pairs or triplets of disciplines, each overlapping with different neighbors to form a coherent whole, with Signal Processing as a universal interest.

### Biosketches

**Kenneth de Jong** is professor of linguistics at Indiana University, conducting research into the diversity of processes pertaining to speech production and perception, from motor coordination to the acoustic structure of linguistic categories to the acquisition of perceptual abilities in a second language. He was editor in chief of the *Journal of Phonetics*, is president of the Association for Laboratory Phonology, and, most pertinent to this article, was cochair of the 168th meeting of the Acoustical Society of America in Indianapolis.
**Shape of the ASA**

Terrin Tamati is currently a postdoctoral researcher at the University Medical Center Groningen in Groningen, The Netherlands, where she conducts research on speech perception in cochlear implant users. She received a PhD in linguistics from Indiana University in 2014. Her research interests include talker and accent variability, speech perception in adverse listening conditions, individual differences in perception, and speech communication in cochlear implant users.

**References**


**Marine Mammal Acoustic Behavior**

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