

The Agony and Ecstasy of Multidisciplinary Research in Speech

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Definition of Multidisciplinary

- Involving a range of subjects: studying or using several specialized subjects or skills
(Encarta Online Dictionary)
- Involving different subjects of study in one activity: a multidisciplinary course
(Cambridge International Dictionary of English)

Definition of Interdisciplinary

- Involving different subjects: involving two or more academic subjects or fields of study (Encarta Online Dictionary)
- Involving two or more different subjects or areas of knowledge: interdisciplinary courses, an interdisciplinary approach to the problem (Cambridge International Dictionary of English)

Welcome To Exploring Leonardo



From <http://www.mos.org/sln/Leonardo/LeoHomePage.html>

NSF on the Value of Multidisciplinary Research

- NSF places a high value on interdisciplinary and multidisciplinary approaches because it believes **many interesting problems transcend traditional science disciplines**, although those disciplines are essential components of any research program.
- It is clear that the **most pressing problems of our world today require a multidisciplinary response**. Traditional lines between the disciplines are starting to blur as we work together, as engineers and scientists, to respond to these challenges in ways that build on our joint expertise and create new solutions.
- Some of the **most interesting challenges arise at the intersection of the disciplines—and some of the most astounding technical advances as well**. The application of micro-electronics to health care and of information technology to molecular biology are two areas of intersection that are already having a profound affect on our lives.

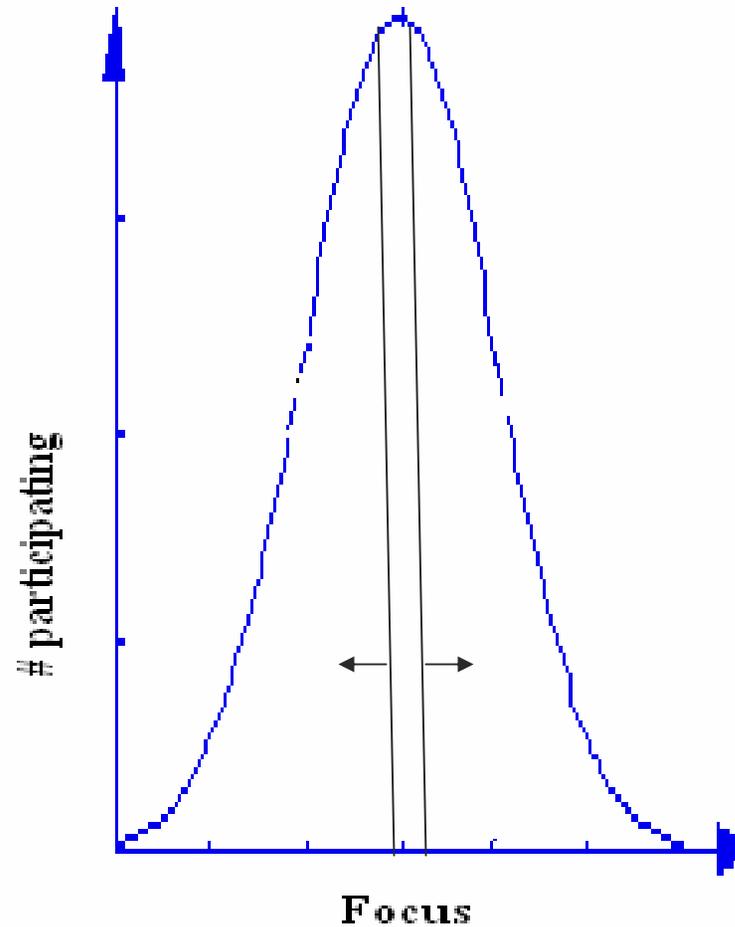
Internet: Speech Research is/should be Multidisciplinary

- Some examples:
 - “Speech is a largely multidisciplinary research field. It calls for skills in domains such as phonetics, mathematics, acoustics, psychoacoustics, signal processing, shape recognition, and knowledge representation.”
 - Finland’s speech research (from www.hltcentral.org/euromap/news/880):
 - New multidisciplinary research programs
 - Common standards and recommendations for speech databases
 - Better coordination of existing resources
 - Long-term multidisciplinary research to understand the essence of spoken language
 - Education should be reorganized in a more multidisciplinary way

The Agony of Multidisciplinary Research

- By its very nature, multidisciplinary research is **non-centrist**. Consequences:
 - Harder to explain the research in an elevator sound byte (4 page papers are quite hard to write)
 - Relevance/value to the core is not always immediately understood by the community making funding/publishing goals harder to achieve
 - Research at the core given priority for lecture presentations
 - Work may not be cited for years to come

[Disciplinary Centrism]

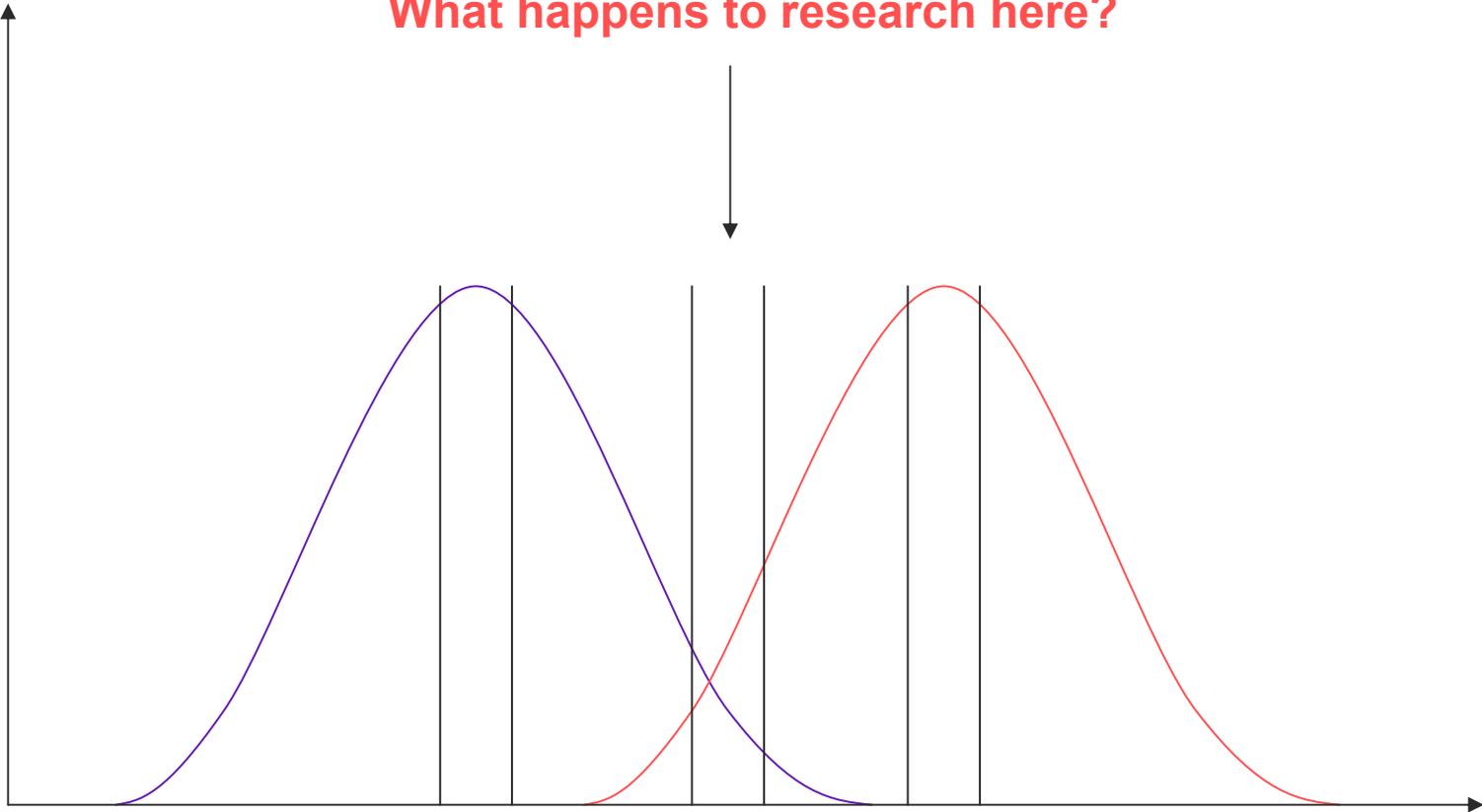


The Center is Defined Based on Many Factors

- There are many factors that tend to affect a speech-related research topic's appearance at the core:
 - Emphasis on engineering versus science
 - Theoretical versus Empirical
 - Observational work, Scientific Method
 - Level of Processing (ASR): Signal Processing, Acoustic Modeling, Pronunciation Modeling, Language Modeling, Language Understanding
 - Resource Availability (related to Barriers to Entry and minimum lab size issues)
 - Focus on Evaluation Metrics versus Error Analysis

Multidisciplinary Research is Affected by Disciplinary Centrism

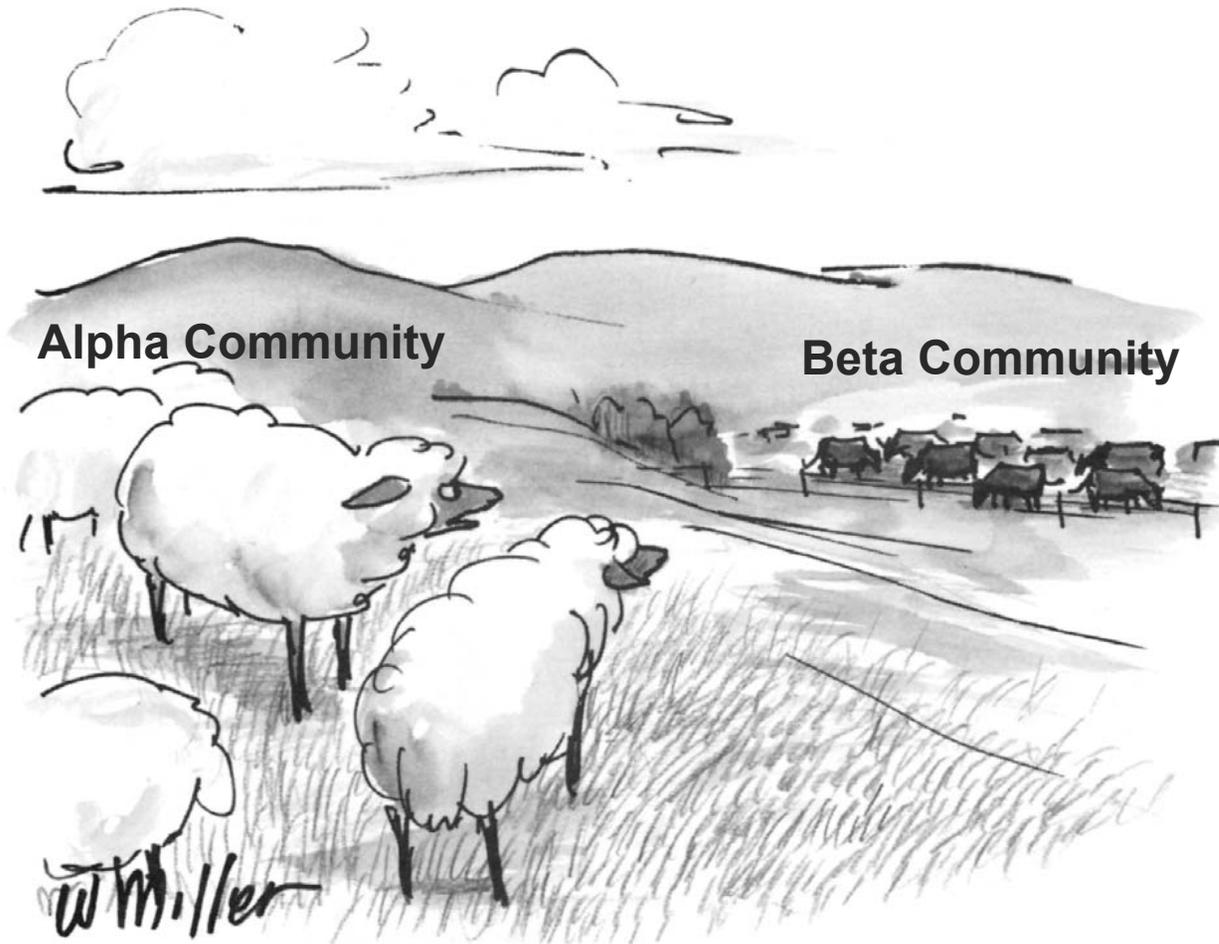
What happens to research here?



Examples of Speech-Related Areas

- Artificial Intelligence
- Biological Sciences
- Cognitive Science
- Computational Linguistics
- Computer Science and Engineering
- Imaging
- Linguistics (all types)
- Machine Learning
- Multimodal Processing
- Neuroscience
- Physics
- Probability Theory and Statistics
- Psychology (e.g., developmental, psycholinguistics, cognitive)
- Signal Processing
- Speech Science
- Systems Engineering

[Disciplinary Mistrust]



Alpha Community

Beta Community

I've never trusted Betas

Some of the Challenges

- Payoff can take time and resources:
 - It takes time to learn about other disciplines
 - Ties can be hard to develop and once established, more fragile
 - Once established, there are higher coordination costs
- There are risks associated with carrying out research not at a discipline's core.

[Some Risks]

- Tenure, reputation, and funding may be adversely affected by choosing the multidisciplinary path!
- Collaborative work can be undervalued.
- Other Issues:
 - Fewer publication outlets (not the union of disciplines)
 - Order of authorship and decisions about PI vs. Co-PI may be misleading
 - Multidisciplinary research often requires a bigger budget than core discipline work
 - Types of collaboration:
 - Master/Slave (funding levels)
 - Equal Partners
 - Separate with some interface
 - Begging for Crumbs

The Ecstasy of Multidisciplinary Research

RAISING DUNCAN

By Chris Browne



Benefits of Multidisciplinary Work

- Develop new knowledge, tools, or products that go beyond current state-of-the-art
- New insights on evaluation methodology
- Add new ideas and expertise to solve the problem of interest
- Create new methods and fields (revolutionary advancement)

Ways to Increase Multidisciplinary Collaboration

- Multidisciplinary Education Programs
- Community Building (needs time and effort)
 - Understand each other's language (jargon) and methods
 - Respect the other disciplines and their values
- Encourage Multidisciplinary Work, for example:
 - Special Issues in Journals
 - New Conferences
 - Multidisciplinary Proposal Solicitations (e.g., KDI)
- Lower Barriers to Participation within the Core (e.g., Infrastructure Sharing)
- Advertise Success Stories