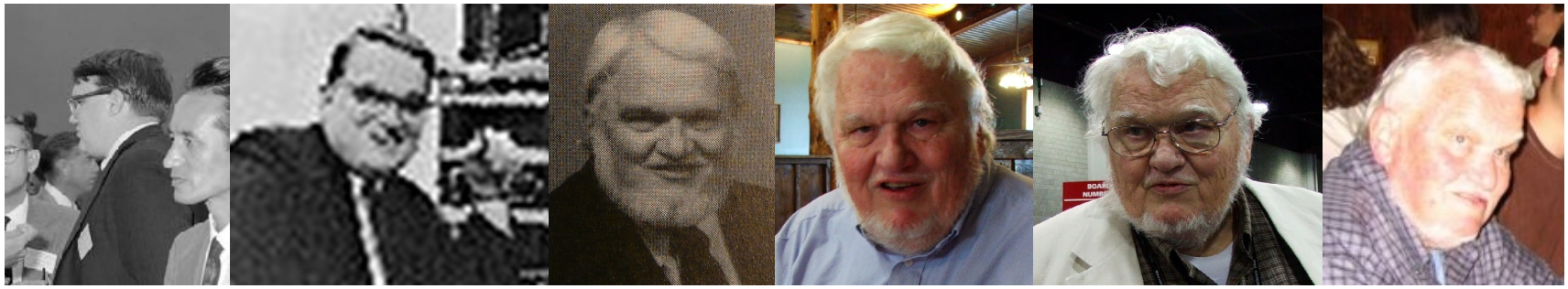
CNS*2010 Workshop: Panel

Higthroughput 3D microscopy and high-performance computing for multi-scale modeling and simulation of large-scale neuronal circuits

Workshop in memory of Bruce H. McCormick (1928–2007)



1960 c. 1960 c. 1998 2005 2006 2007

July 30, 2010

Organizers: Yoonsuck Choe, John Keyser, and Louise C. Abbott

Brain Networks Laboratory

Texas A&M University

Panel Discussion

- The road traveled: Bruce's Career
- The road ahead: Future challenges for us

The Road Traveled: Bruce's Career

Physics $\longrightarrow$ Computer Science $\longrightarrow$ Neuroscience

- 1950's: Studied under Paul Dirac (Nobel prize, 1933) as a Fulbright scholar.
- 1950's: Worked with Luis Alvarez (Nobel prize, 1968) at LBNL.
- 1960's: Professor of CS at UIUC, computer vision.
- 1970's: Professor of EECS at UIC, co-chair of SIGGRAPH 79. Played key role in funding the MRI project (Lauterber, Nobel prize, 2003).
- 1980's: Scientific Visualization Lab. Texas A&M Univ. Founding department head of CS.
- 1990's: Scientific Visualization Lab. Design of the KESM.
- 2000's: Brain Networks Laboraroty. KESM.

The Road Ahead: From Specimen to Data to Description to Explanation

1. Specimen (species, preparation)
2. Data (resolution, volume)
3. Description (structure, function)
4. Explanation (principles, objective functions)

1. Specimen

- Which species?
- Is imaging the brain enough?
- Staining, contrast?

2. Data

- What resolution needed?
- How much volume needed?
- Not one approach is perfect: How to use them in a complementary manner?

3. Description

- Extracting structural description much more time-intensive than data gathering?
- Estimated time per brain for reconstruction?
- How best to validate automated tracing?
- Estimating connectivity.

4. Explanation

- Understanding the network, and importance of visualization.
- Functional/operational principles?
- New conceptual frameworks necessary?

BHM Annecdotes, Remembrance

- Students
- Colleagues
- Collaborators

Messages from Colleagues

- *... He was a most interesting, and charming, fellow. The field will miss him. – D. Glanzman*
- *... sad and shocked ... – Y. Liu, J. Fallon, G. Ascoli*
- *... fond memories ... – M. Wiercigroch*
- *Bruce was a very special man. With a dream and a vision and tremendous drive to see it realized. ... I will miss him a great deal ... A great loss. – J. Bower*
- *man of great vision and determination. It was a delight whenever I managed to meet up with Bruce. – R. Koene*
- *... he was a great scientist ... – B. Mesa*
- *Very sad, he really had a vision to try to [do] micro at a marco scale. – H. Markram*
- *He was a man with great vision and determination. – R. Shankle*
- *and many others.*

Message from Valerie E. Taylor, Texas A&M CSE Department Head

It was pleasure to have such a dedicated and well respected faculty member in the department. Bruce was recognized for creating the term "Visual Supercomputing". Bruce worked tirelessly to create the Brain Networks lab and received a patent for the diamond-edge cutting knife microscope. I was elated that Bruce was the co-PI on an approximately $1M grant from NIH for the brain networks work prior to his retirement. Bruce always spoke his mind and always had high expectations of excellence. Bruce is dearly missed.

Message from John Keyser, workshop co-organizer

Bruce was an inspiration. As a new faculty member at Texas A&M, I found his enthusiasm for brain reconstruction contagious, and I quickly developed an interest in the area myself. I have often remarked that I hope I will be as enthusiastic about my research later in my career, as Bruce was toward the end of his.

I particularly admired the way Bruce was able to see connections between a wide range of fields. He really didnt see brain mapping as being all that different from particle physics or astronomy, and his ability to see the connections between them gave him a tremendous amount of insight. It also gave him the confidence that the problems being faced in one field would certainly be overcome; after all, analogous problems had already been overcome in other fields.

Bruce was definitely a visionary; I think it will take us many years to begin to realize some of the results that Bruce felt should be coming any day now. In other areas, the foresight that Bruce had has now been realized to an extent that we consider those ideas that were once new, to now be normal.

Of these, I think of the one closest to my own research, Scientific Visualization. Scientific Visualization is now such an accepted idea (and even term), that is difficult to realize that at one time, the concept of such a field was something new. Bruce helped give birth to, or at least focus, an entire field that now is the basis of many careers.

I'm glad to have had the opportunity to know and work with Bruce, and I wish he could still be here as we all continue to make progress in these research areas that were so close to his heart.

Advertisements

- Springer book: We will be editing a book on the workshop topic. More announcements to follow (via email).
- IJCNN 2011: International Joint Conference on Neural Networks has special track on computational neuroscience. San Jose, CA, July 31–August 5, 2011.
- ASIM 2010: Advancing Substrate-Independent Minds, San Francisco, CA, August 16–17, 2010 (details TBA: contact Randal Koene).

Acknowledgments

- 3Scan (Todd Huffman)
- Organization for Computational Neuroscience

References

Mayerich, D., Abbott, L. C., and McCormick, B. H. (2008). Knife-edge scanning microscopy for imaging and reconstruction of three-dimensional anatomical structures of the mouse brain. *Journal of Microscopy*, 231:134–143.