

# **NeuroNET Advisory Board Report**

*University of Tennessee Knoxville NeuroNET Program*

*Site Visit & Review May 25-26, 2016*

Report Date: 05-16-2016

## **Introduction**

The newly formed NeuroNET External Advisory Board convened on May 25 and 26, 2016, for its first site visit and program review. The Advisory Board wishes to thank the NeuroNET team for planning and providing an excellent two days of presentations, meetings and discussions at UTK and the Medical Center (UTMSC), along with an excellent set of extensive preparation materials prior to the two-day site visit.

NeuroNET requested the following input from the Advisory Board:

- Provide feedback on how NeuroNET can improve, and how best to use our resources. For example, should we continue building a broad Neuroscience Center, or shift towards a Center of Excellence Model (e.g., Computational Neuroscience, NeuroEngineering, or Neurodevelopment, Degeneration, and Rehabilitation).
- Evaluate our current short-term (1-3 year) and long-term (10 year) goals.
- Suggest how best to leverage support for NeuroNET from the University administration.
- Provide input on marketing UT Neuroscience at regional and national levels.
- Suggest incentives for retaining and attracting faculty and students
- Provide input on potential external partnerships.

This report is a summary of the Advisory Board's initial observations and recommendations.

## **Background**

The University of Tennessee Knoxville (UTK) has benefitted from a grass-roots organizing effort by faculty and students that resulted in the creation of "NeuroNET," a collective of researchers and research interests bound together by a common passion for neuroscience. Professors Rebecca Prosser, Director, Russ Langdon, Assistant Director, and Matt Cooper, Director of Research and Outreach, lead the initiative. This group and its Executive and Ad Hoc Committees are to be commended for an inclusive, wide-ranging, and imaginative effort that reflects great dedication and hard work.

Since its founding in 2012, the NeuroNET program has:

- (1) received UTK Organized Research Unit (ORU) recognition and start-up funds (\$95K the first year, \$62.5K in year 2, and \$60K in year 3 from the Office of Research Engagement (ORE), with matching funds from departments/colleges for a combined total of

approximately \$120,000/year). They have also received \$10,000/year from a Kavli Foundation grant, and submitted a renewal that has been awarded to UTK;

- (2) benefitted from a recent 20% indirect cost return agreement (20% of IDCs generated from sponsored projects with a potential NeuroNET administrative revenue potential of 10% of direct costs ( $0.20 \times 50\%F/A = 10\%$ ) as negotiated on behalf of University Centers by Vice Chancellor of Research and Engagement Taylor Eighmy; and
- (3) gained notable traction, with successful grants and publications.

Other accomplishments are discussed below, including the creation of an undergraduate interdisciplinary major, the organizing of workshops and symposia, the support of collaborative research interactions, and the submission of a Computational Neuroscience training grant application.

## Major Issues and Recommendations

### 1) Leverage the Opportunity

- a. The Neuroscience Undergraduate degree program has rapidly grown to nearly 200 students in a short three years. To view this as anything but an opportunity would be shortsighted. New opportunities and institutional commitment to back such opportunities are vital to achieving Chancellor Cheek's goal of "Top-25" status for UTK. The rapid expansion of the undergraduate program reveals pent-up demand and a real growth opportunity for the University. Undergraduate and graduate student applicant demand is viewed as sustainable and growing nationally.
- b. Although the University has excellent neuroscience faculty and associated program faculty across schools and departments, it comes up short in terms of core neuroscience faculty headcount in the College of Arts and Sciences. The advisory committee frequently heard administrators describe the undergraduate demand for research opportunities in neuroscience as "students under foot," which again points to opportunity. Leading R1 institutions make undergraduate research opportunity a priority. For example, Case Western (ranked #37 nationally) and Vanderbilt (ranked #15) set their resource allocations to ensure at least 80% undergraduate research engagement.
- c. Recommendation: UTK needs to initiate a graduate degree program in neuroscience as soon as possible. The Interdisciplinary Neuroscience program will not receive national recognition and ranking without a PhD program. A full complement of undergraduate, graduate, and post-doctoral trainees is required to create the critical mass of innovative young thinkers that will elevate UTK to national acclaim. Mechanisms to establish Neuroscience program metrics (undergrad to graduate school acceptances, grad student to post-doc placements, career academic and industry placements, etc.). Attendance of graduate students at the [undergraduate] student Neuroscience club meetings should be encouraged so that cross-communication can be facilitated.

2) Get Institutional Leadership Fully On-Board

- a. A successful Neuroscience/NeuroNET program is not a short-term opportunity. It must be handled deliberately as part of a larger strategy.
- b. Resources must continue to be allocated to maintain NeuroNET's core administrative and program capabilities, which have clearly helped anneal a well-defined research community at UTK. If necessary, development offices should be engaged to deliver the needed cash resources to continue supporting programs that benefit NeuroNET undergraduate training and research communication.
- c. Recommendation: Given the clear student demand for this program, University Leadership should prioritize growth and additional faculty commitment to this program. At least five additional Neuroscience Faculty in the College of Arts and Sciences should be hired immediately, with a commitment for ten additional "Core" Neuroscience faculty hired strategically to build an appropriate cross section of capabilities and a critical mass of investigators over the next 5-6 years.

3) Create a Programmatic Identity as a Neuroscience Center of Excellence

- a. One of the weaknesses of grass-roots efforts is that although the initial cadre of existing scientists have much in common, they are largely trained and incentivized to deliver highly focused investigator-initiated sponsored projects. Historically, UTK has lacked incentives or recognition for efforts to build integration across two or more investigator laboratories. Such incentives should be part of the faculty performance metrics defined by the Provost.
- b. The relationship with Oak Ridge National Laboratory is especially valuable. It is an important part of the UTK Neuroscience Program's unique identity and capabilities.
- c. UTMSC's involvement in NeuroNET is also particularly valuable. To facilitate research opportunities bridging basic science with the clinical study of human neurological and psychiatric disorders, new UTK faculty appointments should include qualified clinicians and scientists at the Medical Center, and UTMSC appointments (e.g., neurology, radiology, psychiatry) awarded to appropriate UTK faculty.
- d. Recommendation: Funding should be identified for start-up of Centers and Programs that will deliver unique and valuable capabilities, especially in value-added collaborative or partner relationships between UTMSC and UTK faculty. Some of the most highly funded ventures are academic-government-industry partnerships focused on a clear and achievable goal of mutual interest. This Advisory Board has considerable knowledge and expertise in such partnerships, and is available to aid the University in networking with Tennessee's commercial and governmental resources, as well as other opportunities nationally.

4) Give It Time

- a. While the three years of ORE+Departmental funding in support of NeuroNET is a good start, it is not realistic to suppose that a program of this magnitude and

potential importance to University strategic priorities can be achieved in only three years. It typically takes about 10 years for a major Center to become self-sustaining. Successful examples include Stanford University's world-class Sleep Research Center (10 year strategic plan), and Stanford's Center for Molecular Genetics Medicine (10 year strategic plan).

- b. It takes time for faculty to fulfill existing sponsored project commitments and shift to cross-functional multidisciplinary research strategies. The notion that faculty should just "apply for a Program Project grant" or equivalent fails to consider the current NIH climate, the separate NIH Institute Program Officer priorities, and the required track record of collaborative synergy and productivity necessary to compete with Harvard, UCSF, Stanford, Johns Hopkins, Duke, Baylor, Emory, et al., which all have large networks of national and global faculty and institutions (typically taking about 10 years to establish).
- c. Recommendation: The vision for national ranking as proposed needs to be supported over the long term. The establishment of a critical mass of faculty (Recommendation #2) and longer-term institutional support will be essential. An RFA for ORE proposals for achieving "Top-25" status should be developed to support this effort. NeuroNET faculty and University senior leadership should develop a mutually acceptable long-range plan (10 years) with milestones that map to program, college and university goals.

#### 5) Fully Engage the UT Medical Science Center

- a. Leverage patient-oriented medical research at the Medical Center. Leverage valuable interactions with medical faculty, Residents, and 3<sup>rd</sup> and 4<sup>th</sup> year medical students. A joint team-taught seminar (with faculty from both campuses) could be held at UTMSC, with shuttle transportation arranged for UTK students and faculty.
- b. Structural and fMRI imaging capabilities at the Medical Center are available and critical to successful neuroscience research and training efforts. Medical Center efforts in Neurodegenerative Diseases, Stroke, Traumatic Brain Injury, and Opiate Abuse constitute valuable assets of NeuroNET, with high-value relevance and benefit to the external community/regional constituency.
- c. Recommendations:  
What UTK can do: Incentivize collaborations between investigators at UTK and clinician scientists at UTMSC. The collaboration must include the clinician's participation in grant applications as Co-I, or as Co-PI if the PI is at UTK. *Example 1:* UTK's Greg Reynolds has an R21 and is developing an R01-type application. His chances of funding will improve if he includes a clinician scientist at UTMSC who can perform the baseline diagnoses and monitor developmental changes in control and clinical newborn populations. His efforts could, for example, be eligible for UTK pilot study support provided he includes a clinician scientist, e.g., the new pediatric neurologist. *Example 2:* Subimal Datta is currently exploring fear conditioning and substrates of anxiety, which meshes well with Matt Cooper's studies on social stress. Each investigator brings unique techniques to

the project, and funding opportunities from the VA and NIH for PTSD are considerable. *Example 3:* The nationally recognized arousal state research of Drs. Baghdoyan and Lydic intertwine with Dr. Prosser's investigations on circadian rhythms. Few investigators assess circadian rhythms in relation to a disease process and treatment efficacy/safety. This presents an attractive and valuable opportunity for differentiation of UTK's Neuroscience program and research prowess.

What UTMSC can do: The chair of the clinical departments should encourage collaboration by "matching" the participation of the clinician scientist or UTMSC-based scientist. That is, if the clinician scientist will be 10% time and effort on the grant application, the chair agrees to "match" an equal release time from clinical duties with an additional 10%, if the application is funded. This provides a result-oriented investment in those clinicians interested in research. The chair could also contribute to the pilot study support of the project before submission. Additionally, as mentioned above, to facilitate research opportunities that bridge basic science with the study of human neurological and psychiatric disorders, UTK faculty appointments can be awarded to qualified clinicians and scientists at the Medical Center (and *vice versa*), and a joint team-taught seminar (with faculty from both campuses) can be held at UTMSC.

Seek Technological Differentiation. New technologies would facilitate translational discovery and innovation, benefiting UTK competition for grant funding and access to the best and brightest students, post-docs and new faculty talent. For example, magnetoencephalography (MEG) is a cutting-edge technology that can be used to enhance the technological and clinical research capabilities of UTK Neuroscience research. Such state-of-the-art technologies augment other structural and fMRI, molecular biology, and transgenic techniques. These research technologies serve to unite the UTMSC, UTK computational neuroscience, engineering technology, and ORNL relationships. It is these unique and exceptional relationships that allow NeuroNET to differentiate from competitor institutions and programs. Uniting the efforts of UTK (Arts & Sciences, Engineering) and UTMSC, we recommend the University seek a Governor's Chair in Neurodegenerative Disease Research (e.g., Alzheimer's dementia, Parkinson's dementia and psychosis, etc.). This Governor's Chair would help recruit a "star" investigator who can lead a portion (e.g., MEG) or the combined imaging research effort. The cost of an MEG machine will likely require fundraising by the relevant UTK Development Office(s). Philanthropic sources such as the Summit Foundation, Manning Foundation, and others should be pursued. Together with the computational neuroscience program and ORNL, such a program would place UTMSC and UTK at the forefront of real-time brain activity analysis, a virtually unexplored area in dementia research, placing UTK in a unique and highly competitive position.

Establish a Translational Neuroscience Seminar Series: Host at least one seminar per semester (for credit if feasible) on a neuroscience disease area of topical interest, presented by a team of MD and PhD speakers, discussing the clinical aspect (symptoms, diagnosis, latest treatments, and clinical study findings) and the basic science (animal models, behavioral studies, gaps in the literature).

## **Additional Issues and Recommendations**

### **6) Broaden the Funding Network**

- a. Think beyond the usual sources of funds (NIH, NSF). Proactively pursue NASA, DARPA, ONR, ARO, Burroughs Wellcome, etc. Pursue academic-industry-public-private partnerships focused on a specific problem valuable to industry, and answerable by the unique capabilities of the UTK Neuroscience Program (e.g., “Computational Neuroscience”), thematically delivering innovations in neuro-engineering and machine learning strategies that could be applied towards disease areas. Examples include genetic basis of neuropathology and neurodegenerative disease treatment, novel tools to advance the allosteric modulation of select ion channels, and biomedical engineering solutions to post-translational modification of engineered large molecules, proteins, antibodies, etc. As noted below in 7b, perhaps a special Chair or Center for Research on Traumatic Brain Injury might be established in honor of UTK alumnus Peyton Manning, should he wish to support such an effort.
- b. Pursue device companies (Apple, Samsung, Microsoft, Intel). They are all keen to reinvent themselves in the health technology sector. Possibilities include biosensors, early detection of neurodegenerative disease, and computational neuroscience applied to patient segmentation, especially in neurodegenerative disease and neuropsychiatry. There is enormous opportunity for innovation through cross-collaboration between Neuroscience, Engineering, and the Medical Center sponsored through industry partnership.

### **7) Seek to Maximize External Impact**

- a. Proactively pursue philanthropy funds tailored to address the underserved rural constituency of Eastern Tennessee. Leverage this together with the Chancellor to heighten visibility locally and nationally.
- b. Engage the Development Office with the backing of the relevant Deans, Provost, and Chancellor. The Pat Summit Foundation is a start, but individual philanthropy could be more successful, initially (think “The Peyton Manning Center for Trauma Neuroscience” or something along these lines).

### **8) Identify a Full-Time Dedicated Leader of the Neuroscience Program**

- a. Highly successful programs always rally around a charismatic and visionary leader. Rebecca Prosser, serving a two-year term, and her team have done an excellent job leading the growing and evolving NeuroNET effort. At this stage,

with all of its accomplishments, its 3- and 10-year goals, and its important and attainable vision, NeuroNET Research Center is ready for a full-time leader whose sole or primary responsibility is this program. The individual will need to be a seasoned leader, highly motivated, passionate about the mission, and respected by peers nationally/internationally in some aspect of neuroscience discovery.

- b. The individual will need to be offered a Distinguished Professor position, or some equivalent, with minimal teaching load.
- c. A research clinician or scientist, who knows and loves the institution, likely would have a natural passion for such a leadership position.

9) Resolve Indirect Cost Recovery Issues with Joint Appointment Faculty

- a. IDCs generated by new faculty hires with joint appointments at the Medical Center (Drs. Baghdoyan, Datta, and Lydic) do not return to the College of Arts and Sciences, UTMSC, or the NeuroNET program. An IDC sharing agreement should be reached ASAP to rectify this.

10) Resolve Lack of Teaching Hours Credit for Faculty Teaching in Neuroscience

- a. This is simply unfair. The institution has a charter obligation to 200 undergraduate neuroscience students. By extension, the University should (indeed must) give credit to faculty for the hours they deliver compulsory degree program instruction to these students. These classes are not “luxury electives.” These are UTK meat and potatoes tuition-generating compulsory courses required to attain a degree in Neuroscience.

11) Boost the Value of NeuroNET to the Participating Individual Faculty

- a. Create an internal grant review process to help increase funding success, and to help ensure applications build upon the long-term cross-functional and multidisciplinary goals and strategies of the Program.

12) Celebrate outcomes!

- a. Current activities are excellent in promoting members, such as the Investigator of the Month on the website. We highly recommend expanding program recognition, celebration, and publicity activities. For example, create special recognition events to celebrate funded extramural awards, and recognize seminar speakers on a permanently displayed plaque.
- b. Celebrate the matriculation of Neuroscience trainees (undergrads, grad students, post-docs, and fellows). Celebrate student participation in undergraduate research conferences/publications, i.e., ICUR, TEL, and Pursuit. Proactively ensure these accomplishments receive campus and local media attention. Let every member of the program know, and feel, how important their contributions are to the larger NeuroNET community and the University.

13) Identify and Align Clinical Research Models Based on Medical Needs in the Eastern Tennessee Region and the Broader Appalachian Region:

- a. Although NeuroNET (and UT in general) seeks national recognition, this goal may be best achieved by focusing on Eastern Tennessee's specific disproportionate challenges, including prescription drug abuse, polypharmacy, obesity, the lack of primary care, and rural poverty.
- b. The Appalachian Region offers a broad array of challenges. NeuroNET should demonstrate the ability to engage its surrounding geography with meaningful programs that link basic science to clinical research models. This serves as a competitive advantage for NeuroNET, as it leverages its greater access to this specific patient population relative to competitive institutions (i.e. Vanderbilt). This approach will garner the attention of local and State government leaders, as well as the media, bringing high-value attention to the contributions of the UTK campus and Medical Center.
- c. The costs associated with the challenges described above are immense and continue to grow. Government and private funding in this area will continue to increase as patients place additional strain on the region's social safety net.
- d. Recommendation: Identify specific areas of expertise within NeuroNET (and UTMSC) that can address the specific challenges to this region. Leverage that expertise to secure external funding (government, industry, and philanthropic, ideally in partnership together with UTK).

**Submitted by:**

**NeuroNET Advisory Board Members**

**Dr. Brian DeBusk**

CEO, DeRoyal Industries

<http://www.deroyal.com/aboutderoyal/executives.aspx>

Email: [bcdebusk@deroyal.com](mailto:bcdebusk@deroyal.com)

**Dr. Dale M. Edgar**

Lilly Distinguished Research Fellow – Emeritus

Founder, Hypnion Inc. (was Eli Lilly and Company)

<https://www.linkedin.com/in/dale-edgar-6663bab>

Email: [dmedgar@comcast.net](mailto:dmedgar@comcast.net)

**Dr. Edgar Garcia-Rill**

Professor of Neurobiology and Psychiatry, University of Arkansas for Medical Sciences; Director,  
Center for Translational Neuroscience

<http://neurobiology.uams.edu/faculty-staff/faculty/edgar-garcia-rill-ph-d/>

Email: [GarciarillEdgar@uams.edu](mailto:GarciarillEdgar@uams.edu)

**Dr. Lee Martin**

Clinical Professor, Dept. Industrial & Systems Engineering, Univ. Tennessee Knoxville

<http://www.engr.utk.edu/eep/hlm.html>

<http://ise.utk.edu/peopletwo/lee-martin/>

Email: [lmartin@trinityfound.org](mailto:lmartin@trinityfound.org)

**Dr. Barbara Morgan**

NASA Astronaut (ret.), Distinguished Educator-in-Residence, Boise State University (Emeritus)

<http://news.boisestate.edu/update/tag/barbara-morgan/>

Email: [barbaramorgan@boisestate.edu](mailto:barbaramorgan@boisestate.edu)

**Dr. Marlene Oscar Berman**

Professor, Depts. Anatomy & Neurobiology, Psychiatry, and Neurology, Boston University  
School of Medicine

<http://www.bumc.bu.edu/anatneuro/our-people/faculty/oscar-berman/>

Email: [oscar@bu.edu](mailto:oscar@bu.edu)