

This document is a brief report to the NJCSCR on the impact of the Five-Year Professorship Award on me, my career and my research. In addition, I include some comments on my views as to the importance of the designation of a New Jersey Professor of Spinal Cord Research.

### **Impact on my research and the direction of my lab**

The goal of the research proposed for my five year professorship award was to explore and extend my established neurogenesis research program to include aspects related to spinal cord injury and recovery of function after a spinal cord injury. I have done this by maintaining my focus on cell proliferation and by including spinal cord research in my research program and also in my thinking. Prior to receiving the five year professorship, I had spent my career working primarily on neurogenesis during the development of the brain with some effort directed towards adult neurogenesis. The impact of the five year professorship on my research and the direction of my lab has been immense. The largest impact has been on my ability to think and plan for the long term. This was possible because during the 5 years that I have had the NJCSCR Professorship I have also had significant federal support from NIH. I have exploited this by thinking deeply about the long term aspects of my research program with respect to the future of cell based therapies for the repair of the nervous system especially the spinal cord. I initiated a number of projects that were specifically designed to have long-term payoffs. I could not have done these projects without the NJCSCR 5 year professorship award. There are 3 major projects that fit this category: 1) an analysis of cell proliferation after spinal cord injury in the mouse, 2) an analysis of the role of miRNA's in brain development and function, 3) an analysis of cytokines during cell proliferation after spinal cord injury, and 4) a collaboration with Dr. Stephen Strittmatter at Yale on Go/Nogo after injury including the role of cell proliferation. Of these projects, publications from Project 1 and Project 2 are in preparation and Marc Carmichael from my laboratory is using the results from Project 1 for his Ph.D. Dissertation. These publications will be submitted in the next few months. Project 3 was, to be frank, a bust. A few pieces of this will make it into Mr. Carmichael's dissertation and our papers, but most of the experiments simply did not pan out. Project 4 is in progress and will continue through 2011. In addition, the perspectives that I gained from being the NJ Professor of Spinal Cord Research changed the research that I have been doing in general. I have moved the bulk of my research program from neurogenesis during the embryological period to studies of adult neurogenesis. For anyone who knows me and my work this is, in effect, a 180 degree change. The analysis of adult neurogenesis now underway in our laboratory is focused on the the genetic control of this process in the dentate gyrus and also in the rostral migratory stream. In both of these population we have identified several gene candidates that contribute to the variation of proliferation that exists in the normal mouse population. The proliferating cells that participate in adult neurogenesis produce progeny that survive and become part of the circuitry of the normal adult brain. The long term goal of my research program has become focused on understanding how these cells achieve this so that new neurons could also be made to replace neurons lost by spinal cord injury or damage to other parts of the brain. I am convinced that I would not have made this switch in my research direction if I had not become the NJ Professor of Spinal Cord Research. If successful, actually, when successful this research direction will have significant impact on cell based therapies for spinal cord injury.

### **Success in collaborating and in engaging others in spinal cord research**

My success in collaborating and engaging others in spinal cord research has been, in a word, mixed. Within my own department I have established collaborations with Dr. David Crockett, Dr. Cheryl Dreyfus and Dr. Janet Alder. Dr. Crockett is a collaborator on all of our projects that involve spinal cord injury and behavioral assessment of recovery of function. Dr. Dreyfus and I are collaborating on an assessment of glial cell proliferation after CNS injury. Dr. Alder and I are collaborating on an assessment of growth factor functions during adult neurogenesis. Outside my department I have established successful and long-term interaction

with Wise Young, Melitta Schachner, Marty Grumet, and Ron Hart of Rutgers. The interactions with Ron Hart involves miRNA (Project 2 above) and will be submitted for publication in the next few months. Wise Young has served as a mentor, probably the most important mentor that I have had in my recent career. Melitta Schachner and Marty Grumet have been serving as colleagues and sounding board for ideas. These are quite healthy and necessary interactions. Outside of the NJ, I have initiated a long-term collaboration with Dr. Stephen Strittmatter at Yale. Dr. Strittmatter is THE world's leading expert on the regrowth of axons after spinal cord injury. I recruited one of our medical students (Omar Hasan) to serve as the conduit for this collaboration which involves examining Go/NoGo, axon regeneration and cell proliferation. This collaboration will extend through 2011. The success in collaborating and engaging others in spinal cord research is "mixed" because I have not been able to generate a local "group" of interested parties in spinal cord research. Partly, this is due to the financial exigencies of the state and UMDNJ with directly or indirectly led to the departure from this department of two of my floor-mates (Patrizia Cassacia and James Zheng) who were active in spinal cord injury related projects.

### **Results in Publications and Presentations**

The change in my research direction from a focus on neurogenesis during the embryonic development of the brain to adult neurogenesis has been a difficult one, but it has and will continue to raise my visibility in the national and international scientific communities. During my tenure as NJ Professor of Spinal Cord Research I and my students have made numerous presentations at meeting and I have been invited to many universities and society meeting both in the US and abroad. I have also made a point of contributing a commentaries on issues related to adult neurogenesis to major journals. To be clear, I am more than a bit disappointed in my publication record during the past 5 years; however, this is not due to lack of productivity. Rather, it is due to "biting off more than I could chew". The lab has several papers (at least 8) that are in various stages of preparation and which will be submitted during the next year. I have requested a one year no-cost extension from the NJ Commission on Spinal Cord Research to allow us to complete this unfinished business.

### **Value of NJCSCR in Obtaining Additional Funding**

Here, I will be frank. The change in my research direction and my failure to publish results in a timely manner combined with the change at the national level of funding levels has, in my opinion, made my research program temporarily NOT competitive for federal funding. I view this as a temporary set-back and after I get the backlog of manuscript submitted. I expect to be able to compete for federal funding successfully. Since the 5 year professorship will be major source of funding for the manuscripts that we have in preparation, the value of the NJCSCR in obtaining additional funding shall be invaluable.

### **Importance of Designation as New Jersey Professor of Spinal Cord Injury**

It is a great honor to have received the Five-Year Named Professor Award from the NJCSCR. During my tenure of this award nothing is more clear to me than this. It is impossible to count how many comments that I receive when I talk to someone who has read an email or letter from me or to whom I have just given a business card. The title "NJ Professor of Spinal Cord Research" elicits comments and opens doors. When I explain to my friends and colleagues how the NJCSCR works, what it does, and how it is funded, they are impressed that such a state run organization exists. Several of my out-of-state colleagues have begun looking into what it might take to start such a system in their own states. I believe that I have been a bearer of good publicity for the NJCSCR.

### **My Suggestions for the Future**

Given the value of the 5 year professorship to me, you will not be surprised that I suggest that the NJCSCR consider re-instituting this award. However, I am not sure that this is the highest priority for a new program. I would consider the Junior Professorship program to have a

higher priority because I think that its impact would be great and it would have a lower cost. Furthermore, since I know that a major goal of the NJCSCR is to develop collaborative programs, I suggest that a program in which the NJCSCR directly facilitate the formation of new collaborations be given the highest priority. My model for such a program is the one that NASA used for the Neurolab project in the 1990's (in which I was a participant). This concept is to initiate a modified program project type grant mechanism. The modification would be that the participants in the program project be selected by a first round of competition. The "winners" would then be asked to merge their projects into a coherent one and submit them for a second round of evaluation. I am happy to discuss this idea with any member of the Commission. I believe that this could be a highly effective mechanism for funding novel and innovative research.