

NOMINATION COVER SHEET
2012 Virginia Outstanding Faculty Awards

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2. <u>INSTITUTIONAL INFORMATION</u>	3. <u>PROFESSIONAL INFORMATION</u>
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Please check only one box:

- RESEARCH/DOCTORAL INSTITUTION NOMINEE:
- MASTERS/COMPREHENSIVE INSTITUTION NOMINEE:
- BACCALAUREATE INSTITUTION NOMINEE:
- TWO-YEAR INSTITUTION NOMINEE:
- TEACHING WITH TECHNOLOGY NOMINEE:
- RISING STAR NOMINEE:

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Signature (President or Chief Academic Officer) _____ 

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ii. Mission Statement

George Mason University is innovative and entrepreneurial in spirit and utilizes its multi-campus organization and location near our nation's capital to attract outstanding faculty, staff, and students. George Mason will:

- Educate the new generation of leaders for the 21st century—men and women capable of shaping a global community with vision, justice, and clarity.
- Encourage freedom of thought, speech, and inquiry in a tolerant, respectful academic setting that values diversity.
- Provide innovative and interdisciplinary undergraduate, graduate, and professional courses of study that enable students to exercise analytical and imaginative thinking and make well-founded ethical decisions.
- Nurture and support a highly qualified and entrepreneurial faculty that is excellent at teaching, active in pure and applied research, capable of providing a broad range of intellectual and cultural insights, and is responsive to the needs of students and their communities.
- Maintain an international reputation for superior education and public service that affirms its role as the intellectual and cultural nexus among Northern Virginia, the nation, and the world.

iii. Summary of Accomplishments

Dr. Giorgio Ascoli's 15 years at George Mason University constituted a stunning progression of exceptional scholarly achievements. Dr. Ascoli's paradigm-changing innovation laid the foundation of a new field of science, and he was honored with the highest distinction of University Professor at the age of 38. His transformative yet seamless integration of teaching, research, and service secured a leadership role for Virginia higher education in one of the fastest-growing areas of biomedicine and technology. Unanimous testimonies, from undergraduates to Nobel laureates, illuminate the extent and impact of Dr. Ascoli's scholarship. *"Lectures were awesome. Everything was perfect, the tests, website, homework, were just what was needed to truly learn the material. Nothing could make it better. Dr. Ascoli was fantastic" (student class evaluation). "Prof. Ascoli is a real pioneer; many followers are already using his software in an international movement. I am greatly impressed by the results and sophistication he has shown. If anyone has a chance of connecting neurophysiological models with cognitive phenomena, Ascoli does" (Nobel Laureate Don Glaser, Berkeley).*

Dr. Ascoli's superior accomplishments in the scholarship of TEACHING

Dr. Ascoli's educational vision is rooted in the belief that high-level critical thinking is essential for today's students. To that end, he was one of the lead faculty in establishing and designing the curriculum for the neuroscience PhD program at Mason. Dr. Ascoli invests more than 500 hours each year in one-on-one meetings with doctoral and postdoctoral trainees in addition to his regular teaching duties, and he brings into the classroom not only technical expertise but also ethical questions and debate. The results of these efforts include high-level faculty placement, many undergraduates inspired to attend graduate school, and countless students prepared to use critical thinking in the workforce. *"This is the most dedicated mentor to students and postdocs I have ever encountered" (Prof. Steven Schiff, Penn State Univ.); "In Giorgio, you have an outstanding educator" (Dr. Stephen Senft, Marine Biological Lab); "His teaching skills are recognized beyond Mason" (Prof. Esther Gardner, New York Univ.).*

Dr. Ascoli has taught at Mason both at the undergraduate and graduate levels, covering a broad range of topics in three academic units: Bioinformatics in the College of Science, Psychology in the College of Humanities & Social Sciences, and Molecular Neuroscience in the Krasnow Institute for Advanced Study. Dr. Ascoli designed from scratch all but two of the courses he taught, always receiving student evaluations well above department, college, and university averages (*"Dr. Ascoli taught exceptionally well, with passion and love of educating, with a thirst for knowledge and understanding"; "What a wonderful class! Prof. Ascoli and this course were my absolute favorite! He made me want to learn"; "Dr. Ascoli is truly committed to students' understanding"*). In the words of the Psychology Chair, *"I congratulate you on your strong evaluations and thank you for your effort; as the workload keeps increasing and other facets of the university (external funding, etc.) take on increasing importance, it is tempting to wonder if anyone appreciates the extra effort it takes to earn the approbation of students. I do, and it is clear that your students do, as well"; "These are outstanding evaluations in elective courses—they are virtually unprecedented in difficult required courses."*

As we learn more about the human brain, the neurosciences are becoming a fundamental constituent of modern culture. Medical and technical progress is rapidly bringing to the forefront the key ethical issue of defining an individual's person. Dr. Ascoli's courses prepare students to think for themselves, emphasizing the need and power of relevant scientific arguments to back up their views. He often starts class with an ethical question such as, "What should be the modern forensic definition of death and why?" or "At what point, if ever, should robots have rights?" to invest students in the course material. Dr. Ascoli enthusiastically embraces interactive teaching, dedicating half of each period to open discussion with students.

Four PhD students have graduated under Dr. Ascoli's advising, three more will graduate this year, and an additional five are training in his lab along with six postdocs and more than a

dozen undergraduate interns. Dr. Ascoli meets each of his trainees individually every week to review their projects. *"I had no experience in neuroscience, but Dr. Ascoli helped me learn concepts from basic to most complex and answered all my questions. I remember his patience explaining over and over the hippocampal circuit and different neuron types. He did not focus on instruction only. The greatest value came by his prompting and supporting me in devising my own answers and solutions, which helped me develop into an independent researcher"* (Ruggero Scorcioni, former postdoc). *"We attend many scientific meetings together, and he always brings many of his students and postdocs to present their work. From the interactions I have with junior scientists in his lab, Dr. Ascoli is a superb teacher and mentor"* (Dr. Yuan Liu, Chief Officer of International Programs, National Institutes of Health). More than half of Dr. Ascoli's over 100 peer-reviewed publications are first-authored by his trainees, including many in prestigious journals such as *Nature Protocols* and *Proceedings of the National Academy*.

Dr. Ascoli's students have continued to successful careers, including two tenured professors (Drs. Jeff Krichmar, Univ. CA Irvine, and Slawek Nasuto, Univ. Reading, UK), jobs in the government (Dr. Duncan Donohue), prestigious non-profit research institutes (Dr. Ruggero Scorcioni), and major industries (Dr. Maciej Lazarewicz). His undergraduate interns were admitted to elite doctoral programs at such institutions as Johns Hopkins Univ. (Phillip O'Herron), Baylor College of Medicine (Bonnie Lasher), and Univ. of Minnesota (Adam Vogel). Dr. Ascoli also served as a committee member of 10 other doctoral students. *"He taught me not only a wide variety of scientific knowledge but also invaluable lessons about novel research in the real world. It is these skills, including effective writing, presentation, and even time management, that I find most valuable on a daily basis. My work with both the NIH and SAIC validate the foundational training I had with Giorgio"* (Duncan Donohue, former PhD student).

As founding director of the Center for Neural Informatics, Structures, and Plasticity, Dr. Ascoli established an intellectually nurturing environment. He maintains a weekly seminar series, now in its 8th year (http://krasnow.gmu.edu/cn3/abc_fall11.html), which includes invited speakers, student research presentations, and journal clubs. Dr. Ascoli assigns each Center trainee the tables of content of two journals to monitor, teaching them to inform each other of relevant articles. He created a Center listserv to foster exchange of ideas and commentaries on this continuously growing discipline. Dr. Ascoli routinely uses his Chief Editor role of the premier scientific journal in the field, *Neuroinformatics*, and Editor of 8 other international journals, to provide his trainees with invaluable hands-on peer review practice. He also uses extensive track-changes and embedded comments in multiple rounds of manuscript editing of his own students, insisting that they respond to each of them. This powerful integration of teaching and research represents a defining approach of Dr. Ascoli's education mission.

Students and colleagues all testify to his unique blend of astounding scholarship, passionate humanity, and transporting love of life. Dr. Ascoli's exceptional ability to teach and inspire is founded not only on his encyclopedic knowledge and the utmost respect his science instills, but also on humility, kindness, and fun. *"He makes complicated material easy with a wonderful sense of humor, taking home the idea that 'knowledge counts, not the grade'"; "Dr. Ascoli is the best professor I've had. He teaches the material so you understand it, not just to feed it back on a test. He is above and beyond dedicated to help us enjoy"; "Dr. Ascoli is the best! Very motivating, with clear understanding and love for the material that shines through each class"* (student evaluations). *"Although the class was late in the evening, students were fascinated, transfixed, as Giorgio always readily provided interesting extra cases bringing material to life"* (Dr. Slawek Nasuto, former postdoc); *"Dr. Ascoli brings his passion, dedication and broad scientific vision to all facets of life. I have seen him being an inspiration for colleagues, an encouraging mentor for students, and a role model for children, when he explains concepts in simple yet exhaustive ways"* (Prof. Paola Pergami, Pediatric Neurologist, West Virginia Univ.)

Dr. Ascoli's superior accomplishments in the scholarship of DISCOVERY

Dr. Ascoli aims to explain higher human cognition such as autobiographic memory in terms of quantitative computer models based on the cellular architecture of the mammalian brain. Such an ambitious research goal exacts a broad scientific agenda cutting across disciplines (from chemistry to psychology), scales (from microscopic organelles to real-world behavior), and approaches (from experimental electrophysiology to software simulations). Dr. Ascoli's extraordinary record of scholarly discovery is documented in more than 100 peer-reviewed publications (cited over 1,000 times and highlighted in 10 journal covers), 4 patent disclosures, 3 books and 40 invited chapters, and 370 conference presentations and invited talks. His recent breakthroughs have been published by top scientific journals such as *Nature Reviews*, *Proceedings of the National Academy*, *Nature Protocols*, *Behavioral & Brain Science*, *Nature Cell Biology*, and *Journal of Neuroscience*. Dr. Ascoli's seminal contributions are reported in major textbooks, including Scott's 2002 "Neuroscience: a mathematical primer" and Shepherd's 2004 "Synaptic organization of the brain"; his discoveries have also attracted attention in the national news (e.g., NBC/Ch.4 Television 1/14/06 and Washington Post 10/8/98).

Dr. Ascoli fuels such astonishing productivity by involving many trainees in research and inspiring those around him to work hard and creatively. A large lab requires extensive and effective fundraising. Yet, Dr. Ascoli views grant applications as more than a means to seek monetary support. Like academic publishing, they are essential for obtaining critical feedback and for peer-vetting the validity of proposed experiments. After 16 years of continuous funding from the US Departments of Health, Education, and Defense, as well as other public and private institutions, Dr. Ascoli's current yearly expenditure tops \$1 million. The running total of awards brought to Mason is more than \$10 million. *"The submission is significant for cerebro-vascular diseases. The Investigators are very well-qualified and innovative. There was much enthusiasm for this excellent project"* (Biomedical Computing NIH grant review, 2009); *"The proposal is innovative and highly significant [by] an exceptionally productive principal investigator—an outstanding application that generates very strong enthusiasm"* (Biomedical Technology NIH review, 2009); *"The project will develop a new and important concept bridging many levels of resolution. The investigator is a leader and uniquely suited. The application provides high novelty and impact and can be supported with the highest possible enthusiasm"* (Neurotechnology NIH grant review, 2008); *"This significant effort will impact neurobiology and informatics. The investigators made excellent progress using novel algorithms and modern software engineering. Their tools are widely used in the community"* (Human Brain Project NIH grant review, 2002).

Dr. Ascoli's uniquely creative thinking also spurs scientific progress through collaboration and entrepreneurship. An example of game-changing innovation is his initiative to tackle an outstanding open problem in neuroscience through a competition. The quest was to automate the labor-intensive tracing of neuronal trees from microscopic images. Dr. Ascoli formulated the "DIADEM" challenge (DIgital Axonal and DEndritic Morphology) for computer scientists to develop and test new algorithms based on real experimental data. He secured sponsorship for a substantial cash prize and support for the final tournament (<http://DIADEMchallenge.org>) from the Howard Hughes Medical Institute, the Allen Brain Institute, and the National Institutes of Health. Although highly unconventional, this original enterprise exemplified Mason's mission of rethinking the traditional structure of the academy. At the DIADEM official ceremony, university president Dr. Merten publicly commended Dr. Ascoli's leadership as *"embodying the university's interactive approach to change both in the academy and in the world."* By attracting researchers from over a dozen states and four continents to the Janelia Farm Research Campus in Ashburn, VA, DIADEM also constituted an intellectual and cultural nexus between Northern Virginia, the nation, and the world. Most importantly, the technological leap forward that resulted from Dr. Ascoli's inventiveness was announced by the leading scientific journal *Nature* and in numerous media outlets as significant and necessary progress towards deciphering brain connectivity.

“Giorgio’s technique to map brain vasculature has tremendous and even greater importance for understanding cerebrovascular disease” (Dr. René Etcheberrigaray, Director of Neuroscience, Center for Scientific Review, NIH).

Another exciting development in Dr. Ascoli’s research agenda is the “Hippocampome” project. The visionary goal is to formalize all known information about the neuron types of the hippocampus, the brain region responsible for autobiographical memories. Dr. Ascoli discovered that the complex anatomy, biochemistry, and electrophysiology of these neurons can be reduced to a simple organizing principle, based on the location of the neural trees of each cell. Collecting data for this project into a “periodic table of the neurons” has taken years, but it is extremely close to completion. This monumental effort has already resulted in three keynote speaker invitations at major international conferences, numerous collaborative requests, NIH funding, and the planning as a lead co-organizer of a full Howard Hughes Medical Institute research conference on this topic in 2012. The discovery of a unifying principle to capture the unsurpassed diversity of neuron types is a key for predicting how neurons wire into circuits to express all known cognitive functions, as well as the anomalies underlying neurological and psychiatric dysfunctions. *“His groundbreaking work includes rigorous modeling of neurons. I find his software package particularly exciting. It provides quantitative rules for understanding development and building simulations with connectivity found in real circuits. This work is highly original and has tremendous potential” (Prof. Michael Hasselmo, Boston Univ.); “He made landmark contributions to computational neuroanatomy and is an internationally recognized pioneer. The breadth of Dr. Ascoli’s experience and scientific output are remarkable. His approach and results are completely new and very important, not only for basic research but also for understanding neurodegenerative disease” (Dr. Robert Burke, NIH). “He is brilliant. Giorgio is providing the tools to collect, represent, organize and store the most basic property of the brain, the atlas of connectivity of neurons. Techniques he is developing will be as important as imaging and multi-electrode recording. What he and his group are doing is ground zero for neuroinformatics” (Prof. Tomaso Poggio, founding co-Director, Media Lab, MIT).*

Dr. Ascoli’s superior accomplishments in the scholarship of KNOWLEDGE INTEGRATION

Many scientific breakthroughs are based not just on new experiments, but on extraction of knowledge from existing data. Dr. Ascoli’s pioneering research reinforces and multiplies the impact of huge amounts of freely available online data. His groundbreaking contributions to neuroscience knowledge organization triggered a still-ongoing scientific revolution. *“Dr. Ascoli quickly realized that brain computation was strongly coupled to the form of neurons, and this was largely ignored in neuroscience. He avidly pursued this line of research and has pioneered the fields of computational neuroanatomy and neuroinformatics. These fields paved the way for the National Institutes of Health Connectome project, and Ascoli’s lab remains one of the leading groups in these areas” (Prof. Jeff Krichmar, Univ. CA Irvine); “Neurons are remarkably diverse and a unified organizational framework is a major intellectual challenge, for which Giorgio is exceptionally gifted. He is a true leader and thinker in the effort to understand the brain through an ambitious agenda of neuroscientific measurement and modeling” (Dr. Sean Hill, Director, International Neuroscience Coordinating Facility, Stockholm, Sweden).*

For the Hippocampome project, Dr. Ascoli created a computer lab called “Facility for Mining the Literature” (FAMILI), first training and later retaining undergraduates to search, interpret, and store published data on hippocampal neurons. He developed a course covering both state-of-the-art bibliographic techniques (in consultation with senior scientific librarians) and relevant neuroscience expertise. In addition to contributing to cutting-edge discovery, students learn fundamental new skills and acquire a unique perspective for their future professional lives. The success of this training environment is corroborated by the high “return rate”: more than 75% of trainees ask to come back for one or more semesters for a volunteer internship, additional course credits, or a research assistantship. Since its inaugural opening,

the FAMILI lab has been fully staffed to capacity with spontaneous requests from students referred by current interns, and there is always an extensive waitlist of new students wishing to participate in this intellectual discovery. *“Giorgio’s enthusiasm, leadership, and style rub off on his students, who absorb his qualities of passion for field-changing problems and the skill to interact with people in multiple disciplines to pull it off” (Dr. Ken Smith, MITRE Corp.)*

Dr. Ascoli is an internationally recognized leader in major knowledge integration efforts. In 2005, he was invited to a historic gathering of 40 among the most prominent world experts on neuronal properties in Petilla, Spain, the birthplace of neuroscience founding father Ramon y Cajal, to seek consensus on neuron classification. Dr. Ascoli was unanimously elected chair of the coordinating committee and led the group to a seminal publication in the foremost review journal in the field (Ascoli *et al.*, *Nature Reviews Neuroscience* 2008), which has since been cited hundreds of times. He was later appointed head of the Neuron Registry Task Force, an international initiative to centralize a neuron knowledge repository. Most recently, Dr. Ascoli has been invited by *Nature Reviews Neuroscience* to contribute a position article on neuronal classification, which will demonstrate the practical importance of information organization to understand the brain through lifespan development and disease.

Another flagship achievement of Dr. Ascoli’s knowledge integration is NeuroMorpho.Org, a curated database of all 3D neuron reconstructions available from labs worldwide. Upon launching in 2006, this resource was showcased in *Nature Reviews Neuroscience* and saluted by spontaneous enthusiasm from the research community: *“The database is really beautiful... It is going to be very helpful for the community” (Alain Destexhe, Editor-in-Chief, Journal of Computational Neuroscience); “A historic database...the way modern science should proceed” (Luciano Costa, Prof., Sao Paulo Univ., Sao Carlo, Brazil); “Pure dynamite—neuroinformatics made real” (Ted Carnevale, Senior Scientist, Yale Univ., New Haven, CT); “VERY NICE!!! The organization is impressive as is the amount of data” (Brenda Claiborne, Prof., Univ. of Texas, San Antonio, TX – now Provost, Florida Atlantic Univ.).* NeuroMorpho.Org continuously receives unsolicited rave reviews and was independently commended in numerous venues, such as *Nature Methods* and *Frontiers in Neuroscience*. It now contains over 6,500 neurons from dozens of species and brain regions (altogether some 75 years of tracing!) and continues to grow. The website was visited over 50,000 times from almost 100 countries in 5 years, nearing 2 million downloads. Results from these data were published in more than 100 peer-reviewed articles and are routinely used by teachers from K-12 to doctoral programs. In September 2010, the Chinese National Academy of Science selected NeuroMorpho.Org as the official dataset for their applied math Olympics, resulting in tens of thousands of hits over a single weekend. Last year, *Neuron*, the most prestigious peer-reviewed neuroscience journal, invited Dr. Ascoli to contribute a “primer” review on NeuroMorpho.Org and related resources.

Dr. Ascoli recently obtained seed funding to pursue and share with students and colleagues his long-standing dream to sculpt neuronal trees. Magnified 3D embodiments of nerve cells in the form of neuronal sculptures have both artistic value, by revealing the spectacular beauty of brain forests, and a didactic purpose, by fostering intuition of students and researchers alike. After considerable experimentation, Dr. Ascoli found thin metal wire to be the optimal medium and is now collaborating with a professional DC artist and two Mason students (one art major and one in neuroscience) to build a network model of the hippocampus for exposition both in art galleries and at scientific conferences. Similarly, Dr. Ascoli’s work on reminiscence and consciousness represents another clear example of interdisciplinary knowledge integration. His original autobiographic memory test was adapted for the web (cramtest.info) and has already attracted more than 1,000 participants who quantified over 10,000 recollections. *“It is rare for knowledge integration across humanities and science (Stephen Gould and Oliver Sacks are exceptions), but Giorgio’s mind-boggling scholarship knows no disciplinary barriers, seamlessly bridging across ‘the two cultures’” (Prof. Raja Parasuraman, OFA winner, 2009).*

Dr. Ascoli's superior accomplishments in the scholarship of SERVICE

Dr. Ascoli's research and teaching involve a synergistic service component providing leadership on scientific committees, journal editorship, conference organization, creation of public web-based tools for data sharing, etc. Additionally, his community service includes numerous advisory boards both in the US and abroad, professional society leadership, and continuous expository engagements with the public and the media.

Dr. Ascoli dedicates more than 15% of his professional time to peer review. This includes evaluating more than 30 grants per year as standing member of a chartered study section of the National Institutes of Health and of numerous other National Science Foundation and European panels. He also referees over 20 articles per year for leading journals such as *Nature Protocols*, *Lancet*, *Proceedings of the National Academy*, *Neuron*, and *Trends in Neuroscience*. He has reviewed promotion and tenure cases at first-tier universities such as Mount Sinai School of Medicine and Univ. of California at Irvine. *"Dr. Ascoli served on more than fifty review panels for the National Institutes of Health over the past decade, which may well be a record. This is an extremely important function, which demands significant time. Giorgio's research productivity and influence is similarly outstanding. As founding editor-in-chief of Neuroinformatics, he has brought that journal into the forefront of the field. He thinks in a multidisciplinary setting, allowing insight and innovation from many fields to drive scientific explorations"* (Dr. Dennis Glanzman, Chief of Theoretical and Computational Neuroscience, National Institute of Mental Health).

Dr. Ascoli supports the university's mission by leading numerous committees in multiple academic units, including promotion and tenure (both department and college level), evaluation for renewal of senior officers, curriculum development, seminar series, strategic planning, grievance, faculty search, graduate admission, student orientation, academic advising, and scientific misconduct. Moreover, he plays a central role in the intellectual and collegial life of the Krasnow Institute for Advanced Study. Dr. Ascoli serves as formal or informal advisor to junior faculty and senior administrators alike, and his advice is often sought by colleagues and students also outside of his lab and center. He also organizes and actively participates in brownbag discussions, journal clubs, and seminars; regularly hosts external visitors and lecturers; and helps direct institutional activities, from yearly doctoral student admission to faculty recruitment, architectural design, and strategic growth. This involvement impacts student learning both directly and indirectly, by exposing them to diverse educational experiences, and providing a role model for achieving the highest standards of excellence. *"His service is at least as strong as his teaching and scholarship. I was most impressed during the formative meeting of the Neuroscience PhD program. Giorgio contributed the most, and the course structure is due in large part to his efforts"* (Robert Smith, Chair, Psychology Dept.); *"His service is above and beyond expectations. Prof. Ascoli's central role in leadership is uniformly positive and extraordinarily appreciated"* (Dr. Jim Olds, Chair, Molecular Neuroscience Dept.)

Dr. Ascoli fosters the growth of scholarship within the broader public of Northern Virginia in and outside the nation's Capital Beltway. In the last two years alone, he was an inaugural speaker at the Mason Vision Lectures, an invited lecturer at the Humanist Society, the Highland Forum, the Skeptic Society, the joint INOVA Hospital-Mason translational neuroscience workshop, the Center for Consciousness & Transformation, and the Decade of the Mind. He represents Mason in prestigious scientific panels in or near Washington, DC, such as the National Institute of Drug Abuse Neuroinformatics Advisory Board and the Intel Science Talent Search. *"His leadership is particularly noteworthy, and his range and strength are truly impressive"* (Peter Stearns, Provost, George Mason Univ.); *"Warm congratulations on being awarded an important contract of the National Institute of Neural Disorders and Stroke. Your excellent service to the US Department of Health & Human Services reflects favorably upon Northern Virginia and its resources to support such an important program. The Eleventh Congressional District of Virginia is proud to be the home of such a fine business. My best wishes for your success"* (Tom Davis, Congressman).

iv. Personal Statement

As I turned 11, I asked my father, a physicist, if we could do some chemistry experiments—mixing stuff to make it explode or at least change color, that kind of thing. He promised to show me a few tricks if I first learned the Periodic Table of the Elements. To get me started, my father chalked on our home blackboard the first draft of the Table published by Mendeleev in 1869. I was immediately fascinated by how the ordered representation of the Table enabled those early chemists to infer the reactivity of various unknown substances based on the increasing accumulation of fragmented knowledge. Mendeleev's few initial "mistakes," most of which he himself corrected in subsequent versions, especially impressed me. These errors were due to using the atomic mass (the observed "chemical weight" of a substance) rather than the atomic number (the number of protons in the nucleus) as the organizing principle. The atomic nucleus was discovered 42 years later, just 4 years after Mendeleev's death. I was amazed that his corrections, required to describe then-available data parsimoniously, *de facto* predicted the atomic number way before its actual discovery.

When I was growing up, the best high school education in Italy was provided in the humanities, so I took Latin, Greek, and Ancient Philosophy. I still liked best the (too few!) hours of Chemistry lab, but the deep questions of Plato, Aristotle, and Democritus progressively took over my mind: What is the Universe? Where do we come from? What is really real? Is God the same as the laws of physics? What is consciousness? These issues made me recognize that, despite our great confidence in science and technology, the vast majority of knowledge is still to be discovered. To this day, these same questions continue to frame my research. The scientific basis for consciousness must be born out in experimental data. Yet, still no one knows how to even begin to address the questions that humanity was already facing over 2,000 years ago.

When I went to college (in Chemistry, of course), I started challenging all the basics I was learning. In the first year, I questioned the textbook claim that carbocations (transient reaction products) are too unstable to be isolated. I spent months in the library (there was no internet back then) and came up with a formula that I thought would be stable. It took me another month just to convince a professor to let me try it out, and yet a couple more months experimenting at the bench. In the end, I obtained clear spectroscopic evidence that "my" carbocation was right there in the test tube. This discovery was recognized with the top prize of the European Phillips Young Investigator Award. Yet, the deepest consequence of this experience was realizing the distinction between the game of "re-discovery" I was playing as a kid and the almost mystic feeling of true discovery, i.e., learning something that was completely unknown to humankind. Although discovery requires observing and manipulating nature, it only acquires scientific meaning through communication with others. Ultimately, there is no science without dissemination. This realization completely resolved what I had until then considered a puzzling mystery: why the roles of imparting the most advanced education and carrying out active research must be one and the same. I knew then I would be a university professor.

The following summer, I won a research fellowship to clone a spinach enzyme at the Univ. of Michigan. There I learned that a room-sized supercomputer could simulate and three-dimensionally visualize complex molecular structures. Virtually pointing to the individual atoms with other researchers was instrumental to clarify the mechanism of action. I became convinced of the power of computational modelling in explaining function by showing structure. In graduate school, I continued working on drug-protein interactions. At one point, a good friend of mine was prescribed Valium for anxiety, yet paradoxically, she felt even more anxious at the idea of taking a mind-altering chemical. Although not a scientist, she remembered I had mentioned Valium in my pharmacological work. So I gave her a lab tour, explaining how this drug strengthens the bond between an inhibitory neurotransmitter and its natural brain receptor, leading to a relief in anxiety. This counseling was effective to alleviate my friend's worries (she later introduced me to my wife in gratitude). That lay-level 'teaching' episode also irrevocably ignited my passion for the nervous system. I moved from chemistry to neuroscience.

As a postdoctoral fellow at NIH, I characterized important neural proteins involved in learning and neurodegeneration. However, this experience exacerbated my growing frustration with the lack of a unifying picture. Surely, some atoms of specific proteins must be responsible for particular biochemical interactions. But only through the aggregate of many such events do neurons integrate information from other neurons and signal the results to the rest of the network. To understand the highest brain functions, those giving rise to human self-awareness, contemplation, and love, we must complement the reductionist approach of experimental science with the integrative and ever-growing power of computer simulations. Yet these have to be founded on, and informed by, empirical observations rather than a purely theoretical mathematical framework. The foundational credo of chemistry is that *structure implies function*. The same is true in neuroscience, except at a different scale. The structure of neurons, not of proteins, might reveal the secrets of consciousness and reality.

There are some 100 billion neurons in a human brain, a number hard to imagine. If you stare closely at the page or monitor, you might be able to make up the individual points of ink (black) or space (white). There are some 500,000 such points per letter-size page. It would take 200 million pages to plot a dot for each neuron of a single human brain, the equivalent of 10 complete sets of the 32-volume Encyclopaedia Britannica. Every neuron connects to 10,000 other neurons: plotting all synapses of your brain a dot at a time would take 100,000 full Britannica sets. Clearly, we will not understand the working of the brain neuron by neuron, much like we cannot understand the properties of a glass of water atom by atom. However, we might be able to organize the much smaller number of neuron types in a table that could predict their ability to interconnect and exchange input and output signals. A *Periodic Table of the Neurons* might revolutionize neuroscience much like Mendeleev's Table did for chemistry. Neurons communicate with each other through tree-shaped "antennas." Every neuron has specialized input (dendrite) and output (axon) arbors. The exact shape of each neuron is unique, but different types can be distinguished based on their axonal and dendritic geometries, much like botanical trees. No two oak trees are identical, yet they are all clearly distinct from pine trees or palm trees. In neurons, such variation is the key to network connectivity and brain computation. Capturing the functional diversity of neuron types is the mission of my lab at Mason.

Back in the days of my training, only long walks in the woods debating the millennia-old questions of existence could take me away from the chemistry bench. Today in the lab, that same excitement for discovery is so much closer to yielding scientific answers to the deepest philosophical quests. Every day for over a decade, I described to my students and trainees the glut of experimental data being acquired in labs around the world and the even greater magnitude of information still required to constrain computational models of brain function. This on-going struggle finally yielded an organizing principle for a Neuronal Table. Every neuron type may be identified by the brain locations of its dendrites and axons. When the lists of axonal locations of one neuron and of dendritic locations of another neuron are lined up in two rows, any vertically matching entries would indicate a possible connection from the first neuron to the second. If this description is repeated for all neuron types, *the resulting table will predict brain connections*, just like the Periodic Table of Elements predicts molecular bonds!

I am not surprised that my most fertile scientific ideas came not from experimental observations or inspiring research articles, but from trying to communicate with fellow humans. There is no discovery without teaching, and this motivates my commitment to mentor many students and postdoctoral fellows. By extension, my scholarly service benefits society by expressing, organizing, and applying knowledge. Ultimately, all knowledge is integration. Exciting cross-disciplinary advancements are blurring the boundaries between chemistry, neurobiology, and other sciences. That must be why I was caught off-guard a few days ago when I overheard my 11-year-old son telling his three younger siblings what he wanted to do as a grown-up: "A chemist—you know, mixing different things and see if they explode or at least change color..."

v. Curriculum Vitae: Dr. Giorgio A. Ascoli

Education and Positions Held

1993	M.Sc., Chemistry, Pisa University (Italy)
1996	Ph.D., Biochemistry and Neuroscience, Scuola Normale Superiore, Pisa (Italy)
1997-2001:	Research Assistant Professor, Krasnow Inst. for Advanced Study, Fairfax, VA
2001-2005:	Associate Professor, Psychology Department, George Mason University
2005-2009:	Professor, Psychology and Mol. Neuroscience Depts., George Mason Univ.
2006-present:	Founding Director, Center for Neural Informatics, Structure, and Plasticity, Krasnow Institute for Advanced Study
2009-present:	University Professor, George Mason University, Fairfax, VA

Courses Taught: *Biopsychology; Research Methods; Bioinformatics; Computational Neuroscience Systems; Directed Readings; Trends in Modern Neuroscience; Computer Generation of Virtual Brains; Neuroscience Seminar; Special Topics in Psychology; Chemistry and the Brain; Neuroinformatics; Hippocampus Neuroinformatics Lab.*

Recent Selected Grants

2009-2014:	Principal Investigator, MURI grant (ONR): "From attentive to automatic performance: a multi-scale, multi-species, and multi-modal investigation of spatial learning". Total Cost: \$7.5M
2009-2014:	Principal Investigator, Bisti R01 from NINDS (NIH): "Generation and description of neuronal morphology and connectivity". Total Cost: \$1.6M.
2010-2011:	Principal Investigator, Contract from the International Neuroinformatics Coordinating Facility (INCF): "Linking neuronal properties to ontological definitions". Total Cost: \$60,000.
2004-2011:	Principal Investigator, CRCNS R01 from NIA (NIH): "Input/output relationship in CA3 pyramidal cells". Total Cost: \$1.7M.
2008-2014:	Principal Investigator, SyNAPSE Contract from Darpa (DoD): "Electronic Cortex". Total Cost: \$1.3M.
2009-2011:	Principal Investigator, ARRA R21 from NINDS (NIH): "Reconstruction and mapping of human brain vasculature". Total Cost: \$400,000.
2008-2011:	Principal Investigator, R21 from NINDS (NIH): "Neuroinformatics of the hippocampus: from system-level to neural arbors". Total Cost: \$400,000.
2005-2010:	Principal Investigator, Blueprint contract from NIDA (NIH): "Neuroscience Information Framework". Total Cost: \$450,000
1999-2009:	Principal Investigator, Human Brain Project R01 from NINDS/NIMH (NIH) and NSF: "Generation & description of dendritic morphology". Direct Cost: \$1.7M.
1999-2000:	Principal Investigator, ARDRAF grant from the Center on Aging, Commonwealth of Virginia: "Effect of dendritic morphology on neuronal electrophysiology in a model of Alzheimer's Disease". Direct Cost: \$16,000.

Recent Public and Academic Service

2001-present:	Neurotechnology Study Section (National Institutes of Health)
2002-present:	Founding Editor-in-Chief, Neuroinformatics (Humana Press - Springer)
2002-present:	Editorial Board member of eight international journals, including Current Medicinal Chemistry, Biological Bulletin, and Brain Structure & Function.
2008-present:	Board of Directors, CRCNS.org (National Science Foundation)
2009-present:	Associate Editor, Frontiers in Neuroscience Methods.
2009-present:	Chair, International Neuron Registry Task Force
2010-present:	Scientific Council Chair, Icarus-Minds Program, Hughes Research Labs
2009-2010:	Chair, Howard Hughes DIADEM Challenge and Janelia Campus conference

2004-2005: Guest Editor, *Cortex* (issue on Brain, Mind, and Consciousness)
1999-2003: President, Society for Neuroscience Potomac Chapter

Selected Publications (out of 4 patents, 3 books, 80 peer-reviewed articles, 10 journal covers, 40 book chapters, and over 370 conference presentations and invited talks):

- Ascoli G., Bertucci C., Salvadori P.: Stereospecific and competitive binding of drugs to human serum albumin: a difference circular dichroism approach. *J. Pharm. Sci.*, 84:737-41 (1995).
- Ascoli G., Goldin R.: Coordinate systems for dendritic spines. *Complexity* 2:40-8 (1997).
- Ascoli G., et al.: Secondary structure and Ca²⁺-induced conformational change of calyculin, a learning-associated protein. *J. Biol. Chem.* 272:24771-9 (1997).
- Ascoli G., Bertucci C., Salvadori P.: Ligand binding to human serum albumin: same-drug competition to discriminate pharmacological interactions. *Biom. Chromat.* 12:248-54 (1998).
- Ascoli G., et al.: Use of CD and FT-IR to determine the secondary structure of purified proteins in the low-microgram range. *Enantiomer.* 3:371-81 (1998).
- Ascoli G.: Association, abstraction, and the emergence of the Self. *Noetic J.* 2:9-20 (1999).
- Ascoli G.: Progress and perspectives in computational neuroanatomy. *Anatom. Rec.* 257(6):195-207 (1999).
- Ascoli G.: Is it already time to give up on a science of consciousness? A commentary on mysterianism. *Complexity*, 5(1):25-34 (1999).
- Ascoli G., Krichmar J.: L-Neuron: a modeling tool for the efficient generation and parsimonious description of dendritic morphology. *Neurocomputing*, 32-33:1003-11 (2000).
- Ascoli G.: The link between neuroanatomy and consciousness. *Complexity*, 6:20-6 (2000).
- Ascoli G., Krichmar J., Nasuto S., Senft S.: Generation, description, and storage of dendritic morphology data. *Phil. Trans. R. Soc. B*, 356:1131-45 (2001).
- Ascoli G., Krichmar J., Scorcioni R., Nasuto S., Senft S.: Computer generation and quantitative morphometric analysis of virtual neurons. *Anat. Embryol.*, 204:283-301 (2001).
- Ascoli G.: Neuroanatomical algorithms for dendritic modeling. *Network.* 13:247-60 (2002).
- Ascoli G.: Passive dendritic integration heavily affects spiking dynamics of recurrent networks. *Neural Netw.*, 16:657-63 (2003).
- Ascoli G., Atkeson J.: Incorporating anatomically realistic cellular-level connectivity in neural network models of the rat hippocampus. *Biosystems*, 79:173-81 (2005).
- Migliore M., Ferrante M., Ascoli G.: Signal propagation in oblique dendrites of CA1 pyramidal cells. *J. Neurophys.*, 94:4145-55 (2005).
- Ascoli G.: Mobilizing the base of neuroscience data. *Nature Rev. Neurosci.*, 7:318-24 (2006).
- Ascoli G., Domenici E., Bertucci C.: Drug binding to Human Serum Albumin. *Chirality*, 18:667-79 (2006).
- Ascoli G.: Biomedical research funding: When the game gets tough, winners start to play. *BioEssay*, 29:933-936 (2007).
- Ascoli G., Donohue D., Halavi M.: NeuroMorpho.Org—A central resource for neuronal morphologies. *J. Neurosci.*, 27:9247-51 (2007).
- Ascoli G.: Successes and rewards in sharing digital reconstructions of neuronal morphology. *Neuroinformatics*, 5:154-160 (2007).
- Ascoli G. and 38 coauthors: Petilla Terminology: Nomenclature of features of GABAergic interneurons of the cerebral cortex. *Nature Rev. Neurosci.*, 9:557-68 (2008).
- Ascoli G., Samsonovich A.: Science of the conscious mind. *Biol. Bull.*, 215:204-15 (2008).
- Ascoli G., Brown K., Calixto E., Card P., Barrionuevo G.: Quantitative morphometry of electrophysiologically identified CA3b interneurons. *J. Comp. Neurol.*, 515:677-95 (2009).
- Ascoli G., Gasparini S., Medinilla V., Migliore M.: Local control of post-inhibitory rebound spiking in CA1 pyramidal neuron dendrites. *J. Neurosci.* 30:6434-42 (2010).
- Costa L., Batista J., Ascoli G.: Communication structure of cortical networks. *Front. Comput. Neurosci.*, 5:6. doi: 10.3389/fncom.2011.00006 (2011).

vi. Excerpts from Letters of Support for Dr. Giorgio Ascoli

Steven J. Schiff, MD, PhD; Director, Penn State Center for Neural Engineering; Brush Chair Professor of Neurosurgery; formerly at Mason:

“Most of us wither under the onslaught of growing swarms of trainees, almost all of whom start out not at all good at what they are doing. Dr. Ascoli has an unnatural ability and drive to meet intensively with all his charges at least weekly, patiently and thoughtfully guiding and molding them into the professionals they need to become. No urgent business on my part was ever likely important enough to interrupt these meetings with his students. I hold Dr. Ascoli as a role model for me in this regard and have attempted to emulate him in my own career. I also would wander by his classroom at Mason, and captivated by his lectures, would remain in the back of the room and listen. I wondered if his students appreciated the rare opportunity that had come their way—I certainly did. In terms of knowledge integration, Dr. Ascoli basically pulled together a new field, Computational Neuroanatomy, and put the first definitive book on the subject together. He also founded a superb journal, *Neuroinformatics*. His effect on Neuroscience as a scholarly profession from these two successful efforts has been profound. He is a superb scientific colleague. His scholarship of science is fantastic. He is a great collaborator in integrating his efforts with other senior scientists, using his mentoring skills to bring along the trainees involved in a project, and is a careful writer and editor.”

Dr. Daniel Segre, Associate Professor of Bioinformatics, Boston Univ.: “I have known Giorgio for more than twenty years: one of the most gifted, dedicated and creative scientists I have had the luck of encountering. Despite countless scientific conversations, every time I speak with him, a new door is opened to a room full of unforeseen wonders. With contagious enthusiasm and tireless perseverance, and with a deep care for the struggles and aspirations of humankind, Giorgio has a magic capability of involving whoever is around him in passionate discussions about science and its impact on the world. His mind never idle, Giorgio constantly processes scientific knowledge, reflections on how mind works, and his personal experience as teacher, husband, father, and member of a complex society, to come up with ambitious but pragmatic plans. His ideas, which know no discipline boundaries, undergo extremely rigorous rational scrutiny, taking the shape of elaborate intellectual constructs that in different contexts become an unforgettable lesson, a plan for ten years of research, or the beginning of a new field. Whether a new approach to probe the connection between language and consciousness, a daring theory on the fundamental forces of physics, a meditation on the ethical responsibilities of scientists, or a reflection on how personal genomics will affect society, I have learned that an update from Giorgio can irreversibly change the way I see the world.”

James L. Olds, Ph.D., Director, Krasnow Institute for Advanced Study: “Rarely in one’s career as a mentor does one get the opportunity to write a recommendation for someone with as much raw talent for science as Dr. Giorgio Ascoli. In my eighteen years in neuroscience, there is no question that Giorgio is the finest young scientist with whom I have ever been associated. His breadth of knowledge, skill and perseverance at the bench, and keen scientific insight are simply put: breathtaking. Dr. Ascoli first came to my lab in the summer of 1993 to participate in a project to visualize the activation of protein kinase C in living cells. In spite of having virtually no experience in either imaging or confocal microscopy, Giorgio’s efforts were absolutely essential to the eventual success of the project. He single-handedly designed a sophisticated image-analysis algorithm that allowed us to quantify the degree of PKC activation. This tour-de-force was my first clue as to Giorgio’s talent for science. In the fall, he proceeded with characterizing Calnexin’s secondary structure. Giorgio has completed this project beyond anyone’s expectations, and we now understand how Calnexin might act to inhibit K⁺ channels. While working on his experimental neurochemical project, Giorgio became interested in neural modeling. Again independently, Giorgio developed a novel method for enumerating dendritic spines in a somatocentric coordinate space. We are currently working on implementing neurophysiological modeling tools in the mathematical space that Giorgio invented. Here at

Krasnow, Giorgio is conducting one of the most original and scientific advanced neurobiological projects. He is a pleasure to work with both in and outside the laboratory, and his peers all enjoy his sophisticated intellect. I also personally know Giorgio's excellent ability as a class teacher, and his students clearly value him as a wonderful mentor. He has an international reputation which makes him a contender for the National Academy of Science. Dr. Ascoli's research is entirely world-class, and his productivity continues to accelerate. Prof. Ascoli's fundamental contributions to neuroscience will assure a central role in the history of the field."

Prof. Paola Perqami, Pediatric Neurologist, West Virginia Univ.: "Our research projects at the National Institute of Neural Disorders and Stroke evolved into a scientific collaboration of which I am extremely proud. It resulted in important publications and a long-lasting friendship. It was clear since those early days that Dr. Ascoli's dedication to work, passion for neuroscience, and determination were astonishing. Over 15 years, I had the opportunity to witness Dr. Ascoli's growth to become not only an extraordinary neuroscientist leading the edge of computational research, but also an affectionate and supportive husband and a wonderful father. I have always been amazed at his ability to balance such an accomplished professional life with the demands of a large family of four boys and a wife equally engaged in a successful academic career. One of Dr. Ascoli's strongest features is his ability to interact with a wide range of individuals, from professors, to students, to young children. He is always available, helping faculty to achieve their potential and students to focus and gain direction. His positive approach, calm manners, and encouraging outlook bring the best out of people. His ability to bring people together encourages cooperation. Never have I known him to shy away from an opportunity or a challenge. He has the vision that is so essential to successfully lead at a major university."

Dr. Stephen Senft, Associate Scientist, Marine Biological Lab, Woods Hole, MA: "Rarely does one encounter a person with the range of diversity and capabilities as Giorgio. He is extraordinarily quick on the uptake. Whether learning about a new approach to computational neuroscience, picking up one of many technical skills, or canvassing the literature for neurons, Giorgio is highly attentive to detail and has superlative recall. He has a balanced and profound evaluative capacity (honed from chess and from education in the classical tradition of critical thinking). This facility has enabled him to focus on identifying and assembling the talent and resources needed to expose brain features in a highly public form (as [NeuroMorpho.Org](#)), which makes them directly catalytic for insight generation to the entire field of Neuroscience with long-term impact. In his actions, Giorgio has shown equally exemplary traits. In forwarding his thoughtful vision he has progressed deliberately in inexorable stages, in the strategic manner of an advancing quarterback, and I have seen many of them first-hand. These advances include numerous works characterizing the morphologies of neurons and in revealing new aspects relating to their function. Recently, they include the Diadem challenge to greatly accelerate accumulation of data by algorithmic methods for tracing neurons. Currently, his adaptation of the Allen Brain Atlas depicts these structures in a brain-wide map of gene expression. With this campaign, Neuroscience is materially advanced in a very creative way. In addition, there is a kindness and intent to better society. This begins at home, where I have been privileged to observe his good humor and even-handedness as he and his talented wife are raising four boisterous boys using a scheduling strategy as fine-tuned as the operation of Switzerland's trains. This style gracefully extends to the teaching and guidance of a large number of students. It is incredible to see how effectively Giorgio keeps smoothly running the many threads of research in his lab using web tools in effect both when at Mason and when he is at conferences that link his work, in a leadership role, with that of numerous other centers around the globe."

Dr. Maciej Lazarewicz, Senior Scientist, Medtronic Inc., former postdoc: "Prof. Ascoli's passion and ability to ask basic but deep and relevant questions inspired and allowed to see patterns in data. His great organization, abilities, and persistence allowed me to publish my first first-author paper in a good journal in just one year. Until now, that paper was cited 25 times in the scientific literature. Even after I left Prof. Ascoli's lab, he continued to be my mentor,

providing guidance through my career. The collaboration persisted beyond the time in his lab. As an effect, we published another research paper. On top, Prof. Ascoli has a great sense of humor and open mind. I admire his capability to balance his research career with family life.”

Prof. Slawomir J. Nasuto, School of Engineering, Univ. of Reading, UK: “I had the privilege to do my first postdoc in Giorgio’s lab. After over 10 years, I still remember vividly the great atmosphere, a mixture of passion for science and fun, of which he had both in abundance. Giorgio belonged to a rare breed of scientists equally happy at the lab bench or microscope and programming at the computer, building and analyzing computational models. Even then, when *physiological* models had been predominant in neuroscience, he had already recognized the importance of accounting for details of structure of neurons in describing their function. Thus, he was among the few scientists laying foundations for the field of computational neuroanatomy. It was truly inspirational to work in Giorgio’s lab as well as to attend his lectures. Since my time at Krasnow, although I became independent and have expanded my research into other directions, I have been collaborating with Giorgio; it has been nice to see at conferences how much respect his work and science command from researchers all over the world.”

Dr. Ruggero Scorcioni, Associate Fellow, Neuroscience Institute, La Jolla, CA: “When I applied to his lab, I was a Software Designer at IBM in Rome. I had interest in research but was still debating if I wanted to leave the safety of a steady corporate job. Upon meeting Dr. Ascoli, I sensed his dedication to the greater goal of discovery and everyday drive to achieve something of value. Ultimately, this was about the last frontier: discovering how the brain works. I was so inspired that I had no hesitation to leave Italy and start a new adventure. In only a few months, I realized what a smart and lucky decision I had made. After being trained from undergraduate to post-graduate levels in Italy, England, and California, I can say that Dr. Ascoli is the most outstanding, knowledgeable, and dedicated professor. With great gratitude for his efforts and trust placed in me, it is a credit to Dr. Ascoli that my research is focused on large scale modeling to understand brain function.”

Dr. Ken Smith, Senior Engineer, MITRE Corp., McLean, VA: “At Principal Investigator meetings of the Human Brain Project, Giorgio is easy to approach, has a real passion to solve important problems, and collaborates readily across disciplines. I was attracted to Giorgio’s vision of widely sharing all dendritic morphology datasets in the world, enabling his field to actively pursue “data driven science.” We discovered my group’s software, originally built for other purposes, could be adapted to help his NeuroMorpho.Org site, and we have worked closely ever since. NeuroMorpho.Org came to be and has been so very successful because Giorgio has a combination of qualities few possess: the scientific depth to recognize a field-changing goal, the respect of his scientific colleagues around the world, and the persistence to see the project through. It has been exciting to watch the cumulative effect of Giorgio’s research on the field of neuroinformatics, which he has helped pioneer. From the early days, to collaborations in the International Consortium on Brain Mapping, to contributions to the Neuroscience Information Framework, to serving as a member of the Neurotechnology study section, to his establishing the Neuron Registry, Giorgio has been in the thick of things and a visionary leader. He is currently leading an international disciplined framework by which to classify neuron types; this is extremely valuable because researchers are focused on a very small aspect of neuron structure or function, and the field suffers from its inability to ‘connect the dots.’ I recently had the opportunity to participate in how Giorgio transfers his vision to students: last year Giorgio developed a new course in Neuroinformatics at Mason. Not only was the subject matter nearly unique, the course also stood out in that students were exposed to challenges from both neuroscience and informatics. They learned to trace the deeper issues across multiple disciplines, providing a holistic view which did not become disjointed at discipline boundaries.”

Prof. Kristen Harris, Georgia State Univ.: “Dr. Ascoli is highly insightful, an outstanding scholar and research scientist. His work represents the finest of the best, a tour-de-force.”

vii. Additional Documentation

Teaching and Discovery

Dr. Duncan Donohue, Scientist, SAIG-Frederick: "I am very fortunate to have had Dr. Ascoli as my PhD Advisor at Mason. My entire educational career was in the Virginia public school system, could raise concerns of limited exposure to outside ideas. However, Giorgio fostered a remarkably diverse learning environment. Our lab included researchers from India, Iraq, Italy, Russia, China, and Ukraine and from areas of study, including psychology, computer science, biology, physics, and chemistry. This diversity reflected Giorgio's own broad interests. Because of him, I am a firm believer that the best ideas come from integrating different outlooks, scientific and otherwise. As the husband and descendant of Virginia educators, I have a deep respect for highly-effective teaching. Giorgio is a terrific teacher both in and out of the classroom. His personal thirst for knowledge is infectious. Giorgio's ability to both grasp a wide variety of scientific theories and effectively convey them to people with diverse backgrounds and personalities is unmatched. Despite a long list of responsibilities, Giorgio was always very generous with his time when it came to his students. As a graduate advisor, he gave me and my peers room to follow our own passions while giving ample encouragement and direction."

Dr. Jeffrey L. Krichmar, Associate Professor of Cognitive and Computer Sciences, Univ. of California, Irvine; former postdoc at the Krasnow Institute: "Dr. Ascoli is a scientist of the highest caliber and a fine educator. I fondly remember teaching with him Computational Biology at Mason, a course in biochemistry to students with computer science background. Thankfully, Dr. Ascoli taught the Organic Chemistry portion. It was clear from his enthusiastic lectures that he had a love of science and teaching. I have also had the pleasure of working with many of his students and postdoctoral scholars. Dr. Ascoli is a stellar educator and mentor. On a personal level, I have sought his advice on all topics over the years. I have been fortunate to continue our scientific collaborations after I moved to California in 1999. I cannot think of someone more deserving. Dr. Ascoli has shown excellence at all levels of academics."

Representative publications first-authored by Dr. Ascoli's trainees (out of over 100):

- Scorcioni R., Ascoli G.: Algorithmic extraction of morphological statistics from electronic archives of neuroanatomy. *Lecture Notes in Computer Science*, 2084:30-7 (2001).
- Nasuto S., Krichmar J., Knape R., Ascoli G.: Relation between neuronal morphology and electrophysiology in Alzheimer's Disease. *Neurocomputing*, 38-40:1477-87 (2001).
- Lazarewicz M., Migliore M., Ascoli G.: A new bursting model of CA3 pyramidal cell physiology suggests multiple locations for spike initiation. *Biosystems*, 67:129-37 (2002).
- Samsonovich A., Ascoli G.: Statistical analysis of hippocampal neurons indicates selective repulsion of dendrites from their own cell. *J. Neuroscience Research*, 71:173-87 (2003).
- Scorcioni R., Lazarewicz M., Ascoli G.: Quantitative morphometry of pyramidal cells: anatomical classes and reconstructing laboratories. *J. Comparative Neurology*, 473:177-93 (2004).
- Donohue D., Ascoli G.: Local diameter fully constrains dendritic size in basal but not apical trees of CA1 pyramidal neurons. *J. Computational Neuroscience*, 19:223-38 (2005).
- Samsonovich A., Ascoli G.: Statistical determinants of dendritic morphology in hippocampal pyramidal neurons: a hidden Markov model. *Hippocampus*, 15:166-83 (2005).
- Samsonovich A., Ascoli G.: A simple neural network model of the hippocampus suggesting its pathfinding role in episodic memory retrieval. *Learning & Memory*, 12:193-208 (2005).
- Samsonovich A., Ascoli G.: The conscious self. *Cortex*, 41:621-36 (2005).
- Li Y., Brewer D., Burke R.E., Ascoli G.: Developmental changes in spinal motoneuron dendrites in neonatal mice. *J. Comparative Neurology*, 483:304-17 (2005).
- Krichmar J., Velasquez D., Ascoli G.: Effects of β -catenin on dendritic morphology and simulated firing in cultured hippocampal neurons. *Biological Bulletin*, 211:31-43 (2006).
- Samsonovich A., Ascoli G.: Morphological homeostasis in cortical dendrites. *Proceedings National Academy Science USA*, 103:1569-74 (2006).

Li X., Ascoli G.: Effects of synaptic synchrony on the neuronal input/output relationship. *Neural Computation*, 20:1717-31 (2008).

Scorcioni R., Polavaram S., Ascoli G.: L-Measure: web-accessible analysis and search of digital reconstructions of neuronal morphologies. *Nature Protocols*, 3:866-76 (2008).

Donohue D., Ascoli G.: A comparative computer simulation of dendritic morphology. *PLoS Computational Biology*, 4(5): e1000089 (2008).

Ferrante M., Blackwell K., Migliore M., Ascoli G.: Computational models of neuronal biophysics and potential pharmacological targets. *Current Medicinal Chemistry*, 15:2456-71 (2008).

Scorcioni R., Hamilton D., Ascoli G.: Self-sustaining non-repetitive activity in a large scale neuronal-level model of the hippocampal circuit. *Neural Networks*, 21:1153-63 (2008).

Brown K., Gillette T., Ascoli G.: Quantifying neuronal size: Summing up trees and splitting the branch difference. *Seminars Cell Development Biology*, 19:485-93 (2008).

Halavi M., Polavaram S., Donohue D., Smith K., Ascoli G.: NeuroMorpho.Org implementation of digital neuroscience. *Neuroinformatics*, 6:241-52 (2008).

Ferrante M., Migliore M., Ascoli G.: Feed-forward inhibition as a buffer of the neuronal input-output relation. *Proceedings National Academy Science USA*, 106:18004-9 (2009).

Komendantov A., Ascoli G.: Dendritic excitability and neuronal morphology as determinants of synaptic efficacy. *J. Neurophysiology*, 101:1847-66 (2009).

Samsonovich A., Ascoli G.: Toward a semantic theory. *Complexity*, 15:12-18 (2010).

Samsonovich A., Ascoli G.: Principal semantic components of language and the measurement of meaning. *PLoS One*, 5(6):e10921 (2010).

Ropireddy D., Ascoli G.: Potential synaptic connectivity of different neurons onto pyramidal cells in the hippocampus. *Frontiers Neuroinformatics*, 5:5. doi:10.3389/fninf.2011.00005 (2011).

Ropireddy D., Scorcioni R., Lasher B., Buzsáki G., Ascoli G.: Axonal morphometry of hippocampal neurons in different CA3 locations. *Brain Structure&Function*, 216:1-15 (2011).

Baker J., Perez T., Migliore M., Barrionuevo G., Ascoli G.: A computer model of perforant path synapses in CA3 pyramidal cells. *J. Computational Neuroscience*, 31:137-58 (2011).

Donohue D., Ascoli G.: Automated reconstruction of neuronal morphology: an overview. *Brain Research Reviews*, 67:94-102 (2011).

Student Ratings (*term: course, evaluation on a 5-pt scale*): Spring 2008: *Chemistry & the Brain*, 4.73; Fall 2005: *Chemistry & the Brain*, 4.91; Spring 2004: *Virtual Brains*, 4.89; Fall 2003: *Chemistry for Psychologists*, 4.80; Spring 2002: *Virtual Brains*, 4.83; Fall 2001: *Biopsychol.*, 4.86; Spring 2001: *Trends in Neuroscience*, 4.87; Fall 2000: *Biopsychol.*, 4.90; Spring 2000: *Comput. Neuroscience*, 5.00; Spring 2000: *Research Methods*, 5.00; Fall 1999: *Physiol. Psychol.*, 4.67.

Student comments/evaluations: “This was the best course I have taken at Mason. The material was tough but fair, and the presentation style was perfect”; “Dr. Ascoli was the best teacher I had at Mason. The course was great! Very interesting, and the material was given in a very helpful manner” (*Spring 2008*); “The course is intense, but explanation are always clear; he is extremely willing to help students. Office hours are great—teaches students how to reason”; “Dr. Ascoli is a talented, great teacher. If he could teach more courses, there might be more stars coming out of Mason. Thank you so much for a wonderful & inspiring class!”; “Fantastic teaching, excellent job!” (*Fall 2005*); “Dr. Ascoli was very well prepared, very patient, very understanding; great class!” (*Fall 2004*); “Online organization is fantastic. Dr. Ascoli is very un-intimidating. I am actually upset I didn’t take this class earlier” (*Fall 2003*); “Superb course! Dr. Ascoli was very available in person and via email, accessible, helpful, and motivating; the material was difficult and he pushed us, but he made chemistry fun, exciting, and interesting” (*Spring 2003*). “From his organization skills through his intellectual knowledge, he is a great teacher”; “Outstanding use of web. You can talk to him ‘for real’” (*Spring 2001*). “I love the web pages and links”; “He is one of the best teachers I ever had, extremely intelligent and always

available”; “I have thoroughly enjoyed the class and learned a lot. The instructor really knew his stuff. He has made neuroscience not only informative but interesting. Dr. Ascoli has been exceptional”; “I am not a big science fan, but I loved this class. Dr. Ascoli was one of the best instructors I have had during my college career”; “He not only is knowledgeable but also has skills few teachers do: how well he communicates to students. Everything was perfect. I wish more of my teachers were like him”; “He’s very up to date on new findings and discusses them with the class”; “I’m amazed with homework, exams, and activities. Never seen anyone so invaluable in my 3 years at Mason. I’ve already recommended him to friends”; “I recommend Ascoli to anyone. I left with more knowledge than any other class I had at Mason” (Fall 2000).

Service and Knowledge Integration

Dr. Yuan Liu, Chief Officer of International Activities, National Institute of Neural Disorders and Stroke: “Dr. Ascoli is one of the world’s leading scientists in neuromorphology and computational modeling of neural structure, function, and plasticity. He is one of the few neuroscientists who can ‘speak’ the languages of several disciplines, including experimental neuroscience, computational neuroscience, and neuroinformatics. I am always impressed by his in-depth knowledge of scientific advances in so many sub-disciplines. His innovative nature is demonstrated in many integrated activities that benefit neuroscience at large: 1) [NeuroMorpho.Org](#), an extremely valuable asset for the research community. 2) A Society for Neuroscience Symposium to promote data sharing. 3) The DIADEM Contest to automate mapping of neurons. Dr. Ascoli also established [DIADEMChallenge.org](#)—a compendium of resources fostering the development of automated neuronal reconstruction. Giorgio...has made tremendous contributions to neuroscience far beyond his own lab.”

Dr. Daniel Gardner, Professor of Physiology and Biophysics, Cornell Medical College: “I’m enthusiastic to share how really well Dr. Ascoli informs and advances brain research. The Neurotechnology expert NIH advisory panels is the hardest job in biomedical science today, evaluating the most cutting-edge research proposals and selecting those with the highest significance, greatest chance of success, and future impact on the entire field of neuroscience. Dr. Ascoli has been a real leader, concisely explaining them to a broad group of scientists, forcefully and persuasively detailing the good parts and the weak. I remain impressed by how often and readily his position was adopted by all. We also interact through *Neuroinformatics*, the leading journal Dr. Ascoli founded. I have been really impressed by his judgment, expertise, and deep insight about work that will have the greatest significance outside the immediate area. This advances the likelihood that findings will be applied to fundamental questions of brain organization, function, and disease. Dr. Ascoli’s many editorials have been a light unto the nations, clearly inspiring the directions of research. He is a real star, and Virginia should be proud to have his creative, integrative, and outreach activities within the Commonwealth.”

Dr. Sean Hill, Director, International Neuroscience Coordinating Facility, Stockholm, Sweden: “Giorgio is a proven leader in a community effort to categorizing neurons. Many independent approaches have emerged to define their identity. This task involved close collaboration with leading neuroscientists and a deep understanding of complex properties. Giorgio invested the time to explain core concepts such as gene expression, electrophysiology, and connectivity. This work has resulted in significant publications, as well as a new registry for classifying neurons. Giorgio’s commitment to intellectual and philosophical investigation is tenacious, challenging, and valuable. I have deeply appreciated the range and depth of discussions from biologically detailed modeling to the neural basis of consciousness. His broad vision is well complemented by his systematic and profound approach to scientific questions.”

Dr. René Etcheberrigaray, Director of Neuroscience, Center for Scientific Review, National Institutes of Health: “Giorgio came to NIH as a protein biochemist. My most vivid memory was his extreme enthusiasm and happiness of working in the lab. His Italian espressos were also memorable, particularly late evenings when we needed a boost to run one more gel.

Soon after, Giorgio became interested in dendritic architecture and physiology. Giorgio's creative mind led him to combine tools from many different fields. In neural networks, Giorgio has achieved extraordinary success and produced seminal work on hippocampal connectivity. Giorgio went from protein biochemist to top-notch neuroscientist, all the time enjoying himself, achieving great success, and constantly influencing others with his enthusiasm for science. [He also] served as Permanent Member of the Neurotechnology study section [and] as reviewer in numerous Special Panels. Dr. Ascoli readily accepted to serve and never missed a meeting, always prompt, active, and his opinions well-regarded by fellow members. His achievements in neuroscience and computational modeling, track record of high quality research accomplishments, publications, and honors are of great value to medical and allied research in this country. Dr. Ascoli provided invaluable service to the Center for Scientific Review."

Excerpts of official evaluation from promotion cases and annual faculty performance

Peter Stearns, Provost: "This is an unusually strong case. The research is innovative and influential. He is widely published and clearly internationally visible. Referees are uniformly enthusiastic. Prof. Ascoli wins superior student ratings. His interdisciplinary approach clearly represents an important pedagogical as well as research strength. Prof. Ascoli offers successful teaching at all levels and contributes greatly in vital area of university research and teaching."

Daniele Struppa, Former Dean, former College of Arts and Sciences: "Dr. Ascoli is without a doubt one of the strongest, most original, and most successful scientists at George Mason. He has a remarkable and consistent record of scholarship [with] wide international reputation. He is a successful and appreciated teacher. I am personally honored to have Dr. Ascoli as a colleague."

James Olds, Chair, Molecular Neuroscience Department: "Prof. Ascoli continues to perform at the very highest level in research, teaching, and service. He publishes in the very best journals and has a quantity and quality of sponsored research at the very top within the institute and the university. In teaching, Prof. Ascoli continues to receive excellent evaluations from students and peers and to create incredibly innovative opportunities for undergraduates and graduates to participate actively and substantively in scholarship."

Class visitations from colleagues: [1] "Dr. Ascoli was well prepared, patient with students, and very accessible outside of class; his presentations were exciting and interesting. He discussed information in a clear and thoughtful manner, stimulated questions from students which he thoughtfully answered, and kept the presentation at the proper level." [2] "The most impressive part of his teaching performance was the way Dr. Ascoli kept students involved. Students paid close attention all the time, nobody doing anything other than listening, responding or taking notes." [3] "Dr. Ascoli did an excellent job introducing the subject (sleep and dreaming), asking the class to think of examples of rhythms, and was able to get a good response from the students. He then showed how the action potential itself leads to rhythmic behavior [in] a circuit of two neurons. I was impressed with the simple way he demonstrated a complex idea."

External Reviewers: "Dr. Ascoli is a great scientist advancing the understanding of the structure of the brain. He has a world-leading position in computational neuroanatomy" (*Prof. Jaap van Pelt, Netherland Institute of Health*); "Dr. Ascoli has a record of high-quality publication and is one of the pioneers in neuroinformatics" (*Prof. Gordon Shepherd, Yale Univ.*); "Dr. Ascoli is a talented, innovative scientist. His research is supported by the Human Brain Project, a highly prestigious and competitive funding that has been awarded to only 36 investigators in the US and Europe, including Harvard, Yale, Cornell, UCLA, Johns Hopkins, Caltech, and Stanford. Dr. Ascoli has an international reputation for having revitalized quantitative neuroanatomy. His web-based tool allows neuroscientists to visualize neurons using simple measures... The unique approach pioneered by Dr. Ascoli is particularly attractive to students to bridge cognitive science and computational biology" (*Prof. Esther Gardner, New York Univ.*).