PURDUE
UNIVERSITY

DEPARTMENT OF PHYSICS

NICHOLAS J. GIORDANO
HEAD

January 27, 2013

John Mengelt
Managing Director
Breckenridge Partners
1025 West Everett Road, Suite #4
Lake Forest, IL 60045

Dear John,

I enjoyed our conversation last week and learned much about the opportunity at Auburn. In this letter I have put in writing some thoughts about the future of the College of Science and Mathematics at Auburn along with a little more information about me.

I'll begin with a few words about my vision for the COSAM and the role of the dean. I really can't be very specific since I would obviously have a good deal to learn about the college and Auburn, and my initial time would be spent meeting with the faculty, staff, and students getting to understand the challenges we face. However, I can make some general observations based on what I see coming in the future for all major universities including Auburn.

In a nutshell, the job of a dean is to help departments formulate plans for how they can "reach the next level" and then find the resources needed to make that happen. In the COSAM Unit Highlights document that you sent, I noticed that many of the departments hope to grow in some way, either through an increase in faculty size, or in the size of the graduate program, etc. Growth and many of the other goals listed in that document will likely require additional resources, which may come from the higher administration, from donors, or from some other sources. Whatever the source the college must make a compelling argument to the higher administration and other stakeholders about how these resources will enable the college to better serve the university and the broader Auburn community. It should be easy to make this case, since the core disciplines of the college are central to virtually all aspects of the university.

A high priority will continue to be serving the many undergraduate students who take courses in the sciences and mathematics. Developing and implementing new ways to teach these students and improve student success rates will help students graduate faster, a goal that we all share. The college must also explore partnerships with other colleges to develop new undergraduate programs and majors. I am sure that many such partnerships are already in place, but there will almost certainly be new opportunities to work with colleges such as engineering, agriculture, and education in the future. These partnerships will be extremely helpful in developing the kinds of interdisciplinary degree programs that are becoming increasingly important.

Another priority for a new dean will be developing a strategy for strengthening research in the college. This will require that we strike a balance between maintaining and strengthening core

Phone: (765) 494-3000 Fax: (765) 496-2298 E-mail: giordano@purdue.edu
525 Northwestern Avenue • West Lafayette, IN 47907-2036 • www.physics.purdue.edu

disciplines while taking advantage of new interdisciplinary opportunities. There are potential interdisciplinary connections with many areas of engineering, the life sciences, education, and other departments on campus. The solutions to many of the most challenging problems facing society today will require interdisciplinary approaches, and a successful COSAM must be a leader in such initiatives. At the same time, we must always recognize that strong interdisciplinary work can only be built on strong core disciplines.

It is often said that higher education is facing a decade of rapid change. It seems certain that significant changes really are inevitable, such as the "revolution" in online courses. We must also address the urgent need to improve student graduation rates and to control the cost of a college education. We must be partners in guiding that change and demonstrating our value to our students, the state, and society.

Let me now give you a little more information about my scholarly career and accomplishments. After completing a Ph.D. project in which I studied the properties of magnetic crystals at low temperatures, I began a research program to study the properties of very small metal structures, an area that is now part of the field of nanoscience (although the term "nanoscience" was not in use at that time). My nanoscience research began while I was still at Yale and continued when I moved to Purdue, and the work went through several phases. Our first projects investigated ways to make extremely small metal structures, typically metal wires with extremely small diameters (as small as 10 nm, about 30 atoms across), and measure their electrical properties at low temperatures. (See papers #1 and #2 in the list at the end of this latter; these two papers have been cited more than 200 times in the literature.) Our results revealed that such metal structures behave very differently than conventional bulk metals, and I had several graduate students do their Ph.D. work on problems in this area. As the fundamental physics of these structures became understood, we then entered a second phase in which we used these structures to study other phenomena, most notably superconductivity (paper #3) and magnetism (paper #4) in the limit of very small wires. My students and I published a number of papers in this area and my work continues to be referenced, as these are still very active fields. My nanoscience work also branched into the area of nanofluidics. This is an area that is currently very active in engineering and medicine, but our emphasis was on the fundamental properties of liquids confined to very small dimensions (paper #5). My work in this area has been primarily supported by NSF, and I am most proud of the grant I received in 1999 as it was awarded a 2 year extension based on the creative nature of the work (this is grant #1 in the attached list).

In the mid-1990s, I became interested in the field of musical acoustics, with particular emphasis on the physics of the piano. This work led to a number of publications (including papers #6 and 7) and was awarded two consecutive grants from NSF (grants #2 and 3 in the listing). While these grants were of modest size, they were two of the very few grants given by NSF in this area over the past several decades. One of the products of our work was the formulation of a complete computational model of the piano. We were able to start with the fundamental laws of physics (Newton's laws of motion) and derive the sound produced by the instrument. This was the first time that such a model had been produced for any instrument. This is now a very active area of research, and one that I have recently reentered, now in studies of wind instruments such as recorders and flutes (for which the physics is much more complicated that for the piano). I am quite proud of my work in musical acoustics, especially that I have become recognized as an authority on the piano and other string instruments (as evidenced by the fact that I have been

Phone: (765) 494-3000 Fax: (765) 496-2298 E-mail: giordano@purdue.edu
525 Northwestern Avenue • West Lafayette, IN 47907-2036 • www.physics.purdue.edu

solicited to write several book chapters, listed as papers #8 and 9, and by the reviews that my book *Physics of the Piano* has received).

Another activity which I would like to mention was my work in establishing a Research Experiences for Undergraduates program in my department. At a department retreat in 1998, we identified the establishment of such a program as a high priority. I volunteered to lead that program and was the lead PI on the initial NSF grant that funded the program (grant #4). Our REU program has had continuous NSF support since then and I am quite proud to have had a role in creating the program.

Not long after stepping down from being director or our REU program, I was asked to lead the Purdue effort in a large education-oriented project, which became an NSF funded Center for Learning and Teaching in the area of nanoscience. I was a co-PI (along with colleagues from Northwestern University and the University of Michigan) of the center, which brought several million dollars to Purdue (grant #5). Our role was to develop new instructional materials to be used to teach nanoscience at the high school level, and to design and deliver the corresponding teacher professional development programs. That project has ended, but I am now involved as a co-PI in another education grant (#6 in the listing) from NSF with colleagues from our College of Education.

I hope that this letter gives you a good picture of my scholarly accomplishments and how my interests have evolved over time. One message is that I have had strong interests in, and devoted considerable effort to, both my own traditional scientific research and to educational activities (including classroom teaching and research in science education).

This letter has gotten longer than I had intended, but I hope it has provided you with the kind of information you need.

Sincerely,

Nicholas J. Giordano

Nicholas J. Giordano
Hubert James Distinguished Professor and Head
Department of Physics

Phone: (765) 494-3000 Fax: (765) 496-2298 E-mail: giordano@purdue.edu
525 Northwestern Avenue • West Lafayette, IN 47907-2036 • www.physics.purdue.edu