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Greetings, Andy,

This note and accompanying CV are to express interest in the position of Natural Science Chair. I think you'll find my philosophy, background, and interests unusually well aligned with the philosophy of the Deep Springs College and the Nunnian Pillars. I am also familiar with the Gull Island Institute and have spent time exploring the educational opportunities on the Elisabeth Islands. So, while I have much to learn about Deep Springs, its philosophy is not unfamiliar territory. As far as my connection to those pillars:

Labor: If I can impart nothing else about what it is like to be a scientist, it is that it is not a career but a way of seeing the world. More like a farmer, who basically lives their work. I learned this lesson most keenly as a farm hand for several years in Pennsylvania when I was a teenager: dairy farms in the summer and maple sugar farms in the winter. Nature dictates what needs to be done when, and in between there is everything else, cleaning equipment, shoveling manure and cleaning the barn and the farmhouse, mending fences, making meals for staff, hauling buckets of sap, or running tubing to the stiles in the trees and knowing when to light up the boiler, which needs continuous monitoring as long as the sap is running, managing and milking the cows. . . Similarly, scientists don't leave their work at work, because it is what is happening in the world moment by moment that they need to be concerned about. Whether they are setting up and assaying quadrats or transects, banding and tracking birds, growing organisms in the lab or painstakingly analyzing protein interactions through western blot. They are dealing with living things and can't stop and pick up where they left off later, they have to deal with organisms when and where they are.

Self-Governance: As you will see from my teaching philosophy, self-reliance and working in teams is how I teach. Both during the course and after a student leaves, they should be able to navigate and adapt to the social systems they are in and understand the need to work together, solve problems, and be mutually supportive toward their learning and research goals. Students in my courses know that part of their assessment is how they contribute to the wellbeing of the community. In team research, where students need to live together and work toward a successful "boot

camp" experience my students know that their success is interdependent with that of all the other members of the cohort.

Academics: My research agenda (the coupling of complex human and natural systems, also known as CHANS) is the guiding premise for my approach to the natural sciences which straddles traditional disciplines. Every aspect of a habitat is part of the habitat, affects the living things in it, and vice versa in a mutualistic dance. Understanding the roles and connections within ecosystems from the micro to the macro provides an essential baseline for all natural sciences, whether hydrology, geology, population studies, behavior, soil microbiome, energetics, or biochemistry. And, as a disciple of Eugene Odum, I believe sociocultural systems have a significant impact on natural ones, and understanding these effects is an essential aspect of natural sciences. But it is also a lifeway. Integrating the three pillars into academics is "walking the walk" of integration and cultivating a sophisticated understanding of the mutual effects of all our actions on everything else is essential for understanding and living sustainably.

In closing, I was groomed in the sciences from an early age, from summers at Cold Spring Harbor Labs and Woods Hole, to assisting my father in his research on endosymbiosis at Stony Brook University, and on the marine biology research vessel Locayo out of Oyster Bay, New York. When the environmental movement took hold, I surveyed superfund sites and sought to protect endangered species and ancient cultures in sites threatened by construction for environmental impact studies. Along the way, I maintained the question: how did humanity emerge from nature and how can it live sustainably in it? I enthusiastically explored and chronicled every dimension of this question I could, from the biology lab and field work to farm work, wilderness travel, photography, scientific visualization, and media; ultimately developing a research platform to study group interaction in addressing environmental sustainability crises, about which I have lectured widely. If this sounds like a lot of hard work, it is. But pushing the boundaries of any discipline takes intellectual energy and persistence. I am excited by the opportunity to bring this perspective to the position of Natural Science Chair in a way that will be both rigorous and inspiring. Thanks for your time and I would be happy to elaborate on any aspect of my work when it is convenient to you.

Sincerely,

Stephen Miles Uzzo, PhD.

Teaching Statement

Philosophy

As a scientist and transdisciplinarian, I believe, foremost that all learners must be supported and mentored to think critically about the world. Research literature validates this belief. But its implementation in the learning setting means creating a safe environment for discourse that reinforces a kind of literacy that allows students to:

- Acknowledge that wisdom is knowing what they don't know and how to ground and validate their ideas and questions in the real world not just books and papers. This requires what is known as "Beginner's Mind," and is essential to science. Being open to new ideas and potential insights demands parting the veil of assumptions we make about the world and being courageous about having "wild ideas" to think through, seek evidence for, and share.
- Be keenly aware of potential biases, something that is readily taught in science learning settings, but often isn't. It is among the most fundamentally important ideas for learners to integrate into their thinking and ultimately make a habit of mind to check their assumptions about the world, and not just in science.
- Understand that science knowledge is always provisional, based on evidence, and ripe for revision. Understanding the need to do detective work and be open to revising hypotheses and theories if the evidence leads them that way.
- Understand historical, colonial, and capitalist contexts for science and be open to seeing that scientific thinking is not just one way to see the world. This includes indigenous perspectives on knowledge about nature that can be validated. It also helps them understand that there are byproducts and knock-on effects of science practice and knowing what kinds of sacrifices and negative impacts take place in the name of science helps them understand a balanced and sustainable view.
- Understand that science is fundamentally a social process. Research nearly always happens in cooperative teams. While there is the prevailing notion that science ideas must be open to criticism, keeping the criticism constructive is part of the job of good mentoring, facilitation, and creating a collaborative environment for peer support.
- Acknowledge that science learning is largely experiential learning and often requires inventing new approaches, technologies, or using old technologies in new ways. Scientists are makers, technologists and engineers as well. They must be fluent in the essential tools, which often include thoughtful use of computational, data, AI, and programming tools. But also, keen observation and deep noticing in the field.
- Finally, that science knowledge is not atomistic. All of science knowledge fits into systems of connecting ideas and parts that form complex wholes. Complexity and connectedness constitute the fundamental state of nature.

In my praxis I emphasize autonomy and encourage social interaction to scaffold learning. I don't give multiple choice or fill in the blank quizzes or tests, but require student writing about, demonstrating, and explaining their knowledge both to me and their peers. I encourage and use Socratic questioning, which empowers cohort members to answer their own questions rather than me being the "sage on the stage." I also encourage reflective practice, which helps students recognize their thinking in the context of new ideas and helps

with knowledge integration. All of this, of course, makes my job a lot harder, but it is how I get to know the cohort, individualize and socialize learning, help them surmount misconceptions, and facilitate them fulfilling their own needs. Further, I believe that science is emergent from the same creative human instinct that includes arts, humanities, and other domains of thought. And while it differentiates itself through seeking evidence and being disprovable, it deepens humanity's knowledge of the world in ways that inform, and are informed by, all other creative endeavors. I don't expect students to become polymaths but emerge from the clinic as more curious lifelong learners than they were when they went in.

Experience

I have several decades experience teaching and management in a wide variety of learning settings from outdoor experiential learning to designing and developing programs for faculty and teachers. My education leadership and formal teaching experience includes:

- Co-leading development and supervision of a graduate clinical residency program in math and science using the theoretical framing of pedagogical content knowledge to design curricula, syllabi, assessment, and student recruitment, mentoring, and coaching programs;
- Mentoring master's and doctoral candidates. Assisting them in focusing on their research goals, structuring their proposals and dissertations, developing research questions, selecting and developing instruments, thoughtfully applying computational tools, and navigating defense;
- Serving on and leading academic committees for curriculum development for both faculty and student learning, accreditation self-assessment, strategic planning, and aligning curricula and syllabi to international learning frameworks and standards;
- Serving as Adjunct Assistant Professor of Science Education for the New York Institute of Technology Graduate School of Education for sixteen years. I often had the maximum teaching load for non-tenure-track faculty and taught over sixty cohorts both live and online on science teaching and learning with over six hundred students, as well as courses in art integration into science teaching. Cohorts often included international students from China and Israel. Some cohorts were working under student grants from private, federal, or municipal sources, others were full tuition, some online students were in active military service. I did a lot of one-on-one mentoring. Being able to assist students from widely diverse backgrounds, languages and learning needs to be adaptive and thoughtful learners and teachers was a great privilege.

In conclusion, both in philosophy and practice, cultivating the best in students, teachers, and administrators demands modeling ambitious goals, effective learning practices, and being a good listener and mentor. They are the hallmarks of what I believe to be the most effective approaches to bringing out the best habits of mind in students and helping them be curious, open to learning and generalizing their knowledge. Because learning is a dynamic process, rigorous, authentic assessment and evaluation of practice are essential tools to assure that the student experience is inspiring, intellectually sticky and supports lifelong learning.

Research Agenda

My fundamental research question is:

What is the relationship between humans and nature?

And by corollary:

What are the barriers for humans to understand this relationship, and how can they be surmounted?

Background

While this question has haunted me for much of my life, finding pathways into researching and addressing this question was less clear. I consider myself fortunate to have had mentorship by remarkably smart and compassionate people who understood complexity, never recognized the barriers and compartmentalization of science domains, and who considered one of the most important goals of science research to get science in the hands of everyone. As a consequence, I have made a career of seeking out the nature of the nexus of science domains and other domains of human creativity and been able to put a transdisciplinary lens on science research and outreach that seeks to surface and cultivate curiosity in everyone. This career has had the effect of deepening my understanding of the value phenomenological and naturalistic approaches have in investigating the complexity that exists at the boundary of what we call "nature" and "culture." Called "the coupling of human and natural systems" (CHANS), it has become formally recognized only in this century. But the work of Eugene Odum and others many decades earlier was a major catalyst for introducing the idea of the natural sciences, particularly ecology, having a blind spot to the role and impact of human culture on nature. Yet the byproducts of the human species on earth show up everywhere, from the snow that falls in Antarctica to the blood in polar bears in Svalbard. It is also at the heart of the difficulty in making meaningful progress in mitigating climate change and building a sustainable relationship between humans and the rest of nature.

While CHANS includes plenty of statistical methods using quantitative data from socioenvironmental systems, and across earth systems, it recognizes that the relationship between humans and nature is intimate, complex, systemic, and evolving. Meaningful study in CHANS challenges the investigator to develop and adopt innovative analytical approaches, ask questions about what is happening between the data points, and reckon with emergence. Recognizing this important movement in complexity research, I undertook assessing the human relationship to nature using the paradigm of connected systems. My thesis *Network Theory and the Environment: Understanding Human Connections to Nature* was a comparative study of connected structures in natural systems, homologous ones in human systems and how they relate to one another. It resulted in a research and outreach trajectory in the connection between humans and nature throughout my career. Yet, if connected systems is to be a catalyst for human communities to integrate nature into their world view there would need to be better models to educate the next generation of scientists about these systems. Because network science was a nascent field at that time, I turned to the National Science Foundation to support the development and study of educational

models for network science along with expanding the role of nature-human connected systems. The result was over a decade of support for assembling research teams to analyze complex connected systems, while building capacity in designing, managing, and researching educational programs, symposia, workshops, and conferences in network science. After two decades, this capacity-building work in ongoing.

The emergence of the fourth IPCC report on climate change, and subsequently the Kyoto Protocol in 2005 coincided with an opportunity for me to assemble a team and develop research and education in sustainability science through private and government support. My team and I developed a digital immersive research platform and simulation to study group behavior when posed with sustainability dilemmas. Multiple groups work within separate simulated biomes to create a healthy ecosystem but have to share resources with each other and attain a dynamic equilibrium among the biomes. Identifying how the groups respond to the ways the biomes respond to their interventions, characterizing their interactions as a network, and classifying their behavior using machine learning has allowed us to provide real-time feedback to the groups to see how they leverage new knowledge to better understand and meaningfully interact with the ecological systems toward sustainability. We postulate that the results of these studies could be generalizable to social systems in the wild and inform interventions at scale.

Future Trajectory

I remain committed to applying complexity research techniques to wicked problems, such as climate change, environmental plastics, environmental justice, the decolonialization of science and sustainability. A few examples of studies I am contemplating include:

- Study the U.N. Sustainable Development Goals from a complexity standpoint to demonstrate that sustainability is a wicked problem at the intersection of socioenvironmental systems and proposal pathways to develop effective ways to build more sustainable and resilient communities at a global scale.
- Continue to develop innovative approaches and settings to study the relationship between idiographic and nomothetic perspectives on the human integration into nature and seek pathways to promote sustainable behaviors at scale
- Develop scientific and engineering platforms and models to better regulate environmental plastics through circular and regenerative economies
- Study and build curriculum around indigenous science through syntonic connections with and among living systems