Committee Member,

I aim to enroll at Oregon State University to become quantitatively literate. I am attracted to V. Bokil's and N. Gibson's research in fluid flows, electromagnetics and multiscale processes. Under their instruction, I would design and implement numerical methods to model rivers and aquifers in the Pacific Northwest. Upon completion of a master's degree, I plan to complete a Ph.D. and enter an ecological industry.

Here are two motivated descriptions of my research interests.

Sediment Transport In Idaho's Treasure Valley, farmers use a network of reservoirs and canals to suspend and divert the Boise river. To understand how this irrigation regime sweeps up and transports material, I would model water's energy in flood irrigated fields. Constrained by agricultural machinery and topography, I would search for furrow patterns that minimize water's turbidity. As a separate, more dynamical project, I would consider canal geometries that interrupt high-velocity flows.

Ground Water Contamination With the Army's decision to not grant an easement for the Dakota Access Pipeline, I have a redoubled motivation to study contaminant diffusion. Were I contributing to an environmental impact statement, I would (i) consider geomorphic stresses on the pipeline and (ii) model hydrocarbon dispersion at points of stress. I imagine the first topic, characterizing a stress tensor, to be accessible as an inverse problem from geological data. I would approach the second, modeling dispersion from an uncertain source, with a modified finite element method.

I share two examples of my relevant research experience.

Galois Theory & Fuchsian Equations Following Michio Kuga's analysis of Fuchsian-type differential equations, I parameterized the solution space of the hypergeometric equation. For 5 interesting cases, I found the monodromy representation at singular points. I presented my method, its history and a potential application to fluid flow at The College of Idaho's 2016 student research conference.

Igneous Dikes in Scotland Relying on N. L. Bowen's *The Evolution of the Igneous Rocks*, I modeled the cooling of plagioclase feldspar magma. I proposed that my geology abroad group in Scotland visit Glen Sligachan, a significant site for Bowen's field observations. On June 4^{th}, noticing rough shards of buoyantly exposed olivine lodged within dense clusters of plagioclase crystals, we validated Bowen's hypothesis that molten plagioclase carried partially solidified mafic minerals into the crust.

Please consider me as a candidate for a teaching assistantship. I summarize what has prepared me to teach.

Tutoring & Grading I tutored calculus students one-on-one and graded physics coursework. I guided small groups through problems in elementary electromagnetism. I heard out my peers in introductory topology and posed constructive questions. As a Heritage Scholar at The College of Idaho, I led discussions in colloquium. In seminar, I organized half-hour workshops on the logistic equation and the heat equation. I also delivered an hour presentation on epidemiological modeling.

Time Away from School In the last year, I volunteered on a ranch in Germany and worked at a refugee resettlement office in Texas. Here are two examples of how these experiences refined my teaching ability. First, while I learned LaTeX to typeset proofs in analysis and topology, I have also used it to create bus guides in Spanish and Arabic. Second, while I was exposed to G. Polya's guided problem solving and R. L. Moore's inquiry based method in college, I have applied their pedagogy to my work across language barriers: I plan ahead, relax and co-create the space for mutual questions.

Presently, I am a fellow in the Texas Episcopal Service Corps. I live in Houston with two other fellows and work as a medical care intern. This work demonstrates a unique breadth in my qualifications: I advocate for clients with limited English proficiency in the nation's densest health-care bureaucracy; I accompany them as they navigate metropolitan transit; I maintain copies of their medical records to ensure continuity of care.

I am confident that I would contribute formidably to your program. Thank you for your consideration.

Respectfully,
Colton Grainger