Department of Mathematics
University of Utah

Committee Member,

I aim to enroll at the University of Utah to become quantitatively literate. As I want to examine how we, humans, co-create our environment, I am attracted to Utah's research groups in Multiscale Analysis and Computations (MAC) and Material Science. I would like to be considered for a teaching assistantship. 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 numerically simulate water's energy and turbidity in flood irrigated fields. Following up, I would classify how turbid water settles. Modeling regions of low-velocity flow, I could determine where (and which) sediments fall out of suspension.

Ground Water Contamination With the Army's decision not to grant an easement for the Dakota Access Pipeline (DAPL), I have a redoubled interest in contaminant diffusion. If I were contributing to an environmental impact statement for DAPL, I would (i) consider geomorphic stresses on the pipeline and (ii) model hydrocarbon dispersion through sand, shale or clay at points of stress. I imagine characterizing the geometric structure of sand/shale/clay mixtures via inverse homogenization.

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.

I summarize what has prepared 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 form letters and bus guides in Arabic. Second, while I was exposed to G. Polya's guided problem solving and R. L. Moore's inquiry based method at college, I have applied their pedagogy to my work across language barriers: I plan ahead, relax (despite misunderstanding) and ask plenty of questions.

Presently, I am a fellow in the Texas Episcopal Service Corps. I live in Houston with two other fellows and work as a refugee medical care intern. This work demonstrates extraordinary qualifications. I advocate for clients in emergencies and help them navigate the U.S. health-care system. As well, I am facilitating a transition of client data into SQL and uploading our emergency assistance resources to an online repository.

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

Respectfully Submitted,
Colton Grainger

Curriculum Vitae **Colton Grainger**

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OBJECTIVE To complete an M.A. in Mathematics (with applied emphasis) at University of Utah.

EDUCATION

B.S. in Mathematics-Physics May 2016
The College of Idaho, Caldwell, ID GPA: 3.49

- Senior Study: *Galois Theory for Differential Equations*
- Advised by Dr. Jonny Comes.

RESEARCH INTERESTS

Multiscale Analysis and Computations for fluid dynamics and ground water flow.
Material Science concerning percolation models and inverse problems.

EXPERIENCE

Refugee Medical Care Intern August 2016 – Present
YMCA International Services, Houston, TX

- Managed 60 refugee medical cases in a team of 3 staff.
- Scheduled medical appointments, transportation and interpretation.
- Advocated for clients at clinics, food pantries and emergency shelters.

Course Grader & Tutor September 2015 – December 2015
The College of Idaho

- Graded weekly assignments for a section of 25 general physics students.
- Tutored 5 calculus students in weekly one-on-one sessions.

Dishwasher & Server Summers 2011 – 2013, Fall 2015
The Griddle, Meridian, ID

- Served food and kept clean a 100 m^2 commercial kitchen.

COMMUNITY INVOLVEMENT

Service Corps Fellow August 2016 – Present
Texas Episcopal Service Corps, Houston, TX

- Lived in an intentional community with 2 other fellows.
- Committed to 1,700 hours of service in 11 months.

WWOOF Ranch-Hand Summer 2016
Sonnwendhof Biofarm, Möckmühl, Deutschland

- Built relationships with American, German and Italian WWOOFers.
- Pastured sheep and planted a sustainable garden.

SKILLS (rated out of 5)

Spoken Languages

- **German** (3), English (5)

Markup Languages

- **LaTeX** (4), HTML (2)

Programming

- **Python** (3), C++ (2)

Operating

- **GNU** (3), Mac (5), Windows (5)

HONORS

Heritage Scholarship for academic merit 2012 – 2016
Top Putnam Score among College of Idaho students 2013, 2015
Varsity Skier on The College of Idaho Ski Team 2014, 2016