

Brainstorming applied mathematics

- Watershed, Canals, Farming techniques
- Transportation Networks, Urban Planning, energy efficiency
- Forest Management, Conservation, Population Modelling
- Recycling, Waste Management, Wastewater treatments
- Infrastructure, efficient use of materials, thermal efficiency
- Alternative energy sources, power distribution
- demographics, queues, public transportation networks
- local resource planning, produce networks + logistics
- hunger + resource scarcity

what to ask my recommends to write about?

- I am a good teacher.
- I have independent research capabilities.
- I can present mathematics in a coherent manner.
- I have a strong mathematical intuition.
- I am well-rounded, and determined.

Goals + Statements of Purpose

- I am looking for a two years M.A. or M.Sc. program to solidify my foundational mathematical knowledge and explore different fields of application.
- I would like to live in the West, preferably in an urban setting near thriving, wild ecosystems.
- I am interested in working with students at my own ability level (or above it) — not in prestige.
- My applied interests include: ecology, physics, engineering, architectural design, transportation networks, food production + distribution, water management.

- My mathematical interests include: fluid dynamics, theoretical physics, non-euclidean geometry, optimization and mathematical modelling, differential equations, topology, proof writing, spoken mathematics.
- I would like to study at a large university, equipped with rich connections to science + industry.
- I would like to spend no more than \$500 on applications (as I have already spent quite a significant amount of money on the GRE tests).

- My preference in applying to schools is to:
 - apply to institutions where I can take nec. prereqs
 - receive financial aid
 - graduate in two years with a valuable applied math degree
 - make a competitive application to a Ph.D. program or secure a position in industry after graduating.
 - learn more about the relation of mathematics and ecology.
 - connect with my peers on a mathematically meaningful level.

Low Desert

- Albuquerque
- La Cruces

High Desert

- Boulder
- Salt Lake City

Urban

- Los Angeles
- Seattle

Costal

- Irvine
- Santa Barbara

Cascadia

- Corvallis
- Eugene

CU Boulder, MS Applied Mathematics, 12/15/2016

My curriculum would include 30 credit hours, 3/5 of which are applied mathematics courses, and a thesis. My first semester would open with the 500 level courses *Modeling in Applied Mathematics* and *Numerical Analysis I* and the 400 level course *Fourier Series and Boundary Value Problems*.

I will need to understand the basic concepts of linear algebra, have knowledge of a programming language and be familiar with multivariable calculus, vector analysis, and theorems of Gauss, Green, and Stokes.

The faculty at CU Boulder enjoy **dynamic systems** and nonlinear phenomenon. Assistant Prof. Iam Grooms finds mathematical techniques to support atmosphere and **ocean science**. As I am interested to study the effects of climate change, I would be thrilled to work with Dr. Grooms.

University of Utah, MA Mathematics, 01/01/2017

For this degree, I would complete 30 hours of coursework, write a thesis and demonstrate standard proficiency in the German language. My first semester would begin with the 500 level courses *Intro to Real Analysis* and *Intro to Numerical Analysis*.

The prerequisites are similar to those above: familiarity with advanced calculus, linear algebra and scientific computation.

Utah hosts workgroups in **material science** and structural optimization. Associate Prof. Yekaterina Epshteyn researches coarse microstructures. Under her guidance, I could examine **soils** and **sediments**. Prof. Elena Cherkayev studies diffusivity in fluid flows. Maybe we could optimize irrigation techniques.

Washington State University, MS Mathematics, 01/10/2017

This professional degree program requires three group projects and culminates in qualifying examinations. The curriculum emphasizes numerical analysis, optimization, simulation, and statistics.

Assistant Prof. Tom Asaki uses **derivative-free optimization** for image processing. His manuscripts combine topological arguments, algorithmic searches and random variables. I'm intrigued! Assistant Prof. Hong Dong applies quadratic programming to **sustainable agriculture**. His work sounds really cool. I can imagine myself finding a career in the production of sustainable food.

Oregon State University, MA Mathematics, 01/15/2017

Similar to U Utah. At OSU, Prof. Enrique A. Thomas develops mathematical models for problems arising in **ecology**, oceanography, hydrology and natural resource management. I imagine myself finding a mathematically meaningful career where I could spend time outdoors.

Colorado State University, MS Mathematics, 02/01/2017

Similar to CU Boulder. At this CSU, Associate Prof. Iuliana Opera specializes in computational **fluid dynamics** and hydromagnetism. Maybe we could develop alternative energy sources. Dr. Oliver Pinaud studies **wave propagation** in random media. His research seems useful for designing scientific equipment.

University of New Mexico, MS Mathematics, 02/15/2017

Similar to U Utah, but with an emphasis on applications in **theoretical physics**. They have an excellent high-performance computer lab for student research.

THE COLLEGE OF IDAHO

UNOFFICIAL

Mr Colton C. Grainger
1734 W Sugar Crest St
Eagle ID 83616

Date: 20 Jan 2017
ID.: 0540157
Name: Grainger, Colton Crosman
SSN.: XXX-XX-0519

Course	Course Title	Grd R	Crd Att	Crd Cmpt	Grade Points
* Placement, Transfer and Non-Course work, if applicable, listed first					
Other Test			16.00		
Term GPA: 0.000 Totals:			16.00	16.00	0.000
Cum GPA: 0.000 Totals:			16.00	16.00	0.000

FALL SEMESTER 2012 (09/06/2012 to 12/17/2012)					
FYS101	First-Year Seminar	B	3.00	3.00	9.000
HIS110	Western Civilization to	C-	3.00	3.00	5.100
MUS126	Chorale	B+	1.00	1.00	3.300
MAT152	Calculus II	B-	4.00	4.00	10.800
SPE199	Debate I	P	1.00	1.00	0.000
MFL223	German Language& Culture B		3.00	3.00	9.000
IND305.1	Winter Wilderness Experi A		2.00	2.00	8.000
Term GPA: 2.825 Totals:			17.00	17.00	45.200
Cum GPA: 2.825 Totals:			33.00	33.00	45.200

WINTER TERM 2013 (01/07/2013 to 02/01/2013)					
IND305.2	Winter Wilderness Experi A		4.00	4.00	16.000
Term GPA: 4.000 Totals:			4.00	4.00	16.000
Cum GPA: 3.060 Totals:			37.00	37.00	61.200

SPRING SEMESTER 2013 (02/11/2013 to 05/17/2013)					
MUS126	Chorale	A	1.00	1.00	4.000
MFL224	German Language& Culture A-		3.00	3.00	11.100
ENG299T.9	Visions of Environment	A	3.00	3.00	12.000
POE250	Introduction to Politica A		3.00	3.00	12.000
MAT252	Discrete Mathematics	A	3.00	3.00	12.000
Term GPA: 3.931 Totals:			13.00	13.00	51.100
Cum GPA: 3.403 Totals:			50.00	50.00	112.30

Dean's List

FALL SEMESTER 2013 (09/05/2013 to 12/16/2013)					
PHY199	Math & Physics Colloquiu P		0.50	0.50	0.000
MAT251	Calculus III	A	4.00	4.00	16.000
PHY271	Analytical Physics I	A-	4.00	4.00	14.800
PHY271L	Analytical Physics I Lab A		1.00	1.00	4.000
ENG280	Theory& Method in Study A		3.00	3.00	12.000
HIS334	19 C Europe:Ind Natn&Dis A		3.00	3.00	12.000
Term GPA: 3.920 Totals:			15.50	15.50	58.800
Cum GPA: 3.565 Totals:			65.50	65.50	171.10

Dean's List

Continued on next Column/Page

Course	Course Title	Grd R	Crd Att	Crd Cmpt	Grade Points
WINTER TERM 2014 (01/06/2014 to 01/31/2014)					
POE350.1	Topics/Political Phi:Niet A		3.00	3.00	12.000
Term GPA: 4.000 Totals:			3.00	3.00	12.000
Cum GPA: 3.590 Totals:			68.50	68.50	183.100

SPRING SEMESTER 2014 (02/10/2014 to 05/16/2014)					
MAT199	Math & Physics Colloquiu P		0.50	0.50	0.000
PHY272	Analytical Physics II	C	4.00	4.00	8.000
PHY272L	Analytical Physics II La C		1.00	1.00	2.000
ENG333	Hemingway & Faulkner	C	3.00	3.00	6.000
MAT352	Differential Equations	C+	3.00	3.00	6.900
MAT361	Linear Algebra	C	3.00	3.00	6.000
Term GPA: 2.064 Totals:			14.50	14.50	28.900
Cum GPA: 3.262 Totals:			83.00	83.00	212.000

FALL SEMESTER 2014 (09/04/2014 to 12/16/2014)					
CSC150	Computer Science I	A	4.00	4.00	16.000
ENG294	Russian Lit. Mortality	C	1.00	1.00	2.000
PHY301	Theoretical Mechanics	B+	3.00	3.00	9.900
HIS325	Ancient Greek Language& B		3.00	3.00	9.000
MAT461	Algebraic Structures	B+	3.00	3.00	9.900
MAT498	Upper Division Seminar A		1.00	1.00	4.000
Term GPA: 3.387 Totals:			15.00	15.00	50.800
Cum GPA: 3.285 Totals:			98.00	98.00	262.800

WINTER TERM 2015 (01/05/2015 to 01/30/2015)					
MAT282	Intro to Proof:Sets& Fun A		1.00	1.00	4.000
MAT372	History of Mathematics	B	3.00	3.00	9.000
Term GPA: 3.250 Totals:			4.00	4.00	13.000
Cum GPA: 3.283 Totals:			102.00	102.00	275.800

SPRING SEMESTER 2015 (02/09/2015 to 05/15/2015)					
PHY199	Math & Physics Colloquiu WA		0.50	0.00	0.000
HIS349	Mod European Intellectua WA		3.00	0.00	0.000
PHY400	Quantum Physics	WA	2.00	0.00	0.000
MAT431	Complex Variables	WA	3.00	0.00	0.000
Term GPA: 0.000 Totals:			8.50	0.00	0.000
Cum GPA: 3.283 Totals:			110.50	102.00	275.800

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FALL SEMESTER 2015 (09/02/2015 to 12/15/2015)											
MUS126	Chorale	A	1.00	1.00	4.000						
ENG310	English Renaissance Lite	A	3.00	3.00	12.000						
PHY313	Thermal Physics	A	3.00	3.00	12.000						
HIS359	Pre-Modern Japan	A	3.00	3.00	12.000						
MAT451	Real Analysis	A-	3.00	3.00	11.100						
MAT498	Upper Division Seminar	A	1.00	1.00	4.000						
			Term GPA: 3.936 Totals:		14.00 14.00 55.100						
			Cum GPA: 3.377 Totals:		124.50 116.00 330.90						
Dean's List											
WINTER TERM 2016 (01/05/2016 to 01/27/2016)											
MAT370	Geometry	A	3.00	3.00	12.000						
			Term GPA: 4.000 Totals:		3.00 3.00 12.000						
			Cum GPA: 3.395 Totals:		127.50 119.00 342.90						
SPRING SEMESTER 2016 (02/03/2016 to 05/17/2016)											
ENG308	Rival Playwrights	A	3.00	3.00	12.000						
PHY330	Electricity & Magnetism	A	3.00	3.00	12.000						
HIS347	18 C Europe:Fall of Old	A	3.00	3.00	12.000						
ENV389	Scotland Abroad Prep	A	1.00	1.00	4.000						
MAT441	Topology	A	3.00	3.00	12.000						
HIS470	History Portfolio	P	1.00	1.00	0.000						
MAT494	Galois Theory for Diff E	A	2.00	2.00	8.000						
			Term GPA: 4.000 Totals:		16.00 16.00 60.000						
			Cum GPA: 3.473 Totals:		143.50 135.00 402.90						
Dean's List											

Degree Received: Bachelor of Science											
Date Conferred.: 05/17/2016											
Majors.....: Mathematics-Physics											
Minors:.....: German Foundations											
History											
Literature in English											

2016 SUMMER TERM (05/31/2016 to 07/29/2016)											
ENV390	Scotland/Lake District A	A	4.00	4.00	16.000						
			Term GPA: 4.000 Totals:		4.00 4.00 16.000						
			Cum GPA: 3.491 Totals:		147.50 139.00 418.90						

End of official record.

my interests + curiosities
my goals + areas of concern
my future plans + vision

charismatic
megafauna
garden
peers!
history of mathematics/scientific revolution
unifs.
open information for healthcare
terrores
geology
plate tectonics
LGBTQ
environmentalism
epidemiology
jazz
public buildings infrastructure
jogging+hiking
glacial deposits
rock climbing
mountaineering
classical physics
Homes + Living Spaces
architecture
Hakka
agricultural production
ocean + atmospheric
fluid currents
topological formations
Murakami
epicycles + tangents
beautiful clothing
wool!
furniture
durable materials
quantitative literacy
Climate Change Models
Gauss-Bonnet Theorem
differential geometry
Maxwell's Equations
Calculus on Manifolds
alternative energy production
fundamental composition
quantum mechanics
* to be smaller, quieter, less huge?
containment
transportation

I am a mathematician. I would like to master
 my skills in academic areas such as statistics
 or other fields. He is
 telling me how do I
 know

academic
 - college attended
 - STEM GPA
 -

RNHS Kiah

College of Idaho

B.S. Mathematics - Physics

Heritage Scholar

STEM GPA

Complex Variables?

Probability and Statistics?

Advanced Calculus / R Analysis?

ODEs?

Linear Algebra?

Numerical Analysis

Computer Programming?

Do I have any previous teaching, tutoring, or teaching assistant exp?
 Any previous research experience? List any honors.
 What computer software am I familiar with?

~~olivine / peridotite~~ peridotite crystals

Kuga's method

Peridotite Dikes
in the Cullman Hills

neutron gas

coupled oscillating pendulums

good skills to "hunt" for books, papers, etc.
in a mathematics library (and on the web).

Winter Wilderness Experience

Journal Keeping with an emphasis on Empirical Observation

Applications of Galois Theory

Monodromy Groups and Fuchsian Differential Eqs.

Independent Studies

Personal Projects

~~Texas Episcopal Service Corps~~

~~= living in community~~

~~- working at the Beacon~~

~~- working at the Houston Food Bank~~

Course Grader of Physics

~~Work~~ at the YMCA international Services

Case manager

- experience writing up

Legislative Dean at Glen Boys State

Summer Camp in American Gov't.

professional work

~~volunteerism~~

+
teaching experience

WWOOF Farm

Hagenbach, Böhlen Württemberg

↳ Sheep Ranch

↳ Electric fences

↳ feeding sheep

↳ wvcst

Ski Team?

Drshwauhung

Food Services

Freight Associate

Texas Episcopal Service Corps

College of Idaho Varsity Ski Team

~~my folk hand work~~

~~manual work~~

Manual labour + Volunteerism

"thick description" = prose and poetry moves,
provokes and startles
(and amuses!)

empirical observations = scientific logbook

reading topographical maps
geological survey maps

markup languages

* B~~I~~B~~I~~T~~E~~X

German Intermediate

* L^AT_EX

Biber
BibLaTeX

plain language = communicating scientific ideas to a
nonspecialist
population

Sage Math ~~compiler~~

Library of Congress

Python

} programming languages
~~compiler~~

OED

C++

* Mathematica

computer algebra program

Idiomata English

{ precision
conciseness
ease

Visual Basic

Microsoft Excel

~~google maps API~~

"writing up"

special skills

programming languages

Curriculum Vitae Draft

Education

College of Idaho B.S. Mathematics - Physics

Vocation

YMCA International Services

Case Manager

College of Idaho

Course Grader General Physics

Volunteerism

Texas ESC

WWOOF

Manual Labor

Dishwasher

Freight Associate

Busser / Server

Independent Studies

Applications of Galois Theory: Monodromy Groups and Fuchsian DFE

Pseudotriple Dykes in the Culkin Hills

Languages

English

German

Computing Skills

Python

C++

LATEX

SageMath

Mathematica

Honors

2 years highest Putnam score at the College of Idaho

College of Idaho Heritage Scholar

Honorable Mention 2018 COMAP - "Eradicating Ebola"

Interests: open source, open info for healthcare, epidemiology, ocean/atmosphere fluid currents, divisible materials, public transport, agriculture, climate change models

Occupational Experience

Case Manager

WWOOF Ranch Hand

Course Grader General Physics

Dishwasher

Freight Associate

Server

Additional Involvements

Texas ESC

Varsity Ski Team

COMAP Prep

Education

BS Mathematics

small
research
project

Calculus Theory

EDUCATION (research project)

EXPERIENCE YMCA, CoFI, the Griddle, Lowe's

INVOLVEMENT ESC, WWOOF, Ski Team, Boys State

~~TECHNOLOGY I WANT TO WORK WITH~~

COMPUTING SKILLS

Familiar ^{with} ~~Python, LaTeX~~

Acquainted ^{with} ~~C++~~

Python, LaTeX, ~~Scratch~~

C++, ~~Java~~

Programs

Familiar with SageMath
Acquainted with Mathematica
Google Maps API

Operating Systems

~~Windows~~

Windows

OSX

Debian

My research interests:

architectural design

ecology / stewardship

reciprocity in finance

↳ open information on the health market place

epidemiology

theoretical physics

geometry / topology

alternative energy production

transportation infrastructure (esp. railways + urban transit)

{ mathematical modelling
environmental phenomenon
wolf re-introduction in idaho,
the pine-bark beetle, wolverines,
salmon }

I am a St. Simonian.

I study geology,
physics, and CS
with a relish.

Against stress
diet, sleep,
breathing
exercises.

I enjoy citing
sources with Bibex,
BibTex and BibLatex.

I know the
Library of Congress
organization
codes

I exercise
my limbs and
my lungs.

My math writing
has been described
as rhythmic and
precise.

I am a practiced
creative non-fiction
writer.

My two favorite
dictionaries.
wiktionary
and the OED

My favorite
character sets
Unicode ext. latin
and ancient greek.

I prepare
delicious meals.

I read music
and sing in
a choir.

I can wrestle
sheep and carry
them from harm.

III Posed & Inverse Problems

Derivative Free Optimization

Multiscale Analysis & Computations
Material Science

Numerical Methods

Multiscale Analysis & Computation

Dynamical Systems

Stochastic Processes

Multiscale Analysis

Inverse Problems

to model complex systems, e.g., ~~rivers~~ aquifers.

to make known properties of unknown media.

to understand contaminant diffusion
and numerical implementations

for fluid dynamics and ground water flow
concerning percolation models and inverse problems

for approximate solutions to partial differential equations
to model complex systems, e.g., rivers.

Numerical Methods to model fluid flow and contaminant diffusion in porous media.

Multiscale Analysis and Computation to approach complex systems (e.g., aquifers).

✓ hypem	Oblivium
x Soundcloud	Enkerblue
✓ Linked In	enoblivium
✓ Chess - DB	Ruggatore
x Wix.com	Rooryn
✓ Stanley Winter Wilderness Experience	
x Prezi	Monchiquite
✓ Geogebra	Plagiosere Plagrosin
x Academia	Ne Plagiosere
✓ HOU Equality	Plagoreel Plagrosive
✓ Putnam Results	Plagoc
✓ LinkedIn	Plagoreel
✓ Hypem	Plagoreel
✓ College of Idaho	Plagoreel

Colton Grainger

☎ +1 (208) 585 7373
✉ coltoncgrainger@gmail.com
🐦 colton_grainger

Education

2012–2016 **B.S. Mathematics-Physics**, *The College of Idaho*.
Senior Independent Study
title *Applications of Galois Theory: Monodromy Groups and Fuchsian Differential Equations*
adviser Dr. Jonny Comes
description I approached solutions to the hypergeometric differential equation with Galois theory.

Experience

2016– **Clerk**, *Dept. of Case Management, YMCA International Services*, Houston, TX.
Facilitated Medicaid coverage and financial assistance programs.
Typeset resource guides in English, Spanish and Arabic.
Created database of 50 local, low-cost clinics.
Summer **WWOOF Ranch-Hand**, *Sonnwendhof Biofarm*, Möckmühl, Deutschland.
2016 Posted and strung up electric fences.
Planted a sustainable garden.
2015 **Course Grader**, *The College of Idaho*, Caldwell, ID.
Reliably graded assignments belonging to one section of General Physics.
2015 **Dishwasher**, *The Griddle*, Meridian, ID.
Kept clean a 100 m² commercial kitchen.
2011–2013 **Server/Host**, *The Griddle*, Eagle, ID.
Turned tables at a breakfast restaurant.

Involvement

2016– **Fellow**, *Texas Episcopal Service Corps*, Houston, TX.
Lived in community with other fellows.
Connected to metropolitan service projects.
2014–2016 **Athlete**, *College of Idaho Ski Team*, Caldwell, ID.
Skied Slalom and GS in Idaho, Oregon, Washington and Montana.
Summers **Counselor**, *Gem Boys State*, Nampa, ID.
2011–2015 Guided high-schoolers through a camp on American Government.

Computing Skills

Programming	Python, C++	Markup	LaTeX, HTML
Algebra	SageMath, Mathematica	Operating	Debian GNU/Linux

Honors

2012–2016	Heritage Scholar (merit award)	2013, 2015	Top Putnam score at C of I
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a note ~~on~~ on curriculum. I ~~believe~~ that

Where am I at in these subjects?

o Probability and Statistics

o Complex Analysis

} beginner /
interrupted studies

→ take a senior level course

o Differential Equations

o Linear Algebra

} how am I going to rev-up
for a seamless transition into graduate school?

o Scientific
Computing

} independent study over the next year

"adaptive mesh solvers in Julia
solves the Riemannian Problem of the
boundaries..." yeah! Fancy! // Debian

//github

I want to be
exposed to some of this
grammar in the next year.

o R / Adv. Calc.

Spivak's Calculus on Manifolds
and his introduction to Diff. Geometry

"Readers should be comfortable with elementary differential equations
and linear algebra and should have had exposure to vector calculus."

my FAVORITE subject outside of mathematics
was PRE-MODERN JAPANESE HISTORY

October 22, 2016

Department of Applied Mathematics
University of Colorado at Boulder

To whom it may concern,

I'd like to matriculate into the department of applied mathematics. As I imagine myself preparing a thesis with a geophysical slant, I appreciate the department's available coursework in dynamic systems. I also appreciate it's computational strength.

Last year I researched Fuchsian differential equations and igneous rock formation. For the former, I used results from Galois theory to find spanning sets of the different solution spaces. For the latter, I classified plagioclase feldspar granules by the thermal conditions at the time of their cooling.

I summarized my conclusions with respect to Galois theory on a poster presented at my college's student research conference. With respect to granules, I finished my work by traveling to Scotland with friends. On June 4th, I pushed my heels and palms into rough, buoyantly exposed, conglomerates of plagioclase, peridotite and olivine for to climb up the side of Glen Sligachan. I'd plan to get out just as much in Colorado.

In pursuit of a master's degree, I'll approach answers to questions such as

- How might we irrigate to conserve significant amounts of water?
- Can we prevent contaminants from diffusing across an ecosystem?
- Which composition of local materials has optimal properties?

For a career, I imagine creating safe places for people, plants and animals to live. To grow from curiosity towards this vocation, I expect to find a professional setting at CU Boulder where I may join a research group in geophysical applied mathematics.

Presently, I'm a clerk for for a social service office in Houston. As a daily practice, I organize and relay important information in *plain language*. This allows me to speak evenly with insurance companies, medical providers, my coworkers and our clients. I will bring this practice as a discipline to CU Boulder.

Under your consideration,

Colton Grainger

P.S. I am applying for a teaching assistantship. As I have worked through advanced calculus manuscripts, I feel confident to bring students through any semester's curriculum of calculus. I am an excellent candidate for an assistantship because I have experience as a peer tutor and course grader. I am also skilled at typesetting explanations and offering clear demonstrations with chalk and blackboard.

Prof. Dull	Prof. Maughan	Dr. Gomes	Dr. Rosoff
- analytical physics	- 19 th Century European History	- Real Analysis	- Multivariable
- thermal physics	- 18 th Century European History	- Geometry	- Diff Equ
- electricity/magnetism		- Galois Theory + Differential Equations	- COMAP Seminar
			- History of Maths
			- Complex Analysis
			- Topology

Roles?	Physics Prof	Scholarship Advisor	Ind. Study Advisor	Academic Advisor
specialty	Astrophysics	HBC British Evangelicals	Category theory	Algebraic Topology
to say about me	- able to do research (neutrinos)	- able to do research	- able to do research	- thoughtful/mindeful
	- able to present + discuss complex arguments	- skilled writer	- creative	- skilled writer
	- skilled in communication	- critical thinker	- interested in the subject	- skilled oral argument
		- interdisciplinary	- independently motivated	- knows LaTeX
		- independently motivated		- enthusiastic
				- well rounded
Colton (verbs)	prepares, educates, uses Mathematica + LaTeX when needed	explores additional resources, concretizes examples, writes up, researches further, provides discussion	he reads ambitiously, seeks examples + apps, illustrates ideas clearly, motivates himself, communicates	

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Algebra	SageMath, Mathematica	Operating	Debian GNU/Linux

Honors

2012–2016 Heritage Scholar (merit award) 2013, 2015 Top Putnam score at C of I

a note ~~on~~ on curriculum. ~~I believe that~~

Where am I at in these subjects?

② Probability and Statistics

③ Complex Analysis

} beginner /
interrupted studies

→ take a senior level course

④ Differential Equations

⑤ Linear Algebra

} how am I going to rev-up
for a seamless transition into graduate school?

⑥ Scientific
Computing

} independent study over the next year

"adaptive mesh solvers in Julia

solves the Riemannian Problem at the
boundaries..." yeah! Fancy! // Debian

//github

I want to be
exposed to some of this
grammar in the next year.

⑦ \mathbb{R} / Adv. Calc.

Spiwak's Calculus on Manifolds
and his introduction to Diff. Geometry

"Readers should be comfortable with elementary differential equations
and linear algebra and should have had exposure to vector calculus."

my FAVORITE subject outside of mathematics
was PRE-MODERN JAPANESE HISTORY

October 22, 2016

Department of Applied Mathematics
University of Colorado at Boulder

To whom it may concern,

I'd like to matriculate into the department of applied mathematics. As I imagine myself preparing a thesis with a geophysical slant, I appreciate the department's available coursework in dynamic systems. I also appreciate it's computational strength.

Last year I researched Fuchsian differential equations and igneous rock formation. For the former, I used results from Galois theory to find spanning sets of the different solution spaces. For the latter, I classified plagioclase feldspar granules by the thermal conditions at the time of their cooling.

I summarized my conclusions with respect to Galois theory on a poster presented at my college's student research conference. With respect to granules, I finished my work by traveling to Scotland with friends. On June 4th, I pushed my heels and palms into rough, buoyantly exposed, conglomerates of plagioclase, peridotite and olivine for to climb up the side of Glen Sligachan. I'd plan to get out just as much in Colorado.

In pursuit of a master's degree, I'll approach answers to questions such as

- How might we irrigate to conserve significant amounts of water?
- Can we prevent contaminants from diffusing across an ecosystem?
- Which composition of local materials has optimal properties?

For a career, I imagine creating safe places for people, plants and animals to live. To grow from curiosity towards this vocation, I expect to find a professional setting at CU Boulder where I may join a research group in geophysical applied mathematics.

Presently, I'm a clerk for for a social service office in Houston. As a daily practice, I organize and relay important information in *plain language*. This allows me to speak evenly with insurance companies, medical providers, my coworkers and our clients. I will bring this practice as a discipline to CU Boulder.

Under your consideration,

Colton Grainger

P.S. I am applying for a teaching assistantship. As I have worked through advanced calculus manuscripts, I feel confident to bring students through any semester's curriculum of calculus. I am an excellent candidate for an assistantship because I have experience as a peer tutor and course grader. I am also skilled at typesetting explanations and offering clear demonstrations with chalk and blackboard.

Untitled

ROSOFF

You have instructed me in multivariable calculus, differential equations, the COMAP seminar, history of mathematics, and topology. As well, you have served as my academic advisor.

In your courses I learned

- vector calculus (the theorems of Gauss, Green and Stokes)
- introductory point-set topology (in the Moore method)
- to write up my proofs in LaTeX,
- to deliver oral argument, and
- to offer constructive criticism.

I pride myself on proofs I wrote and delivered in your classes. May you kindly discuss my writing skills and tact in presentation?

I am motivated to join a research group which applies mathematics to combat social and ecological injustice. May you please describe how I work with small groups?

Because I believe I will flourish in a structured, research-intensive environment, I look forward to embarking on a steep graduate curriculum. May you help explain my ambition to the application review committee? My potential for growth?

I am applying for a teaching assistantship, in hopes to bring students by the curriculum of calculus. What classes would you recommend me as a TA for?

MAUGHAN

You have instructed me in 18th and 19th century European history. As well, you served as my scholarship advisor last year.

In your courses, I learned to

- search, find and parse historical literature
- concretize examples
- participate in conference style discussions
- write analytically

Because I believe I will flourish in a structured, research-intensive environment, I look forward to embarking on a steep graduate curriculum. May you kindly help explain my ambition to the application review committee? My potential for growth? My ability to research?

I believe I am an excellent candidate for a ``formative graduate experience.'' May you please describe the quality and tenor of my character?

Hey Colton, greetings from Portland, on the run. Happy to write for you (and it will be a very good, detailed recommendation) and good to have all the supporting materials. Put the first deadline in my schedule. Stay in touch. Best, Steve

COMES

You have instructed me in real analysis, geometry and `differential equations and galois theory.' You served as my independent study advisor.

In your courses I learned

- fundamental properties of the real number line,
- the prerequisites for Felix Klein's Erlangen program,

Untitled

- discipline for self study,
- methods to quickly parse mathematical literature.

I am proud of my weekly preparation for our independent study. May you kindly discuss working one-on-one with me?

Because I believe I will flourish in a structured, research-intensive environment, I look forward to embarking on a steep graduate curriculum. May you please give suggestive comments for members of the application committee to place me in challenging, but not insufferable courses?

I am applying for a teaching assistantship, in hopes to bring students by the curriculum of calculus. What classes would you recommend me as a TA for?

Hey Colton,

First off, I'm sorry for the delay in my response.

Thanks for all the stuff. It will be helpful when writing your letter. I will be sure to include the specific points you mentioned. My plan is to write your letter (at least one version of your letter which I can modify for specific applications as needed) sometime in the first 3 weeks of November. I will be in Bonn without my family then, and thus will have lots of spare time on my hands. Don't worry, I will be ready with letters in time for deadlines. I will also send you (probably next week) any thoughts/suggestions I have concerning your application material.

You asked what classes I would recommend you as a TA for. Just to be clear, is that something you would like me to address in your letter, or just for you? I am happy to recommend you as a TA for any undergraduate math course you are interested in. I expect you know (or could quickly learn) any of the mathematics covered in a course equipped with a TA. I also have no reservations about your teaching potential.

Best,
Jonny

DULL

You have instructed me in analytical physics, thermal physics and 'electricity and magnetism.' As well, you have been a professor whom I could frequently visit with questions. Thank you.

In your courses, I learned

- to read and write for physics daily,
- to explore additional resources and texts, and
- to orally communicate complex arguments.

Physics coursework involves many important applications of vector calculus, of probability and statistics, and of partial differential equations. May you kindly describe the quality of my course work in thermal physics and 'electricity and magnetism'?

Electricity and magnetism was a unique class in its focus on small group collaboration. May you please describe how I work with small groups?

My background in physics prepares me for a graduate degree in applied mathematics. May you kindly discuss my ability to work in SI units? To find numerical solutions in Mathematica? To write a brief lab report?

I am applying for a teaching assistantship, in hopes to bring students by the curriculum of

Untitled

calculus. What classes would you recommend me as a TA for?

Colton,

I have started to receive letter requests. If you are applying to be considered for TA work you might want to include any and all experience you have in explaining mathematical concepts including simple algebra to your class mates and others at the Boone table. I think any class that uses your rigorous approach to problem solving/problem analysis would be a good fit for you. I believe the more rigor required for the course the more likely you are to like it and the more the students you teach would take away from it.

Cheers,
James Dull

Undergraduate Syllabus

Colton Grainger

January 21, 2017

2015–2016

MAT-441 Topology

3 credit(s). Taught by Dave Rosoff, with final grade A.

- Dave Rosoff. *Course Notes on Elementary Topology*. Personally distributed, 2016. adapted from notes by Michael Starbird
- An introduction to the techniques and theorems of point-set topology. Approached in a modified Moore method, with emphasis on writing, revising and presenting proofs. Topics included cardinality, separation axioms, compactness, connectedness, continuity, as well as novel proofs for the Heine-Borel theorem and the fundamental theorem of algebra.

MAT-494 Galois Theory for Diff Eqs

2 credit(s). Taught by Jonny Comes, with final grade A.

- Michio Kuga. *Galois' Dream: Group Theory and Differential Equations: Group Theory and Differential Equations*. Birkhäuser Boston, 1993
- An independent study. Explored the correspondence between the fundamental group of the plane with n points removed and its covering surface. Used Galois theory to prune the ring of continuous functions defined out of the covering space down to exactly those functions that are solutions to Fuchsian type differential equations.

PHY-330 Electricity & Magnetism

3 credit(s). Taught by James Dull, with final grade A.

- David Jeffery Griffiths. *Introduction to Electrodynamics*. Prentice Hall, third edition, 1999
- An intermediate level survey of classical electro-magnetic theory including electrostatic and magnetostatic fields and potentials, Gauss's law, Laplace's equation, dielectrics, vector potentials, magnetization and Maxwell's equations.

MAT-370 Geometry

3 credit(s). Taught by Jonny Comes, with final grade A.

- Michael P. Hitchman. *Geometry with an Introduction to Cosmic Topology*. Jones and Bartlett Publishers, 2009

- A preparation for Felix Klein's *Erlangen* program. Developed geometry in terms of a space and a group of transformations of that space. Emphasis on congruence relations. Topics included Möbius transformations, hyperbolic geometry and elliptical geometry and quotient spaces.

MAT-451 Real Analysis

3 credit(s). Taught by Jonny Comes, with final grade A-.

- Stephen Abbott. *Understanding Analysis*. Undergraduate Texts in Mathematics. Springer New York, 2015
- Proceeded from the Axiom of Completeness to rigorously prove results about the convergence of sequences and series. Defined continuity (Lipschitz and uniform), the derivative and nowhere differentiable functions. Used suprema and infima to define the Riemann integral.

MAT-498 Upper Division Seminar

1 credit(s). Taught by Dave Rosoff, with final grade A.

- Douglas R. Shier and K.T. Wallenius. *Applied Mathematical Modeling: A Multidisciplinary Approach*. Discrete Mathematics and Its Applications. CRC Press, 1999
- A student-led recitation concerned with computational methods for mathematical modeling. I presented a introduction to epidemiological modeling, with the early outbreak of HIV in Houston as a case study.

PHY-313 Thermal Physics

3 credit(s). Taught by James Dull, with final grade A.

- Daniel V. Schroeder. *An Introduction to Thermal Physics*. Addison Wesley, 2000
- Physical basis and applications of thermodynamics and statistical mechanics including temperature, heat engines, entropy and free energy. Included an introduction to Maxwell-Boltzmann, Bose-Einstein, and Fermi-Dirac statistics and their application to the solution of thermal, mechanical and electrical problems in fluids and solids.

2014–2015

MAT-431 Complex Variables

0 credit(s). Taught by Dave Rosoff.

- After six weeks, I administratively withdrew for medical treatment.

PHY-400 Quantum Physics

0 credit(s). Taught by Kathrine Devine.

- After six weeks, I administratively withdrew for medical treatment.

MAT-372 History of Mathematics

3 credit(s). Taught by Dave Rosoff, with final grade **B**.

- Carl B. Boyer and Uta C. Merzbach. *A History of Mathematics*. Wiley, 2011
- A historical survey of the ideas, tools, and symbols of mathematics and the people who developed them. Addressed sexagesimal computations, Diophantine equations, as well as medieval Indian analytic geometry. Emphasis on notation and legible proofs.

MAT-461 Algebraic Structures

3 credit(s). Taught by Robin Cruz, with final grade **B+**.

- David M. Clark. Theory of groups. *Journal of Inquiry Based Learning in Mathematics*, (No. 3), April 2007
- An inquiry based course in abstract algebra focused primarily on groups. Addressed basic properties, cyclic groups, LaGrange's Theorem, homomorphisms, isomorphisms, representation theorems, normal subgroups and quotient groups. Many examples.

MAT-498 Upper Division Seminar

1 credit(s). Taught by Dave Rosoff, with final grade **A**.

- Stanley J. Farlow. *Partial Differential Equations for Scientists and Engineers*. Dover books on advanced mathematics. Dover Publications, 1993
- A student-led recitation addressing partial differential equations in mathematical modeling. I presented an application of Fourier analysis to analytically solve the heat equation.

PHY-301 Theoretical Mechanics

3 credit(s). Taught by Kathrine Devine, with final grade **B+**.

- John Robert Taylor. *Classical Mechanics*. University Science Books, 2005
- A survey of classical and modern topics in dynamics. Topics included orbital mechanics, non-inertial reference frames, rigid-body motion, Lagrangian and Hamiltonian methods, and elements of nonlinear mechanics and chaos.

2013–2014

MAT-352 Differential Equations

3 credit(s). Taught by Dave Rosoff, with final grade **C+**.

- Carl B. Boyer and Uta C. Merzbach. *A History of Mathematics*. Wiley, 2011
- A study of the solution and applications of ordinary differential equations including systems of equations using matrix algebra.

MAT-361 Linear Algebra

3 credit(s). Taught by Robin Cruz, with final grade C.

- Robert A. Beezer. *A First Course in Linear Algebra*. Published Online, 2012
- A study of general vector spaces, linear transformations, eigenvalues and eigenvectors.

References

- [1] Dave Rosoff. *Course Notes on Elementary Topology*. Personally distributed, 2016. adapted from notes by Michael Starbird.
- [2] Michio Kuga. *Galois' Dream: Group Theory and Differential Equations: Group Theory and Differential Equations*. Birkhäuser Boston, 1993.
- [3] David Jeffery Griffiths. *Introduction to Electrodynamics*. Prentice Hall, third edition, 1999.
- [4] Michael P. Hitchman. *Geometry with an Introduction to Cosmic Topology*. Jones and Bartlett Publishers, 2009.
- [5] Stephen Abbott. *Understanding Analysis*. Undergraduate Texts in Mathematics. Springer New York, 2015.
- [6] Douglas R. Shier and K.T. Wallenius. *Applied Mathematical Modeling: A Multidisciplinary Approach*. Discrete Mathematics and Its Applications. CRC Press, 1999.
- [7] Daniel V. Schroeder. *An Introduction to Thermal Physics*. Addison Wesley, 2000.
- [8] Carl B. Boyer and Uta C. Merzbach. *A History of Mathematics*. Wiley, 2011.
- [9] David M. Clark. Theory of groups. *Journal of Inquiry Based Learning in Mathematics*, (No. 3), April 2007.
- [10] Stanley J. Farlow. *Partial Differential Equations for Scientists and Engineers*. Dover books on advanced mathematics. Dover Publications, 1993.
- [11] John Robert Taylor. *Classical Mechanics*. University Science Books, 2005.
- [12] Robert A. Beezer. *A First Course in Linear Algebra*. Published Online, 2012.

~~my Prade~~

~~course work~~

~~presentations~~

~~quantitative literacy~~

interest
experience
potential

Idaho Statesman May 10th 2019
Rocky Barker

~~I want to attend school to~~

Quantitative Literacy

How to confront water scarcity in Idaho?

modeling the watershed

removing noise

multigrid
methods

Domain Decomposition

{ Derivative Free Optimization } ★
Luis Nemes Vicente

when will the aquifer be extinguished?

Theory of Groundwater Flow

Aquifers composed of a range of
range in ~~chemical~~ composition,
geological material and physical
structure

valley filled,
basalt filled
sedimentary / Volcanic Aquifer

idaho geology . org

what to do with the drilling data?

How to interpolate? How to use data gathered by proprietary companies
for scientific development?

Queues for water rights

Multigrid methods

"What sets this drought apart from
1992 and before is what water managers
now know about the aquifer. Levels
have dropped an average of 200,000 acre-ft
annually in the Eastern Snake River Plain
Aquifer." ~~late E~~

"Those levels peaked in the 1950s, dropping
since in part due to changes from flood irrigation
to sprinklers and the rise in ground water
pumping for farming."

Polubarinova-Kochina, P. Ya. (1962).
Theory of ground water movement
Princeton, NJ: Princeton University Press.
Pelagosa Yakovlevna Polubarinova Kochina

Wang, Herbert. (1982).
Introduction to groundwater modeling:
finite difference and finite element
methods. San Francisco: W.H. Freeman,