

# **How to Apply for and Win a Prestigious National Fellowship**

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BYU College of Engineering Fellowships Committee  
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A fellowship is like a scholarship, but it's for graduate school and working towards the MS or PhD degree

# Differences between Degrees

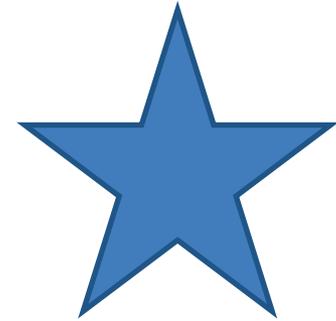
- BS:
  - Understand the field broadly
- MS:
  - Understand scope and breadth of a sub-discipline
  - Create a new design or solution that extends prior work
- PhD:
  - Make unique contributions in sub-discipline
  - Completely understand one problem or a few related problems
  - Solve a recognized open problem
  - Emphasis on writing, scholarship, and publishing ideas

# BYU vs Elsewhere

- Pros of staying at BYU:
  - Continuity, already know professors, programs
  - May take less time
  - Attention/mentoring received from advisors
  - World-class research
  
- Pros of going elsewhere:
  - Top schools have strong brand name
  - Different perspective on ECE
  - Increased network
  - Different course offerings

# Funding

- Most graduate engineering students:
  - Have tuition paid for by advisor / institution
  - Receive a stipend on order of \$20-25k
- Graduate fellowships are available
  - Usually requires strong GPA
  - NSF, NDSEG, SMART
  - Many others



# A TRAJECTORY TO OPPORTUNITIES



A graduate fellowship can be a key to your engineering success. Begin now to prepare for fellowship applications and place yourself on a trajectory to opportunity.

**1 FRESHMAN**

Participate in the  
BYU Honors Program

**2 SOPHOMORE**

Find a faculty mentor  
Apply for an ORCA Grant

**3 JUNIOR**

Participate in undergraduate research  
Publish a research paper  
or give a conference presentation

**4 SENIOR**

Apply for fellowships

**5 GRAD SCHOOL**

Pursue an MS or PhD—or both

**OPPORTUNITIES**

Breakthrough research  
Leadership  
Strategy  
Innovation  
Policy  
Grand challenges  
Entrepreneurship

# PRESTIGIOUS NATIONAL FELLOWSHIPS IN ENGINEERING

## GRADUATE RESEARCH FELLOWSHIPS

Winners typically go to top U.S. graduate schools  
Worth \$30,000–60,000 per year

Aim for 3.8 GPA or higher

Participate in undergraduate research

Apply in the fall of your senior year

Generally reserved for U.S. citizens or  
U.S. persons

BYU's engineering program has a good track  
record of successful candidates



National Science  
Foundation



Department of  
Defense



Department of  
Energy



NASA



SMART



Hertz

## GRADUATE STUDY ABROAD FELLOWSHIPS

Winners go to graduate school in the  
United Kingdom or elsewhere

Various dollar values

Aim for 3.9 GPA

Seek broadening experiences

Apply at the end of your junior year

Generally reserved for U.S. citizens or U.S. persons

Can be very competitive



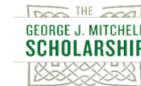
Fulbright



Gates



Marshall



Mitchell



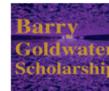
Rhodes

## UNDERGRADUATE SCHOLARSHIPS

Good practice for graduate fellowships

Can be worth several thousand dollars

Apply as a sophomore or junior



Goldwater



Tau Beta Pi



Phi Kappa Phi



Many other options

For more information, contact your department fellowship expert (listed below) or visit [www.et.byu.edu](http://www.et.byu.edu).

**CHEMICAL ENGINEERING:** John Harb, 801-422-4393, [john\\_harb@byu.edu](mailto:john_harb@byu.edu)

**CIVIL ENGINEERING:** Michael Scott, 801-422-6324, [michael.scott@byu.edu](mailto:michael.scott@byu.edu)

**ELECTRICAL AND COMPUTER ENGINEERING:** Karl Warnick, 801-422-1732, [warnick@ee.byu.edu](mailto:warnick@ee.byu.edu)

**MECHANICAL ENGINEERING:** David Fullwood, 801-422-6316, [dfullwood@byu.edu](mailto:dfullwood@byu.edu)

**SCHOOL OF TECHNOLOGY:** Richard Helps, 801-422-6305, [richard\\_helps@byu.edu](mailto:richard_helps@byu.edu)

# BYU has a Prestigious Scholarships Office

- They are not BYU's Scholarship Office or BYU's Financial Aid Office
- What they do:
  - Promote national and international scholarships and fellowships
  - Help students apply for external scholarships
  - Make scholarship resources easily accessible
- Where they are:
  - Maeser Building
- Contact info:
  - [national.scholarships@byu.edu](mailto:national.scholarships@byu.edu)
  - <https://ugrad.byu.edu/scholarships>



# Prestigious Fellowships at BYU

BYU has a heritage of excellence in winning these awards:

- 35 Goldwater
- 28 Gilman
- 59 Fulbright
- 4 Gates Cambridge
- 5 James Madison
- 11 National Defense Science & Engineering
- 157 National Science Foundation Graduate Research

# Graduate Fellowships

## **General and Humanities Fellowships:**

- Marshall
- Mitchell
- Rhodes
- Gates
- Fulbright
- Institute for Humane Studies (IHS)
- Intercollegiate Studies Institute (ISI)
- National Security Education Program (Boren)
- Woodrow Wilson (Pickering)
- Samuel Huntington Public Service Award
- James Madison Memorial Fellowship

## **Science, Engineering & Technology:**

- Hertz Foundation
- Department of Energy Computational Science Graduate Fellowship
- National Defense Science and Engineering Graduate Research Fellowship
- National Science Foundation Graduate Research Fellowship Program
- NASA Space Technology Research Fellowship
- National Institutes of Health-Graduate Partnerships Program
- Rocky Mountain NASA Space Grant
- Tau Beta Pi (Engineering)
- U.S. Department of Energy
- U.S. Department of Homeland Security
- Science, Mathematics And Research for Transformation (SMART) Scholarship (DOD)

# National Science Foundation Graduate Research Fellowship

- *Support students who have demonstrated their potential for significant achievements in science and engineering research*
- College seniors or 1<sup>st</sup> year graduate students
- Fields of science, mathematics, or engineering
- Stipend of \$32,000, education allowance, one-time \$1,000 International Research Travel Allowance (\$132k total value)
- 3 years
- Good GPA (3.8+), research products – journal paper and/or conference paper

Deadline: October to Mid-November  
(deadlines vary by discipline)

# NSF GRFP Application

- Submit at [www.fastlane.gov/grfp](http://www.fastlane.gov/grfp)
- U.S. citizens, nationals, and permanent residents
- Academic transcripts
- Three letters of reference (online)
- Personal statement
  - How will grad school prepare you to expand scientific understanding and broadly benefit society?
- Research statement
  - Intellectual merit and broader impact on society
  - Creative and transformative
  - Well-reasoned research plan
- GRE scores optional
- Around 2,000 awards out of 12,000 applications (17%)
- See [nsf.gov/grfp](http://nsf.gov/grfp) for more info

# NASA Space Technology Research Fellowship

- “NASA’s Space Technology Mission Directorate (STMD) seeks to sponsor U.S. citizen and permanent resident graduate student researchers who show significant potential to contribute to NASA’s goal of creating innovative new space technologies for our Nation’s science, exploration, and economic future.”
- Technology areas: propulsion systems, space power and energy storage, communication, sensor systems, science instruments, nanotech, materials, structures, thermal management, etc.
- Open to MS and PhD students
- \$36,000/yr stipend, \$32,000/yr in travel, fees, etc. – over \$200,000 total value
- NASA research collaborator, visit to NASA research center or lab
- Application:
  - Personal statement
  - Project narrative
  - Schedule
  - Curriculum Vitae (CV)
  - Transcripts and GRE scores
  - Letters of recommendation
- **Deadline: November**

# Students Preparing for Prestigious Scholarships Should

- Participate in undergraduate research (thanks, IMMERSE!)
- Develop meaningful relationships with people who can open doors for you – faculty mentor
- Know scholarship eligibility requirements and deadlines
- Apply
- Keep trying!

# Advisor and Recommenders

- Mentor and Advisor
  - An advisor is a critical contact; he or she will help you develop a competitive application, help you write and edit your personal statement and research plan, and provide answers to questions you have along the way.
- Recommenders
  - Choosing the right recommenders can give your application the competitive edge.

# Letters of Recommendation

- Carefully select your recommenders
  - Letters must be specific and include details
  - Choose professionals and academics
  - Recommendations need to be positive and well written (we can help faculty with this)
- Be helpful
  - Provide recommenders with specific information about the scholarship and yourself. A brief listing of your accomplishments or a draft letter will make writing a glowing letter about you much easier for them
- Respect your recommenders' time
  - Give recommenders 2-4 weeks to write the letter.
  - Let them know the deadline
- Follow up
  - Drop in a week before it is due to offer any additional help and remind them of the approaching deadline.

# Application

- Make sure to follow directions:
  - Deadline
  - Be complete and correct
  - Appearance is important
- Start early and revise
  - Write your essays early and seek feedback from qualified editors! Revision is not optional. Only those who revise, revise, revise will be successful
- Aim to submit your application early. Last minute crises often occur

# Personal Statement

- Personal/intellectual biography in narrative form
- Discuss personal motivations, experiences, activities, and how they relate to your goals
- Reveal your personality
- Make it memorable but not frivolous or canned

# Principles of Clear Writing

Many common rules of grammar are either useless (write clearly!) or can be ignored (split infinitives, don't begin with and or but)

## Are there principles of clear writing?

### Sentence level:

- **Clarity:** Subjects of sentences are the “character” in the story and verbs express actions
- **Passive voice** is often used in technical writing but first person is also acceptable
- **Stress:** Familiar information at the beginning of a sentence, end with new information
- **Concision:** Eliminate unnecessary words, change negatives to positives, trim metadiscourse (therefore, however, note that)
- **Elegance:** End a sentence with strong words, use balanced phrases

### Paragraph level:

- **Stress:** Give the topic of a paragraph at the end of the first sentence
- **Cohesion:** Ends of sentences match the beginning of the next
- **Coherency:** Beginnings of sentences in a paragraph are consistent

From Joseph Williams, *Style: Lessons in Clarity and Grace*, which is actually fun to read. See ECEn 692!

## Personal Statement

Only a few months ago, Boulder, Colorado experienced widespread flooding and high numbers of landslides as a result of torrential rainfall. These events cost millions of dollars and numerous lives. Just years ago, New Orleans flooded as a result of Hurricane Katrina, and the floodplain rivers of Bangladesh inundate cities with water almost annually. Natural hazards exemplify only some of the plethora of issues—from adequate food production and distribution to infrastructure maintenance and repair—that society still needs to understand and address. However, the complexity of these issues is seen, if for no other reason, because they have not yet been satisfactorily solved. I entered the civil engineering field because I hoped to lower the costs (both to life and to property) that natural and human-induced hazards generate. Continuing in this field, I have learned that many of these problems simply need to be better understood before satisfactory decisions can be made. My aim in completing both a master's and a doctoral degree is to get the training I will need to begin addressing the hazards facing society today.

## Personal Statement

Some time ago, a question from Facebook's Questions application caught my eye. Someone had asked "Why do we need to learn math? When are we going to need it after high school?" As I thought about these questions, I realized that the real questions were "why do we need to learn? How are we going to use that learning after school?" I reflected back to my high school classes where many of my classmates asked similar questions. Although I didn't have much of an answer back then, I enjoyed learning, especially math and science. This love of learning eventually led me to my answer.

## Personal Statement

Throughout my life, I have always felt that I should use my talents and abilities to make a positive impact on the world and that I could never truly be happy without serving a purpose greater than myself. After being offered a full-tuition academic scholarship at Brigham Young University, I decided to attend and study computer science to apply my strengths. Although I thought that it was a good choice, I lacked passion in my studies because I did not make the connection between engineering and the positive benefits it can have on individual lives. It was not until I spent two years in India that my eyes were opened. I traveled to various cities and villages throughout India as a volunteer for the Church of Jesus Christ of Latter-day Saints. I met thousands of people and became aware of how blessed my life had been in comparison to many who struggle daily for the bare necessities of life. I met with many people whose adversity had led to feelings of hopelessness and despair. In many ways, the experience was frustrating because I knew that I could never help everyone who needed it. There were simply too many to count.

## Proposed Plan of Research

Over the last few decades, characterizing optical fibers based on their transmission properties such as attenuation, dispersion, and spectral response has enabled rapid development and expansion within the telecommunications industry and the field of fiber optics. However, it is not a sufficient means of characterization for advanced fibers and fiber-based devices. The underlying physical properties of fibers, such as size, refractive-index distribution (RID), and residual-stress distribution (RSD), determine the optical properties and performance of such devices. Currently, novel fibers and fiber-based devices are conceived, designed, fabricated, and then characterized by their measured transmission. Assumptions about their physical properties are made to reconcile observed transmission characteristics with theoretical prediction and fabrication changes are made based on these assumptions. The ability to directly measure three dimensional RID and RSD of fibers and fiber-based devices would fundamentally transform the research process as these assumptions would be replaced with measured data.

## Proposed Plan of Research

Computational fluid dynamics (CFD) has sought numerically refined, quantitatively accurate, and algorithmically stable solutions to the Navier-Stokes equations for years. Proper modeling of these equations is crucial to making informed decisions about topics varying from wind loads on buildings to flood mitigation. However, solving these equations is often difficult because of their nonlinear structure and dependence on time and geometry (Anderson 2009). For example, traditional finite element analysis fails to accurately express these flows because it uses piecewise-linear functions to approximate flow, fundamentally changing the solution with grossly simplified geometries. As a potential NSF Graduate Research Fellow, I aim to model the Navier-Stokes equations more stably and accurately than traditional methods using isogeometric analysis and T-splines.

# Takeaways

- 1. Fellowships provide financial support for graduate school**
- 2. Get more information about graduate school and fellowships:**

**<https://ece.byu.edu/graduate>**

**<https://ece.byu.edu/honors> (I'll post these slides here)**

**<https://engineering.byu.edu/scholarships>**

**Contact Karl Warnick**