

why YOU ought to consider an **ACADEMIC CAREER**



Dr. Rahnema



Dr. Whiteman



Dr. Graham



Dr. Kurfess



Soon-to-be-Dr.
Tomar

MEGA
A PANEL DISCUSSION

22 June 2005, 11am

MRDC4211

Agenda

- Motivation
- Intro to panelists
- Dr. Rahnema -academia versus industry
- Dr. Whiteman - the fun of teaching
- Dr. Kurfess - the industrialist in a faculty
- Dr. Graham - research at an academic setting
- Soon-to-be-Dr. Tomar: why did I choose an academic career path

Motivation

- Carnegie Classification of Universities



Research I

Research II

Doctoral I

Doctoral II

Masters I

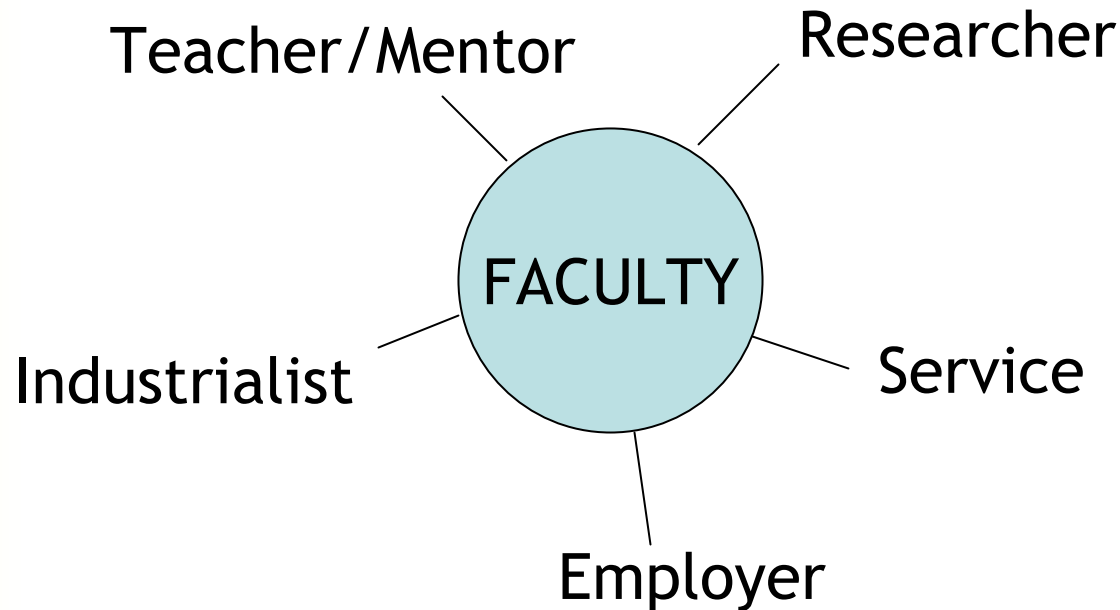
Masters II

Baccalaureate

THERE IS A DIFFERENT WORLD OUT THERE BEYOND RESEARCH I INSTITUTIONS

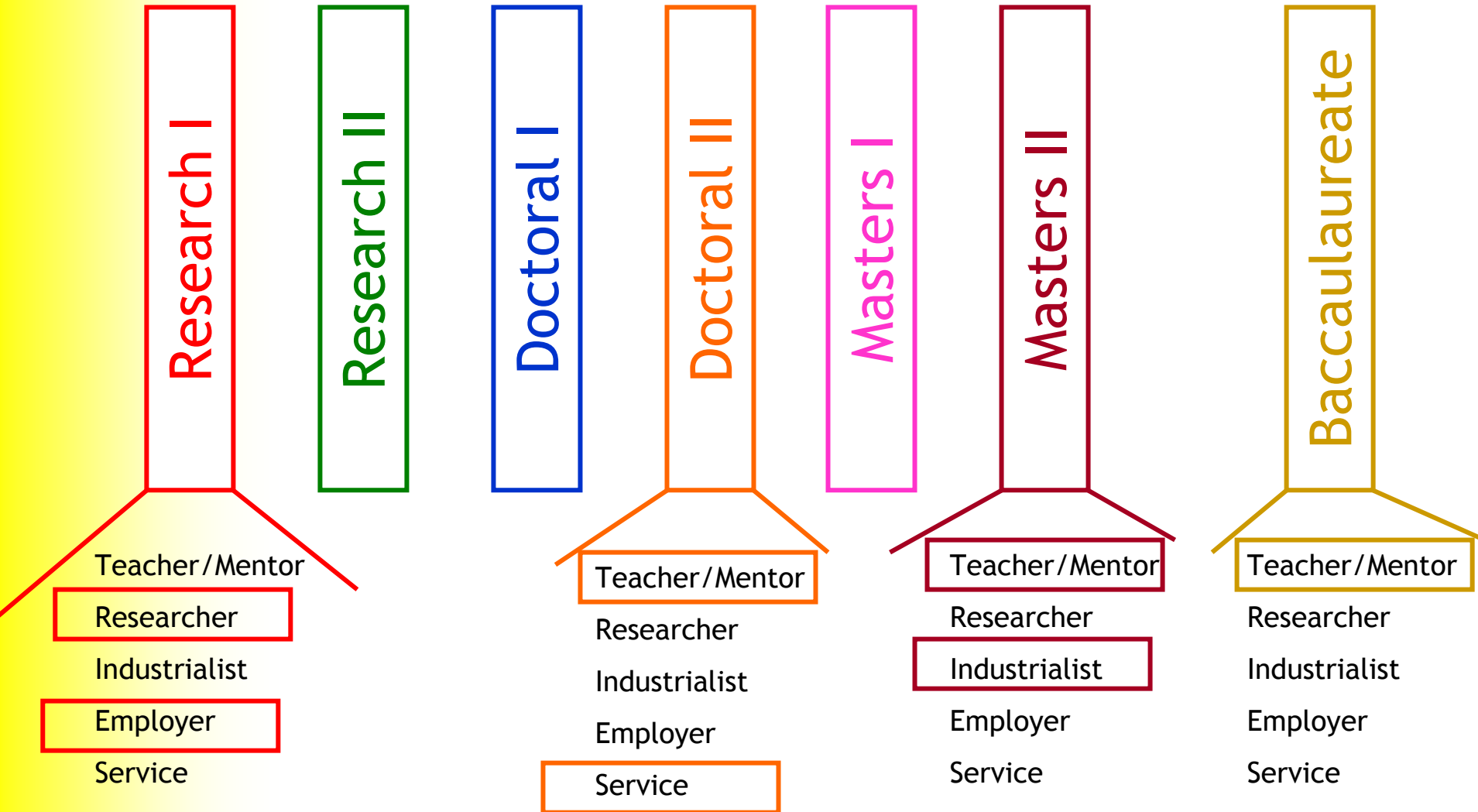
Motivation

- Multi-faceted role of a faculty



WHICH ROLE OR ROLES DO YOU WANT TO PLAY?

Pick and choose your roles!



THE PANELISTS

WILL HIGHLIGHT SOME OF THE ROLES OF A
FACULTY

Dr. Farzad Rahnema



Reactor physics,
perturbation and variational
methods, computational
transport theory, criticality
safety

Professor and Associate Chair of the
Woodruff School,

Chair of the Nuclear and Radiological
Engineering/Medical Physics Program

- PhD, UCLA, 1981
- Principal Engineer at GE Nuclear Energy
- Came to Tech in 1992 as Associate Professor
- Fellow of the American Nuclear Society (2003)
- Guest Editor for Journal on Transport Theory and Statistical Physics

Dr. Wayne Whiteman

Director of the Office of Student Services

- PhD, GA Tech, 1996
- Professor at the US Military Academy, West Point
- Came to Tech in 2003 as Senior Academic Professional
- GA Tech Women in Engineering Faculty Excellence Teaching Award, 2004
- Tau Beta Pi Eminent Engineer, 2001
- Registered P.E. in Virginia



Vibrations, structural dynamics, nonlinear dynamics, and engineering education

Dr. Tom Kurfess

Professor



System dynamics, control, metrology, CAD/CAM/CAE, and precision system design

- PhD, MIT, 1989
- Associate Professor at Carnegie Mellon
- Came to Tech in 1994 as Associate Professor
- Fellow of ASME (2004)
- Outstanding Faculty Leadership for Development of Graduate Research Assistants Award, 2002
- W. Roane Beard Outstanding Teacher Award, 2000
- NSF Presidential Faculty Fellowship, 1993-1998
- ASME/Pi Tau Sigma Gold Medal Award, 1995

Dr. Samuel Graham

Assistant Professor

- PhD, GA Tech, 1999
- Senior Member of the Technical Staff at Sandia National labs
- Came to Tech in 2003 as Assistant Professor
- SME M. Eugene Merchant Outstanding Young Manufacturing Engineer Award, 2004
- NSF Facilitating Academic Careers in Engineering and Science Grant, 2003



Microscale heat transfer, thermophysical properties, nanostructured materials, nanodevices, and device reliability

Almost-Dr. Vikas Tomar



Mechanics of materials;
computational - MD, FEM

Ph.D. Candidate

(Advisor: Dr. Min Zhou)

- Next stop: Assistant Professor, University of Notre Dame
- Came to GaTech in 2001
- Topper PhD qualifiers (Spring 2002)
- DAAD fellowship award by Germany (2000-2001)
- Nano-Science and Technology (NaST) fellowship recipient 2003-2004
- 3 refereed journal papers, 3 conference proceedings and 1 book chapter



Academia versus Industry

Dr. Farzad Rahnema

Industry

- **Research and Development is the most likely job for a PhD**
 - **Technical track: mostly work as a member or a leader of a team**
 - Research is highly product and customer driven
 - Development periods are relatively short ranging from one to several quarters (companies are driven by short term earnings)
 - less freedom than academia
 - Publication is not encouraged and most of the times not allowed
 - This leads to reduced visibility affecting the ability to switch to academia
 - May improve on this by working for national laboratories
 - Generally, the research is technically more challenging
 - Must solve real world problems
 - **Management track**
 - Mostly, managing technical people
 - Less technical
 - But get to determine direction of R&D
 - **Regardless of the job track, work is highly focused**
 - i.e., unlike academia, the role is less multifaceted

Academia -1

- Lots of freedom within the multifaceted role
- You can think of it as running your own company
 - Employ UGRAs, GRAs, research engineers and faculty, administrative assistant, subcontractor, ...
 - Develop products that can be marketed or used to attract research funding
- Must excel in all areas of teaching, research and service
- Ingredient for success
 - very good interpersonal skills
 - time management skills
 - deep knowledge of the active fields
 - good research skills
 - good lecturer
 - good teacher and mentor
 - willing to take a risk
 - good salesman
 - good innovator
- Measure of success
 - Graduate MS and PhD students
 - Level of scholarly activities (e.g., peer reviewed publications, patents)
 - Level of funding support for your research activities
 - Level of professional and on-campus service

Academia -2

- Research
 - Attract funding support for your research
 - Research and development activities - new ideas, extend/improve current state of the art
 - Supervise graduate students
 - Publish in peer reviewed journals
 - Present research work at technical conference
 - Manage graduate students, postdoctoral fellows, research faculty, ..
 - Ultimately must bring visibility to your program as well as to the institute
- Teaching
 - Teach courses
 - Develop new courses
 - Train students in your research area
 - Fill a gap in the department
 - mentor students
- Service
 - Participate in campus service activities
 - Committees, faculty advisor of student chapters, ...
 - Participate in activities that benefit your professional societies
 - Committees, division officers, chair technical sessions, review papers, journal editor, organize technical sessions or conferences, ...



The fun of teaching

Dr. Wayne Whiteman

NOTE: DR. WHITEMAN JUST GAVE A TALK ON HIS CAREER PATH WITHOUT SLIDES; THE FOLLOWING SLIDES ARE HIS SLIDES USED IN TP CLASS LECTURE

Thoughts on Teaching

Dr. Wayne Whiteman

A Compendium of Learning Principles

- Be enthusiastic and demonstrate the joy of learning.
- Use images and visual learning.
- Ensure students are engaged (active).
- Have positive expectations of students.
- Provide means for students to be challenged, yet successful.

A Compendium of Learning Principles (*continued*)

- ◆ **Encourage students to teach other students.**
- ◆ **Care about what you are doing.**
- ◆ **Encourage students to take ownership of their learning.**

Good teaching takes time and hard work.

Lowman says...

“The subtleties of a college teacher’s behavior toward a class *throughout the term* do more to produce optimal class atmosphere than sweeping structural changes at the beginning.”

Developing Interpersonal Rapport

- **Assistance outside of class:**
 - *Always* try to make time to see a student who asks for help.
 - *Seem* eager to see a student, even if you are not.
 - Don't be punitive.
- **Try to be accessible (within reason)**

Developing Interpersonal Rapport

Be Fair, Flexible, and Responsive

- Ensure grading is as fair and objective as possible.
- Solicit feedback, and respond to it.
- Demonstrate flexibility, when appropriate.

Establish a Positive Classroom Environment

- Let your own personality show through.
- Have a positive disposition.
- Maintain *contact* with your students as much as possible.
- Avoid cynicism about students.

Lowman says...

“Outstanding teachers have often expressed the sentiment that to become a *great* classroom instructor, one must *genuinely like* college-age students and identify with their interests, both serious and foolish.”





Industrial Affiliations

Dr. Tom Kurfess

Industrial Affiliations

- Why work with industry?
- Differences between industry and government
- Leveraging industrial collaboration
- Hooking industry
- Consulting vs. Research
 - Research / Development / Implementation
- Industry and your students



Research at an academic setting

Dr. Samuel Graham

Why Research in Academia?

- **Research**: investigation or experimentation aimed at the discovery and interpretation of facts, ... or the practical application of new or revised theories or laws. *Webster's*

Research may be performed in private corporations, government laboratories, academic institutions.....or your own basement.

Academic institutions offer freedom of exploration and thought not found in any other environment. It is a privilege, but comes with many responsibilities.

Academic institutions offer the ability to combine teaching and education to impact the lives of the next generation of scientist and engineers. Being a good researcher helps to enrich and enhance your teaching.

May lead to additional financial benefits.

Research in Academia

Personal Comparison

Research while at SNL

3.5 year program to study environmental effects on the performance of thin-film EUV optics.

2 year program to initiate a microscale heat transfer lab. (Applied to MEMS devices)

main interest



Research Since Arriving at GT

3 year program to study thermal transport in organic semiconductor thin-films.

3 year program to develop micro/nanoscale Raman thermometry technique

5 year program to study thermal transport in wide band gap semiconductors

3 year program to study manufacturing techniques for flexible electronic components

1 year program to develop high temperature thermal conductivity measurement techniques for thin-films.

Research in Academia

- Research Production is a key component in the way you are evaluated:
 - *research funding*
 - *papers published in scholarly journals*
 - *students you have trained*
- *Obtaining research funding: very competitive. Must be very aggressive, have great ideas, and sell them well.*
- *Expand beyond the scope of your PhD research.*
- *Be sure to compete for special funding for Assistant Professors*
 - *NSF CAREER Awards*
 - *DoD Young Investigator Awards*
 - *DOE PECASE Awards*

Research in Academia

Many opportunities in Interdisciplinary Themes and National Initiatives:

National Nanotechnology Initiative (www.nano.gov)

NSF Priority Areas (http://www.nsf.gov/news/priority_areas)

Nanoscale Science & Engineering	Biocomplexity in the Environment
Human & Social Dynamics	Mathematical Sciences

DOE Hydrogen Fuel Initiative (\$1.2 Billion) (<http://www.eere.energy.gov>)

DOE FreedomCar Program and a host of others (<http://www.eere.energy.gov>)

Seed funding may exist with Science and Technology Centers, MRSECs, and ERCs

Network and communicate your research with others, especially those outside of your department.

Make sure that your contributions to a multi-PI program are clear.

Research in Academia

- Other funding may be obtained from NSF core discipline areas as well as Mission Agencies and industrial partners:
DARPA, DoD, DOE, NIH, etc.
- Generate good ideas and present unique solutions to funding agencies:
Communicate with Program Managers and volunteer to review proposals (NSF).
Attend workshops or conferences sponsored by the Mission Agencies.
Participate in summer research programs at various agencies.
- For less research intensive universities and colleges, obtaining research funding can still enhance your career. Research can be performed in areas of Engineering Education or in more technical areas.
Partnerships with Research I institutions can be fruitful.



Why did I choose an academic career path

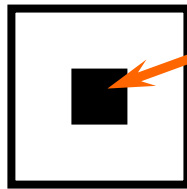
Soon-to-be-Dr. Vikas Tomar

Some Questions!

- ✓ **Why did I go for PhD?**
- ✓ **What is the most effective way I can achieve my purpose?**
- ✓ **What are my personal attributes?**

Division of Labor for a PhD

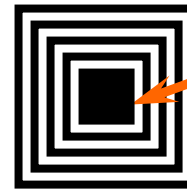
Academia



Its Me!

Its Open!

Industry



Its Me!

There Are So Many Boxes!

I Have Some Answers!

- ✓ **I get to choose in academia**
- ✓ **I get maximum credit for my work**
- ✓ **I have my philosophy and I am expected to explore and expand it as a part of my profession!**
- ✓ **I can be an entrepreneur in an environment that is extremely supportive of my knowledge**
- ✓ **I get investment for my promise and they (My support framework) just want me to succeed in doing what I want to do!**

I Don't Want Economics to Mould My Thinking!

I Want to Share

As a teacher I expect to learn, As a teacher expect to understand, As a teacher I expect to think, As a teacher I expect to teach, and as a teacher I expect to share...

I try and then I learn and then I share and then I try again....

Wrap Up

- Plenty of food for thought
 - Enough to get you to consider an academic career?
- Slides will be up on MEGA website
 - <http://www.me.gatech.edu/mega>
- Time for Q & A