My Road to CAREER

2013 CISE CAREER Proposal Writing Workshop
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My Background

Education and Experience

1999 B.A. and B.S. Swarthmore College
2007 Ph.D. (Mech Eng) Univ of Pennsylvania
2007 – 2008 Visiting Assistant Professor Swarthmore College
2008 – Present Assistant Professor Drexel University

Research Area

• Robotics: Robot swarms, Networked robots
• Controls: Distributed control and coordination

Number of CAREER Workshops Attended: 1
CAREER Submissions: 3 (2 declines)
• Road to Tenure is Unique
  » Institutional Factors
  » Personal Factors

• Hindsight is 20/20

• Universal Tenure Advice Axiom
  » $i = 1, \ldots, k$ where $k \in \mathbb{Z}$
  » $A_i$ – set of advice provided by $i$

\[
A_1 \cap A_2 \cap \ldots \cap A_k \equiv \emptyset
\]
Picking the Problem

• “Be Brave” – Kostas Daniilidis (CIS UPenn)
  » Important/Big Problems vs Pet Problems
  » Who cares?

• 6 – 8 Samples of Awarded Proposals

• Proposed work and # of PhD Students

• 3 CAREER Attempts:
  1. Analysis of Stochastic Behaviors in Robot Ensembles
  2. A Chemistry-Inspired Framework for Robot Ensemble Coordination
  3. A New Paradigm in Control and Coordination of Robot Teams in Geophysical Flows
Attempt 1: July 2009

• Strengths:
  “the idea is interesting, and getting inspiration from chemistry might help ...”

  “… high-risk ... w/opportunity for good payoff ...”

• Weaknesses:
  “... little evidence ... the proposed approach will work ...”

  “… not convincing why the approach is more likely to succeed than other ...”

  “… not convincing that the idea has real potential ...”
Attempt 2: July 2010

- **Strengths:**
  
  “... idea is well received ...

- **Weaknesses:**
  
  “... project is ambitious and high risk ...

  “... not clear how macro relates to micro ...

  “... experimental details are missing ...”
Differences

• CAREER Proposal Writing Workshop
  » Better written w/ clearer goals and objectives
  » Feedback from mock panels

• More details and results
  » Publications, seminar talks, conference workshops

• Received *detailed technical* feedback

• More samples of successful proposals

• RESULT: NRF -> Competitive
Attempt 3: July 2012

• Strengths:
  “... mathematical approach is exciting and interesting...”
  “... work seems complementary with the existing literature ...”

• Weaknesses:
  “... concern about practicality of the experimental approach... tempered by the basic science nature of the work ...”
  “... concern with overlap with ONR award ...”
Differences

• 2010 ONR Summer Faculty Fellow
  » Nonlinear Systems Dynamics Section, Plasma Physics Division, Navy Research Lab

• New Mentors
  » NRL Mentor
  » NSF NRI Collaborative Proposal Experience

• Application
  » Monitoring and track of geophysical fluid dynamics

• Scope
  » Intellectual merit & broader impacts
  » 2009/2010 proposed work -> 1 objective in 2012
Lessons Learned

I. The Importance of Mentors

II. Getting Feedback

III. Don’t Underestimate Good Grantsmanship
I. The Importance of Mentors

- Learn to leverage your network/community
- Collaborative projects
- Good, bad, and knowing the difference
- Informal Annual Reviews
- Participate in NSF Panels
- Talk to NSF PDs
II. Getting Feedback

• Keep Publishing!
  » Main Difference between 2009 and 2010 – More results!
  » Networking

• Learning to read in between the lines
  » 2009 Strength:
    “... high-risk ... w/opportunity for good payoff ...”
  » 2010 Weakness:
    “... project is ambitious and high risk ...”

• Good, bad, and knowing the difference
  » Papers vs Proposals
III. Good Grantsmanship (1)

Source: Honing Your Proposal Writing Skills by Dr. George A. Hazelrigg (NSF ENG PD)

- Words that do not mean “research”
  » develop, design, optimize, control, manage, etc.

In 2009:
My research interests are centered on the development of scalable control and coordination strategies ...

In 2012:
The goals of this project are to overcome the theoretical and technical challenges of developing a general math & control framework ...
III. Good Grantsmanship (2)

Source: Honing Your Proposal Writing Skills by Dr. George A. Hazelrigg (NSF ENG PD)

- Goals vs. Objectives and knowing the difference
  - Goals -> Scope
  - Research Objectives -> Specific methodology

In 2009:

  The principal objective of this work is to combine ...

In 2012:

  The goals of this project are to overcome the theoretical and technical challenges of developing a general math & control framework ...
III. Good Grantsmanship (3)

Source: Honing Your Proposal Writing Skills by Dr. George A. Hazelrigg (NSF ENG PD)

- Listen to George!
- I am not kidding, list to George!

by Jian Cao (Northwestern)
Parting Words

- Be Selfish
  - Start Early and Prioritize
- “To thine own self be true” – Shakespeare
  - Robotics vs. Controls
  - Strengths vs. weakness – leverage/plan accordingly
  - Do Right for and by YOU!
- Remember the Roses!
  - Ave. Road to Tenure 5-7 years
  - Stress about the RIGHT things
  - CAREER vs. Career
Acknowledgements

- Workshop Organizers:
  - Jie Wu, Shan Lin, and Chiu C. Tan
  - Richard Voyles (NSF PM, U of Denver)
  - NSF

- Questions?