

Being a successful teacher-scholar in an evolving university

The research portion of your Academic Portfolio

Thomas Vojta – Physics

Ray Luechtefeld – Engineering Management

Kumar Venayagamoorthy – Electrical & Computer Engineering

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NSF Career Awards

Ray Luechtefeld – CAREER: Development and Evaluation of Portable, Computationally Intelligent Team Training

G. Kumar Venayagamoorthy – CAREER: Scalable Learning and Adaptation with Intelligent Techniques and Neural Networks for Reconfiguration and Survivability of Complex Systems

Thomas Vojta – CAREER: Quantum Phase Transitions in Electronic Systems



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The NSF CAREER program

“Faculty Early Career Development Program”

“offers the NSF's most prestigious awards in support of the [early career-development](#) activities of those teacher-scholars who most effectively [integrate research and education](#)”

- **NSF Solicitation:** NSF 02-111 (currently under revision)
Program Target Dates: Late July Annually
Cross Cutting Program: Foundation wide activity
- **Eligibility:** Untenured Assistant Professors can submit three times
- **Program Philosophy**
Must have an [integrated research-education-outreach plan](#)
Support teacher-scholars likely to become leaders in their fields
- **Evaluation criteria**
Technical merit, broader impacts

Establishing a balanced and robust program of research and scholarship

- **What to Research?**
- **Publications**
- **External Funding**
- **Networking**
- **Integration of Research and Education (Teaching)**

Un-Successful Education Research

“We want to do research on teaching X. We’ll have YY students in the class and will look at their grades to see what they learned. Then we’ll report the results.”

“We tried out a new way of teaching Z. Then we surveyed students about how they liked it. The average evaluation was 3.5 on a 4.0 point scale.”

Suggestions for Successful Education Research

Education Research components to include

- **Research Context**
- **Research Question**
- **Research Methods**

Research Context

The Research Context is the “lens” through which you view your research. It should be based on existing literature and theory.

Examples of Theories:

- **Theories of Learning (e.g., from observation, rote, etc.)**
- **Theories of Instruction (e.g., sequencing, events, and media)**
- **Test Theories (investigating reliability and validity)**

Research Question

The Research Question is what you are trying to answer. It should be rooted in your context.

Research Question should:

- **Sets direction (leads to specific hypotheses)**
- **Sets boundaries (neither too broad nor too narrow)**
- **Defines the research**

Research Methods

Research Methods describe “how” you are going to investigate the question.

Should include:

- **Setting and Approach (e.g., Lab, # of students, etc.)**
- **Design of the research (e.g., experimental design)**
- **Data collection approach (survey, observation, etc.)**

NSF CAREER: Scalable Learning and Adaptation with Intelligent Techniques and Neural Networks for Reconfiguration and Survivability of Complex Systems

G. Kumar Venayagamoorthy

**Associate Professor of Electrical and Computer Engineering &
Director of the Real-Time Power and Intelligent Systems Laboratory**

Missouri S & T

<http://rtpis.mst.edu>

<http://web.mst.edu/~ganeshv>

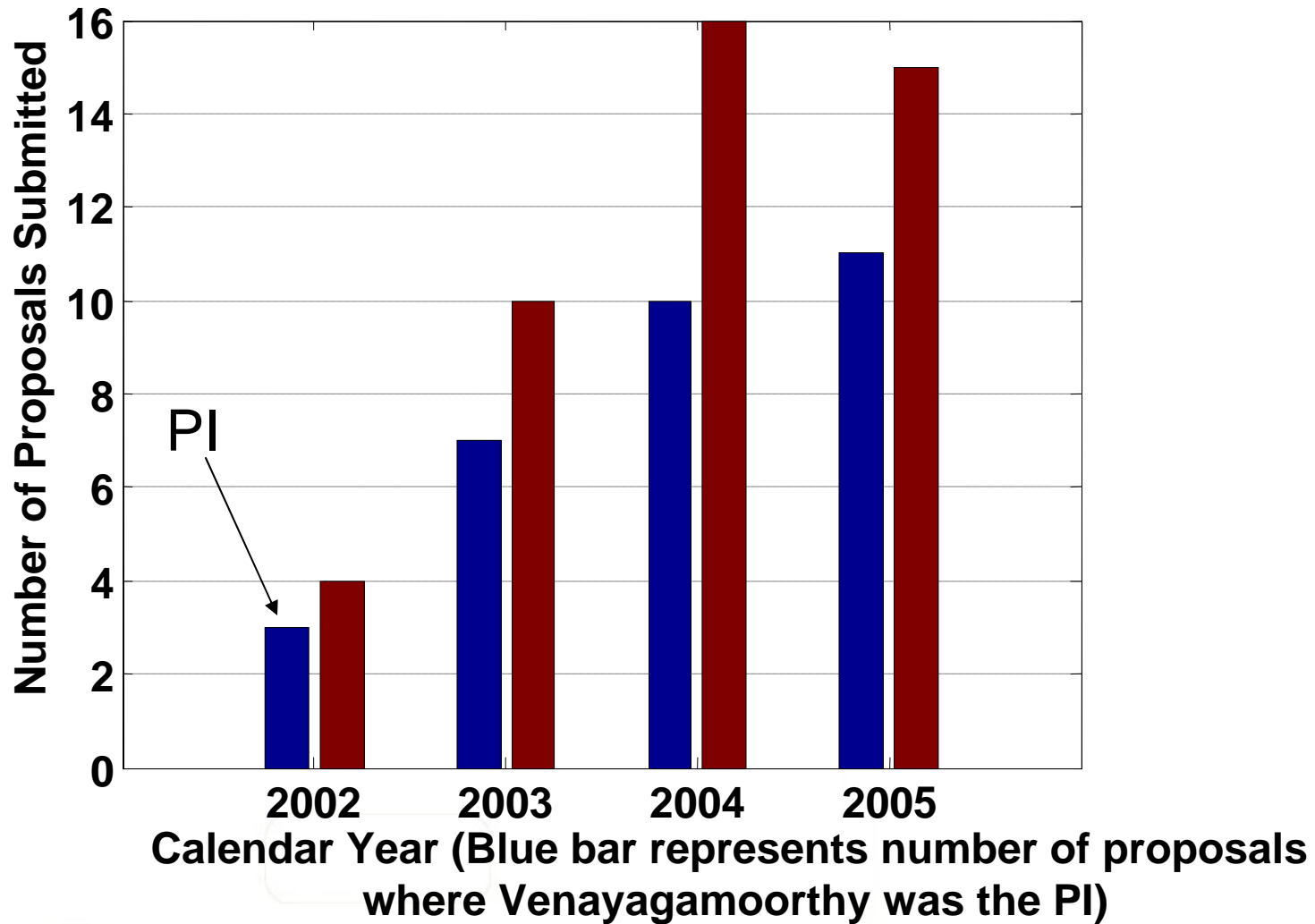
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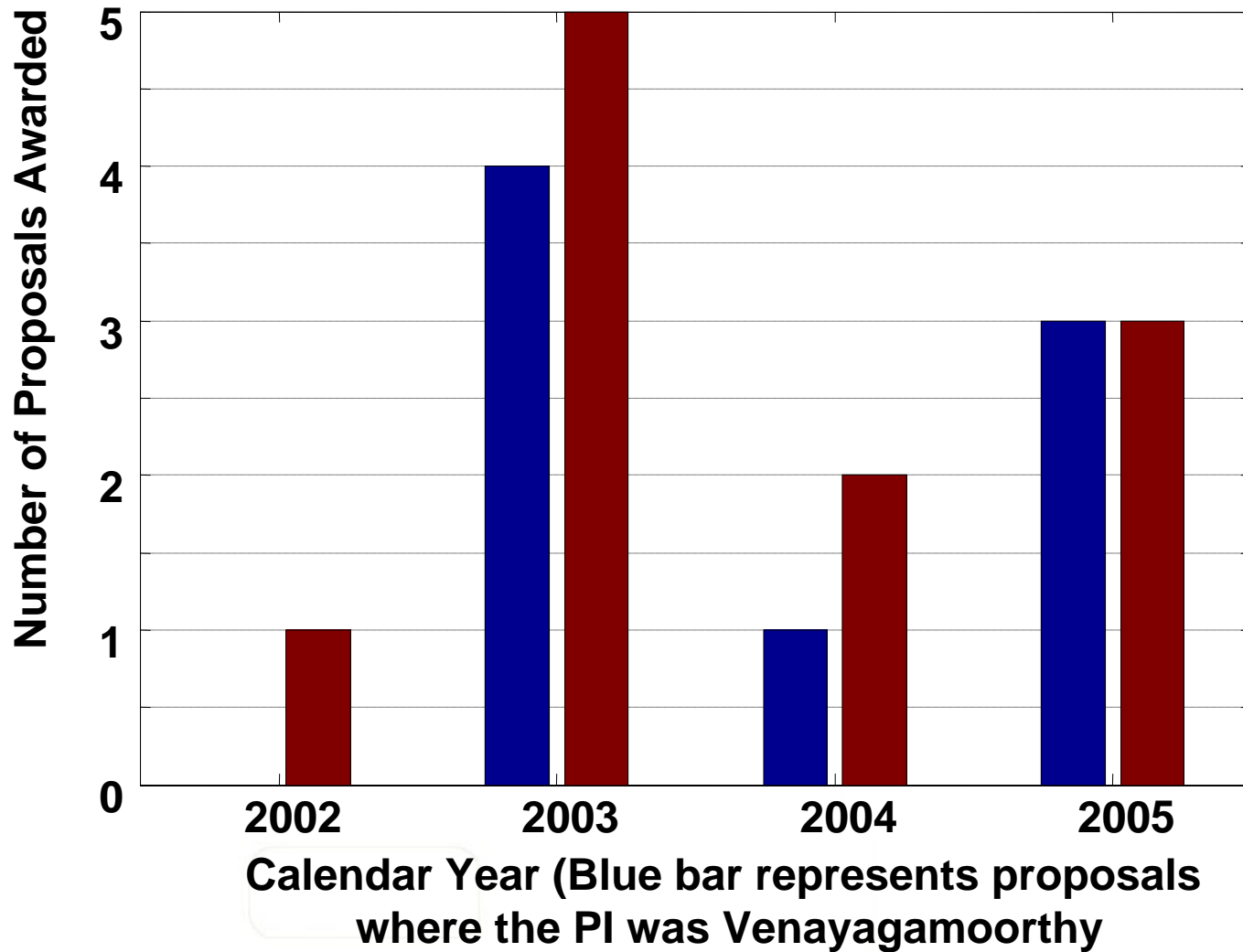
Establishing a balanced and robust program of research and scholarship

- **What to Research?**
- **Publications**
- **External Funding**
- **Networking**
- **Integration of Research and Education (Teaching)**

45 Proposals Submitted in 42 Months - \$ 14.6 Million
Venayagamorthy PI on 31 Proposals - \$ 4.8 Million

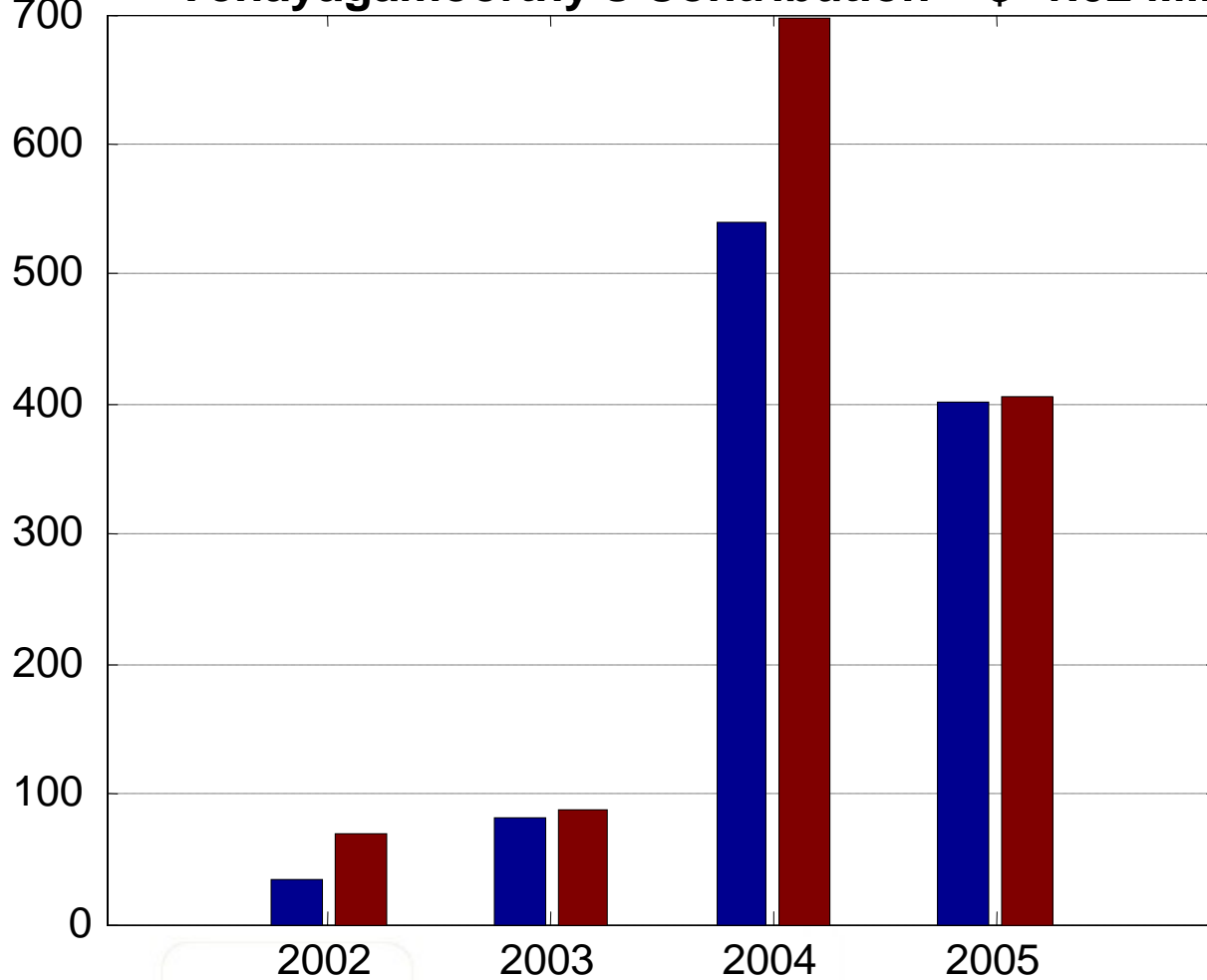


11 Proposals Awarded (25%) - \$ 1.21 Million
Venayagamoorthy PI on 8 Proposals - \$ 0.87 Million



Amount of External Research Funding (thousands of US \$)

Total Funding - \$ 1.21 Million
Venayagamorthy's Contribution - \$ 1.02 Million



Calendar Year (Blue bar – Venayagamorthy's contribution)

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Establishing a balanced and robust program of research and scholarship

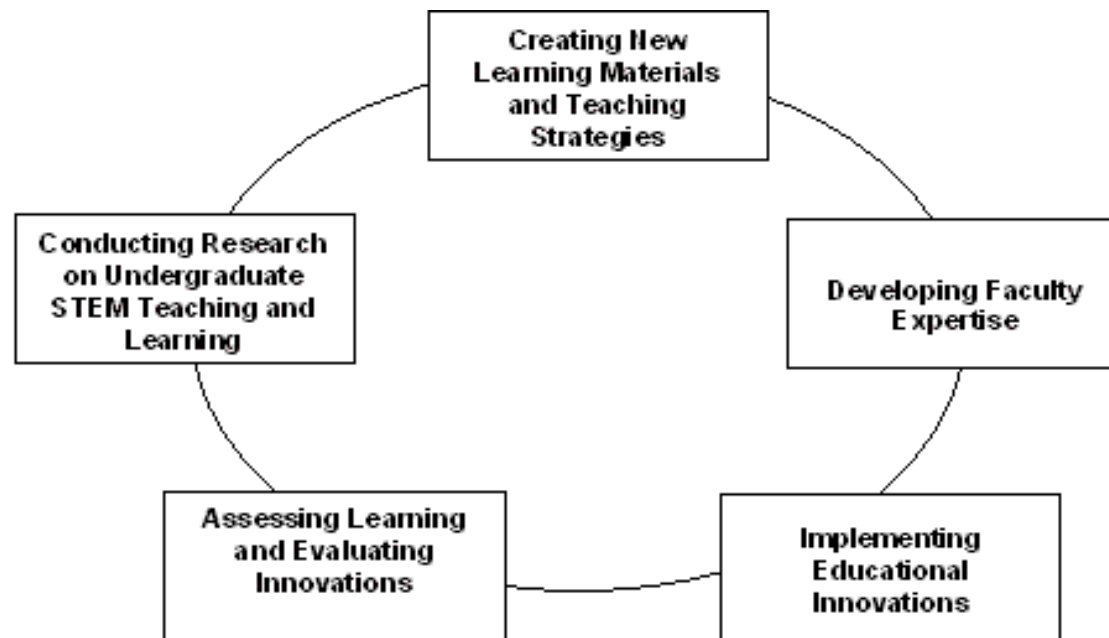
- What to Research?
- Publications
- External Funding
- **Networking** – Conferences, Workshops, Panels, Collaborations
- **Integration of Research and Education (Teaching)**

Other Opportunities

- NSF CCLI
- US Dept. of Education GAANN Program
- ONR/AF/Army YIP

Education Proposals

- **CCLI – Course, Curriculum, and Laboratory Improvement (NSF 06-536)**



Cyclic model for knowledge production and improvement of practice in undergraduate STEM education

CCLI Grant –2006

- **CCLI – Modernizing the Undergraduate Power Engineering Curriculum with Real-Time Digital Simulation (3 years) ~ \$ 151K**
- **Developing a novel, real-time, state-of-the art power system simulation teaching and undergraduate research laboratory that incorporates actual computer-controlled hardware in the simulation loop.**

GAANN Award –2006

- **ADVANCED COMPUTATIONAL TECHNIQUES AND REAL-TIME SIMULATION
STUDIES FOR THE NEXT GENERATION ENERGY SYSTEMS -
\$511K**
- The objective of our GAANN proposal is to provide an interdisciplinary research experience in the area of next generation energy systems, which is of national (and international) need and emerging technology for the doctoral students in the Department of Electrical and Computer Engineering.



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ONR YIP Award –2007

- **THE INTELLIGENT ALL-ELECTRIC SHIP POWER SYSTEM - \$405K**

The *objectives* of this proposal are to address the needs of the future Navy surface combatants.

- Self-healing strategies can enable power systems to self-heal in response to threats, material failures, and other de-stabilizers allowing improved fight through survivability with minimal manning requirements.
- Computational intelligence techniques based modeling, identification, control and reconfiguration algorithms will be developed to ensure the stability and maximize the survivability and operability of the AES power system during normal, fault and, fight and hurt conditions.