Developing a Successful NSF Science & Technology Center; CLiPS

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Background

• STCs (and ERCs) sit atop the NSF hierarchy of programs
• 5 + 5 years, $4M/yr
• Renewal is common, but requires diligence
• STCs emphasize science, some technologies, not so much device-oriented
• STCs have significant expectations for education and outreach

• A group of five CWRU faculty met weekly for ~12 months, often over offsite lunches, to brainstorm the overarching theme
• The first significant concept was developed for a month then discarded; the second lasted for two months
• Finally we decided upon a topic
Getting Started

• Enabling Technology + a Plan for Going Forward

Enabling Technology – Three Components

- MULTIPLIER
- 5 layers
- 9 layers
- Thousands of layers

Number of layers = \(2^n + 2 + 1\)

where \(n\) = number of multipliers

Goal 1 – “Polymers Plus” Research

A broad range of new science and innovation will emerge from our unique technology to establish a global resource for micro- and nano-scale layered polymeric systems.

“Polymers Plus” Focus

- Optic/Electronics
- Photonics
- Membranes
- Barrier Materials
- Interphase Science
- Bio-Inspired Concepts
- Novel Devices

Multi-Disciplinary Research

Cross-Disciplinary Education

National Needs in
- Science and Technology
- Diversified Work Force
The Process at NSF

March, 2003
June, 2003
October, 2003
August, 2004
December, 2004
April, 2005
December, 2005
August 1, 2006

STC solicitation issued by NSF
164 preproposals submitted
37 chosen for full proposals
12 chosen for site visits
6 recommended for funding
2 announced, 4 delayed
Decision to move toward funding
Funding awarded
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<th>Date</th>
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- The times between solicitation and pre-proposal deadline, invitation and deadline for full proposals are insufficient. Must write in advance of communication by the NSF.
Getting Started

- Moving forward with a leadership team of 3 faculty, plus another 3 key faculty
- Hired an external grant writer
- Divided concept areas to develop
- Commitments from University Administration is essential (faculty, space, grant preparation)
Team

- Initial team 5 research universities + 5 PUls
- Current team 7 research universities, 1 national lab, 2 majority PUls and 5 HBCUs
- Initially 13 research faculty, now 22
- Change is ok
Succession planning required
Operations

• Executive Committee meets every month (phone)
• Thrust team leaders meet every month (phone)
• Each thrust team meets once per month
• Entire STC meets once per year for a technical and administrative exchange – planning and prep

• All coordinated by an executive director, who also makes site visit arrangements, collates outputs and assembles annual reports
Assessment

• External assessment is essential, and should be listened to
• Significant changes in the CLiPS Education program, responsive to the assessment, were made after year 3
• Assessment team contributes to the annual reports, and presents at annual site visits
Layered Systems for Confined Crystallization: PEO/EAA and PEO/PS Multilayered Films

25nm PEO layer

P(0) of 50/50 Films

Oxygen barrier of PEO layer improved 130X with decreasing layer thickness.


High Energy Density Capacitor Film

Layered films have enhanced breakdown strength and energy density compared to controls.

70PC/30PVDF-HFP composition has the best properties for a high quality high energy density capacitor: high energy density and low tan δ.

All-Plastic Distributed Bragg Laser

BEST PERFORMANCE:

90 µJ/cm² threshold
19.3% for a R6G sample
Selected for Optics in 2008 Research Highlights, OPN
Impact - Technology

- CLiPS research and education has led to the creation of three independent companies based in Ohio and Texas.
- 6 U.S. patents issued/10 pending
- 3 Spin offs
- Several grants spun off
Impact – Education & Outreach

- Led to 5 faculty hires
- New graduate curriculum at CWRU
- Transplanted courses to HBCUs
- Envoys outreach program has changed the lives of 60 inner city students
Legacy

- Faculty, curricula, collaborations continue
- Spin off companies
- Grants seeded by CLiPS funding
- New major proposals being formulated (see slide 3)
- Continuation of outreach programs a major emphasis of PIs, Development Departments
Final words

- The funds were obviously important
- The program continues in new forms
- It was worth all the required efforts
Thank you