DEPARTMENT OF PHYSICS

"Charting a New Course for the New Millennium: Enhancing Rigor, Relevance and Relationships"

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DEPARTMENT OF PHYSICS RETREAT

DECEMBER 7, 2006

PROGRESS & POTENTIAL
2001-2006 to 2007-2012

QUO VADIS?

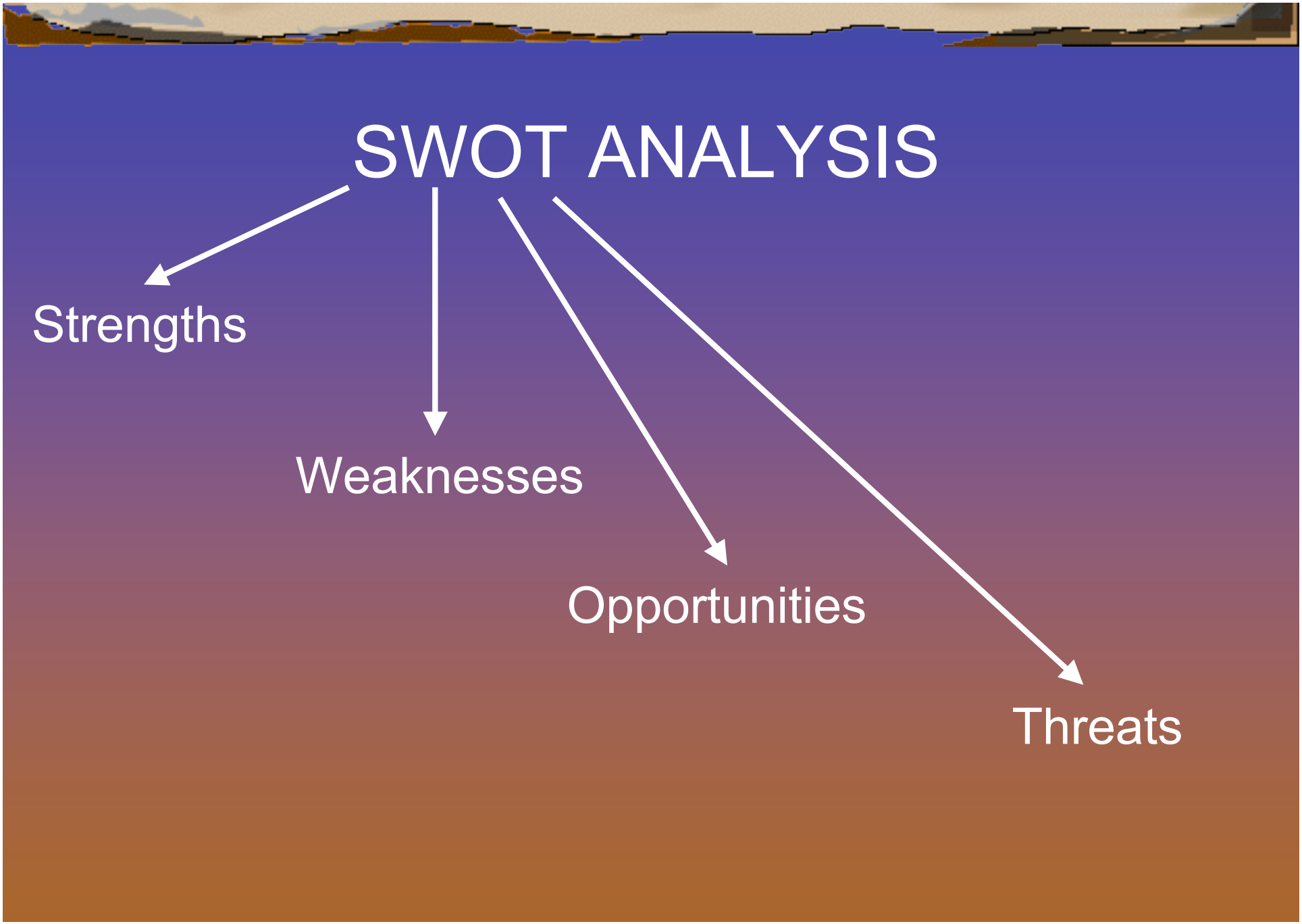
WHAT I INTEND TO DO TODAY

- Mention our accomplishments
- Give a hand to ourselves for several accomplishments over the past five years
- Discuss briefly a SWOT (Strengths, Weaknesses, Opportunities, Threats) Analysis
- Share with you my knowledge of what the external environment is like
- Share with you what we need to do to do better over the next five years
- Ask for your input
- Specify immediate and medium term action items
- Leave you with a few thoughts

OUR MISSION - FOUR-FOLD

- *To provide an **outstanding and distinctive education** to our undergraduate students;*
- *To achieve **national and international prominence in strategic research areas;***
- *To enhance our **service to the community** - local and at-large; and*
- *In doing so, to **reaffirm our relevance (raison d'etre)** to the taxpayer and the State of Texas.*

SWOT ANALYSIS



STRENGTHS

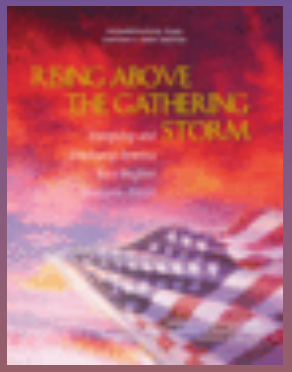
- Qualified and highly credentialed faculty and staff
- Good diversity in ages (oops, I mean experiences)
- New faculty active in research, publications and grants
- Novel collaboration with TSU on Radiation Science Education
- Possible new collaboration with TSU on T-STEM
- Author/Co-Author of Textbook/Monograph
- State-of-the-art laboratories and facilities
- Sustainable funding for the undergraduate laboratories (Equipment Access Fee - more enrollment, more $$$s - nice formula!)
- Every student (except Nursing) has to take at least one course from Physics
- Increased enrollments in PHSC courses
- Excellent support from the CAS Dean's office, College of Education and the senior administration

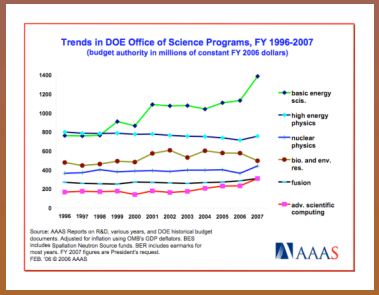
WEAKNESSES

- Fragmentation in disciplines
- No critical mass of faculty expertise in strategic areas
- No targeted growth plan
- No targeted recruitment plan
- Limited sustainability in funding
- Little or limited financial support for majors - scholarships or stipends
- Limited diversity in faculty - no women or Hispanics
- Unclear relevance of the degree program to individual growth/ advancement
- Too many internal conflicts

OPPORTUNITIES

- President Bush's American Competitiveness Initiative (ACI)
- National Academies' Raising Above the Gathering Storm
- Increased funding from NSF
- Increased funding from DOE's Office of Science
- Increased awareness for physics as an integral part of future education - Example: National Academies' BIO 2010
- Contracting opportunities
- More funding for multi- and inter-disciplinary projects
- Increased support for Science and Mathematics education





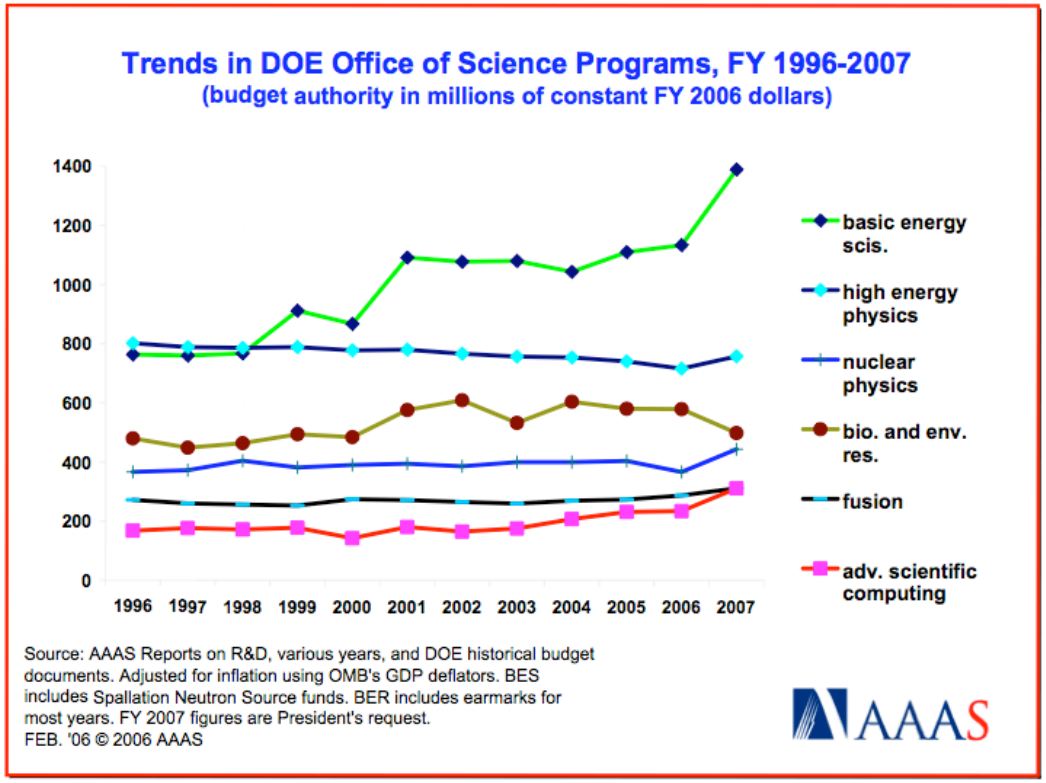
DEPARTMENT OF EDUCATION

The Education Department's Mathematics and Science Partnerships program would be increased by 23.5 percent, or $42.8 million, from $182.2 million to $225.0 million. The FY 2007 request was $182.2 million.

NATIONAL SCIENCE FOUNDATION

House appropriators recommended a funding increase of 4.5 percent, or $35.8 million, for NSF's Education and Human Resources (EHR) Directorate, from $796.6 million to $832.4 million. The FY 2007 request was $816.2 million. Within this recommendation, the Committee would provide the requested $46.0 million for NSF's Math and Science Partnerships, a reduction of 27.2 percent, or $17.2 million.

DOE



After several years of flat or declining budgets, funding for every OS program would increase substantially. The largest OS programs would all receive increases of 8 percent or more, including a dramatic boost of 24 percent for Nuclear Physics after a decade of stagnant funding, a 36 percent increase for computing research, a 25 percent increase for Basic Energy Sciences, and a 31 percent increase for the core (non-earmarked) life sciences research portfolio.

THREATS

- Low to zero enrollment, attrition
- Department/Discipline mergers - Department of Physics and Chemistry or Department of Physical Science(s) or Department of Natural Sciences …
- Physics departments closing down or being reduced all over (except in China, India, Japan, Korea, …)
- Little interest on part of most faculty in science education
- Decreased funding in areas of interest to us
- Title III funding to Physics will cease effective October 2007
- Perceptions (Public) vs. Peerceptions of physics as a needed knowledge base for the national good
- UH-type efforts

THREATS - PERCEPTIONS VS. PEERCETIONS

- Grants going down in number, contracts on the rise
- Increased accountability
- “Set asides” almost the same - about 5% of the agencies’ budgets
- But, in real terms, budgets are shrinking because the number of competitors is increasing enormously - there were under 200 minority institutions in 1990 (132 HBCUs with 8 engineering programs), today there are close to 500 MIs (103 HBCUs with 13 engineering programs). U of California at Berkeley is an MI!
- Perception that faculty are research oriented, increasingly reductionistic, narrowly focused, with little relevance to society, rather than focus on innovative, integrative educational programs
- Changing expectations - universities are more than instruction and research; they need to be units contributing to the economic development of their communities and the nation

WE NEED TO KNOW WHAT THE EXTERNAL WORLD IS THINKING OF US

- Institutions of higher education commonly exhibit a dangerous conceit.
- They behave as if they are convinced that they are in charge of their destiny even when they refuse to take charge of their evolution.
- They very often act like canoeists on a white water river who
- believe that if they decline to paddle, their canoe will not move.
- The fact is, it will move, and rapidly, whether they paddle or not.
- Their survival among the rocks in the white water educational river may depend on their recognizing that fact!

STARTLING EXAMPLE: UC BERKELEY

- The Physics Department at Berkeley, once the premier Physics Department in the country, is now in significant decline.
- This can be traced to a combination of insufficient faculty engagement and a crumbling physical plant.
- “We urge both the highest levels of University leadership and the leaders in the faculty of the Department to come together and act forcefully to restore what was once the crown jewel of the College of Letters and Sciences at Berkeley.
- Two problems are most urgent: how to effectively tackle and improve the deteriorating space and facilities of the Department; and how to convince a dispirited faculty to re-engage in the Department as a whole, rather than retreat to their own disciplines.
- The faculty in the Department must recognize the need for a new vision and be prepared to commit their energies anew to the Department.”

http://www.berkeley.edu/news/media/releases/2003/05/06_physicsreport.shtml

ENVIRONMENT IN THE TWENTIETH CENTURY!

- Punctuated equilibrium
- Fairly stable and anticipatable changes
- Have time to leisurely build up capabilities so as to respond to initiatives “next time they come around”
- Less than severe competition

ENVIRONMENT IN THE TWENTY-FIRST CENTURY!

- Rapid changes
- Proactive responses
- Punctuated chaos

Physics Department's Response & Strategic Plan for *Moving Forward*

- Curriculum reform planning for undergraduate programs to reflect interdisciplinary themes, in particular, relevant to pre-service teachers.
- Cross-departmental teaming in research and education type proposal writing.
- Distinguished lecture series with interdisciplinary themes: inter-departmental participation and organization.
- New faculty hiring plans and projections to reflect interdisciplinary themes.

QUESTIONS TO ASK

What are the revenue raising improvements for growth necessary for success going into the next century?

What innovation capability could I develop that would catapult me far ahead of the competition?

What innovation capability could our university develop that would catapult it far ahead of the competition?

EXTERNAL FUNDING IS A PRIORITY! - WHY?

Example:

- A Faculty Member at $6,000 per month or $54,000 for 9 months
- 25% release from grant - $13,500
- Typical Adjunct Faculty - $2,000 to $3,000 per course
- So, $13,500 = 4-6 courses/sections (approximately) per 9 months
- 2-3 per semester - more courses/sections = more formula funding
- If adjunct faculty chosen is a senior doctoral student or a post-doctoral associate in an area of our interest, he/she can collaborate on research proposals as well as assist us in our research laboratories.
- That means, every 1 dollar spent generates around 4 dollars (or more)!
- Also allows one of us to teach at an off-campus location
- Also an effective way of recruiting future faculty
- Sustained funding (for 3-5 years) allows us to make long term commitments to the adjunct faculty.

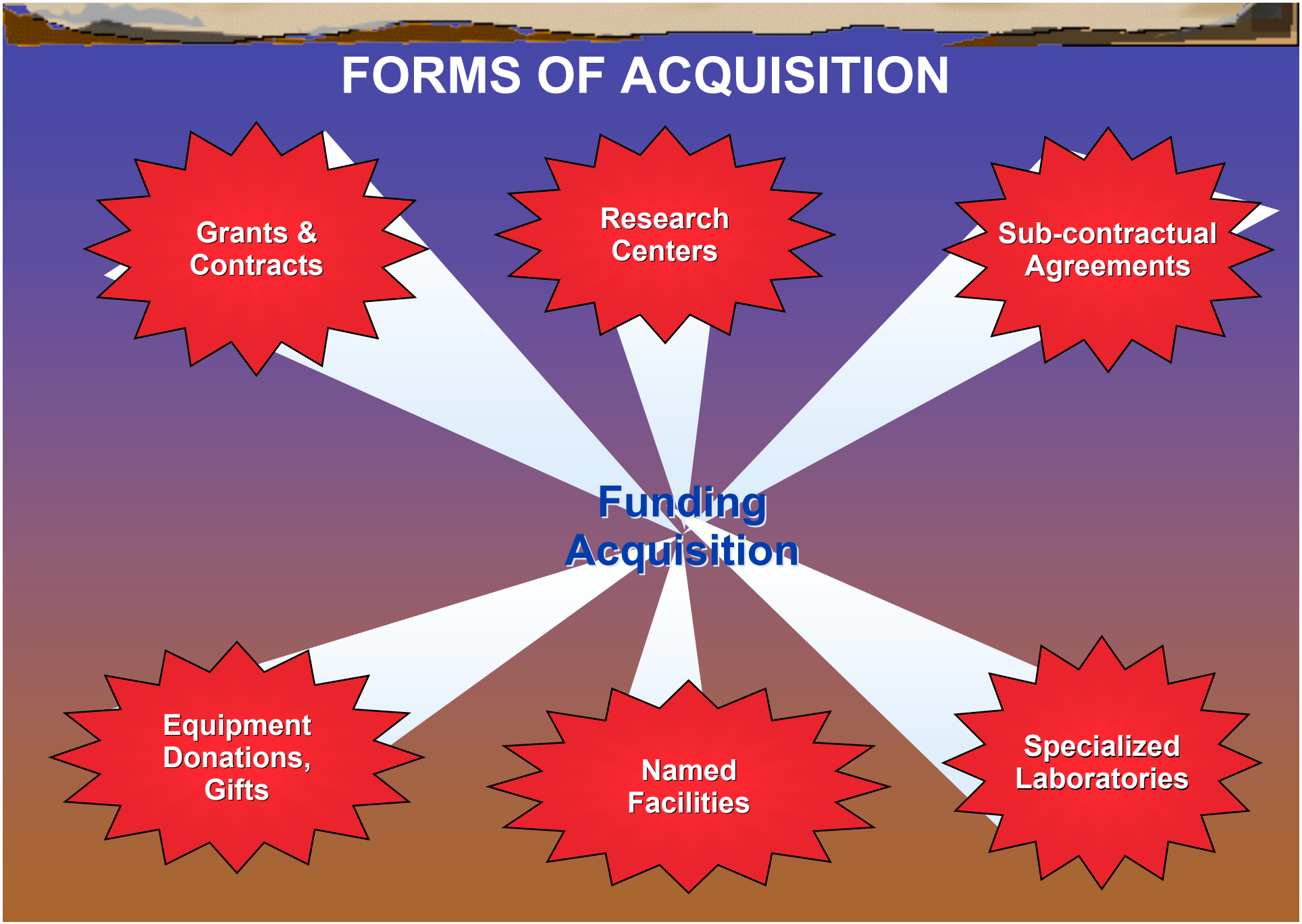
A FEW FACTS OF LIFE

- Submitting “blind” proposals will not work.
- In many cases, funds are earmarked.
- Proposed effort, no matter how original and brilliant, will not be funded if not covered in the original bill.
- Proposed effort , no matter how original and brilliant, will not be funded if not a priority for the agency.
- Proposed effort, if seen as a solution looking for a problem, will not be funded.
- Partnerships are more likely funded.

NEED A STRATEGY

- Assess the needs of the “market”
- Retool ourselves
- Take efforts to *be informed* about national trends on funded research
- Be *consistent* in published research - typically, a cluster of faculty with expertise in a given area is more likely to attract sustained funding
- Be ready and be flexible to *team up* in inter-departmental and multi-university ventures.
- Build program directors’ support
- Look for opportunities beyond the traditional
- Look for collaborative opportunities with other schools/colleges on campus
- Develop a strategic plan - A ROAD MAP - for research with a timeline
- Implement the strategic plan
- Perform periodic evaluation & assessment

FORMS OF ACQUISITION



ROAD MAP FIRST PHASE (2007-2009)

- **Explore and identify thrust areas**
- Invite managers of federal funding programs to give presentations about their *program scope*, future directions and needs
- Arrange visits and *summer appointments* for the faculty at industries and government labs
- Work with *other* departments to jointly develop multidisciplinary research directions
- Explore *innovative outreach and education programs* for teaching excellence (k-12 teacher preparation, undergraduate & graduate)

ROAD MAP FIRST PHASE (IMMEDIATE)

- Submit for approval a set of new courses in PHSC for education majors
- Request approval to offer a new PHSC degree program or at least a new PHSC Track for pre-service teachers as well as professional development for in-service teachers
- Meet with our “customers” - colleges and schools on campus and the industry - to assess our own activities and performance
- Explore addition of new “more relevant” courses in PHYS:
  - Materials Physics/Science, Physics of Information Technology, Electronics, ???
- Establish an External Review Board (TAMU, FSU/Magnet Lab, NASA-JSC, UH-Clear Lake, Lockheed, TI, Shell, TSU, …)
- Sponsor a “Physics for the New Millennium” Conference in early spring 2007

ROAD MAP FIRST PHASE (IMMEDIATE)

- Conduct a quick, comprehensive self-study of the updated needs of the "market" - the environment we want our students to enter into.
- Build an alliance of faculty and school teachers that would provide for a critical mass of capabilities to address issues relevant to this market.
- Determine range of competencies needed to respond to the market needs. These competencies and assets are a part of self-sustaining and self-organizing markets.
- Design and implement an actionable plan to capitalize on these competencies.
- We not only have to reinvent how we work, but we also need to reinvent our relationships with our customers and stakeholders.
- Establish models and processes that will be sustainable.

Strategies for Student Recruitment and Retention

- Irreproachable customer service
- Cultivate close contacts with schools - visits, student projects, teacher professional development
- Well-defined plan for reaching out to middle and high schools
- Aggressive plans to expand the undergraduate research assistantship, scholarship and stipend bases
- Interdisciplinary undergraduate curriculum
- Seminars in other departments and schools on the relevance of physics to one's life

PROJECTED INTERDISCIPLINARY AREAS OF GROWTH

Building on Existing Departmental Strengths And Developing Capabilities in Areas of Need

Biophysics

Medical Physics

Radiation Physics/Science

Applied Physics

Engineering Physics

Environmental Science

Nuclear and Radiation Physics

Science Education

Forensic Science

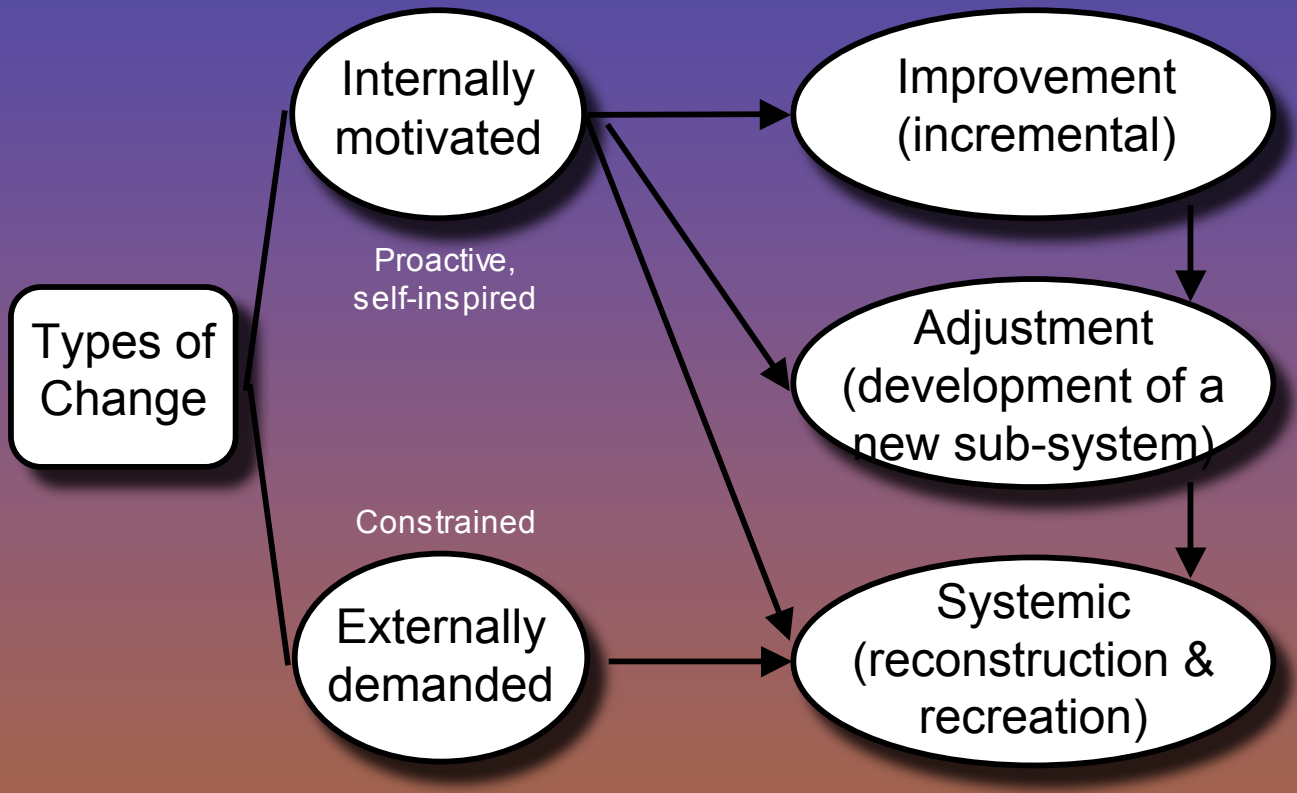
???

U.S. Physics Departments with Active Research Groups in Physics Education

- American University
- Arizona State University †
- Black Hills State University
- Boise State University
- California Polytechnic State University, San Luis Obispo
- California State University, Fullerton
- California State University, San Marcos
- Carnegie Mellon University
- City University of New York
- Clarion University
- Grand Valley State University
- Harvard University
- Indiana University-Purdue University Fort Wayne
- Iowa State University*
- Kansas State University†
- Montana State University*
- New Mexico State University
- North Carolina A&T University
- North Carolina State University*
- Ohio State University
- Rensselaer Polytechnic Institute*
- San Diego State University†
- Southwest Missouri State University
- Syracuse University
- Texas Tech University
- Tufts University
- University of Central Florida
- University of Maine*
- University of Maryland*
- University of Massachusetts – Amherst
- University of Minnesota†
- University of Nebraska*
- University of Northern Arizona
- University of Northern Iowa
- University of Oregon
- University of Washington*
- University of Wisconsin – Stout

*/† offer Ph.D. in Physics Education in Physics/collaborating department

TYPES OF CHANGE



"There isn't a plant or a business on earth that couldn't stand a few improvements. Someone is going to think of them. Why not beat the other fellow to it?" **- Roger Babson**

Develop well-defined plans for assessment

RESEARCH & SCHOLARSHIP

Goal/Objective	Indicator of Progress	Results for 2007 Targets for 2008	Progress vs. Plan +/-
Increase stature of PV in quality of research & scholarship	Number of National Academy memberships		
Increase the stature of PV in quantity of research and scholarship	Total reported NSF research expenditures		
	Total sponsored research expenditures		
	Amount of externally funded research awards		
	Number of proposals submitted		
Enhance the quality & reputation of PV faculty	Number of publications by PV faculty		
	Number of citations received by PV faculty, most recent 5 years		
	Diversity of tenure-track faculty		

UNDERGRADUATE EDUCATION

Goal/Objective	Indicator of Progress	Results for 2007 Targets for 2008	Progress vs. Plan +/-
Maintain comprehensive undergraduate curriculum	Assess effectiveness with core curriculum areas		
Strengthen the quality of undergraduate instruction	Scheduled workshops/ seminars through CTE		
	Average total SAT score of freshmen		
	Number of applications		
	Honors & Awards		
	Academic space		
Create learning experiences that maximize the benefits of attending a large research university	Number of students participating in formal experiential learning experiences		
Expand PV leadership in the integration of instructional technology with pedagogy	Participation in CTE training		
Welcome and nurture diversity of people and ideas	Percentage change in undergraduate enrollment by ethnicity		

OUTREACH/SERVICE

Goal/Objective	Indicator of Progress	Results for 2007 Targets for 2008	Progress vs. Plan +/-
Sustain the University's commitment to outreach and international affairs mission	Number of faculty providing leadership to outreach programs		
	Number of students involved in outreach programs		
Expand the quality of life-long learning programs	Number of continuing and professional education programs		
	Number of participants in continuing and professional education programs		
	Net revenues generated through continuing and professional education programs		
Strengthen the relationship betw een outreach and extension	Number of programs jointly developed and delivered		
Organize, coordinate, communicate about, and integrate the various economic development activities at PV	Number of contacts made w ith external groups related to economic development		

CONSEQUENCES OF NONPLANNING

- By the year 2000, the nation's 3,600 or so accredited colleges and universities that now exist will have sorted themselves -- or will have been sorted by external forces -- into just a few categories.

- Some will continue to do business as usual instead of addressing the new realities. As a result, they will have lost status and will be in danger of becoming extinct.

- Some will have confronted these new realities but will have taken only small incremental steps to address them. They will constitute the undistinguished middle of the academic pack, those we will think of as "hanging on, but nothing special" or the "me too" ones.

- And some will have confronted the new realities and will have responded with wisely-chosen, bold, and radical changes of direction. They will form the new vanguard of higher education.

Remarks by University of Maryland System Chancellor Donald N. Langenberg (1995)

PARTING THOUGHT

"There are young people out there cutting raw cocaine with chemicals from the local hardware store. They are manufacturing new highs and new products by soaking marijuana in ever changing agents, and each of these new drugs is more addictive, more deadly, and less costly than the last. How is it that we have failed to tap that ingenuity, that sense of experimentation? How is it that these kids who can measure grams and kilos and can figure out complex monetary transactions cannot pass a simple math or chemistry test?"

- Senator Kohl, from the U.S. Senate Hearing: "Crisis in Math and Science Education"

PARTING THOUGHT

"There is at least one point in the history of any company when you have to change dramatically to rise to the next level of performance. Miss that moment – and you start to decline."
– Andrew S. Grove, Former CEO of Intel

"Proper Preparation Prevents Poor Performance." – Rep. Nancy Pelosi

IN CLOSING,

We need to have more harmonious and positive ways of working with each other.

Constant confrontations are not beneficial. In addition to weakening/ fragmenting the department it will make it look weak to the outside, making its growth and progress more difficult.

We must understand and accept that we are held accountable for everything we are expected to do. This is not the culture physicists are used to but the world is changing.

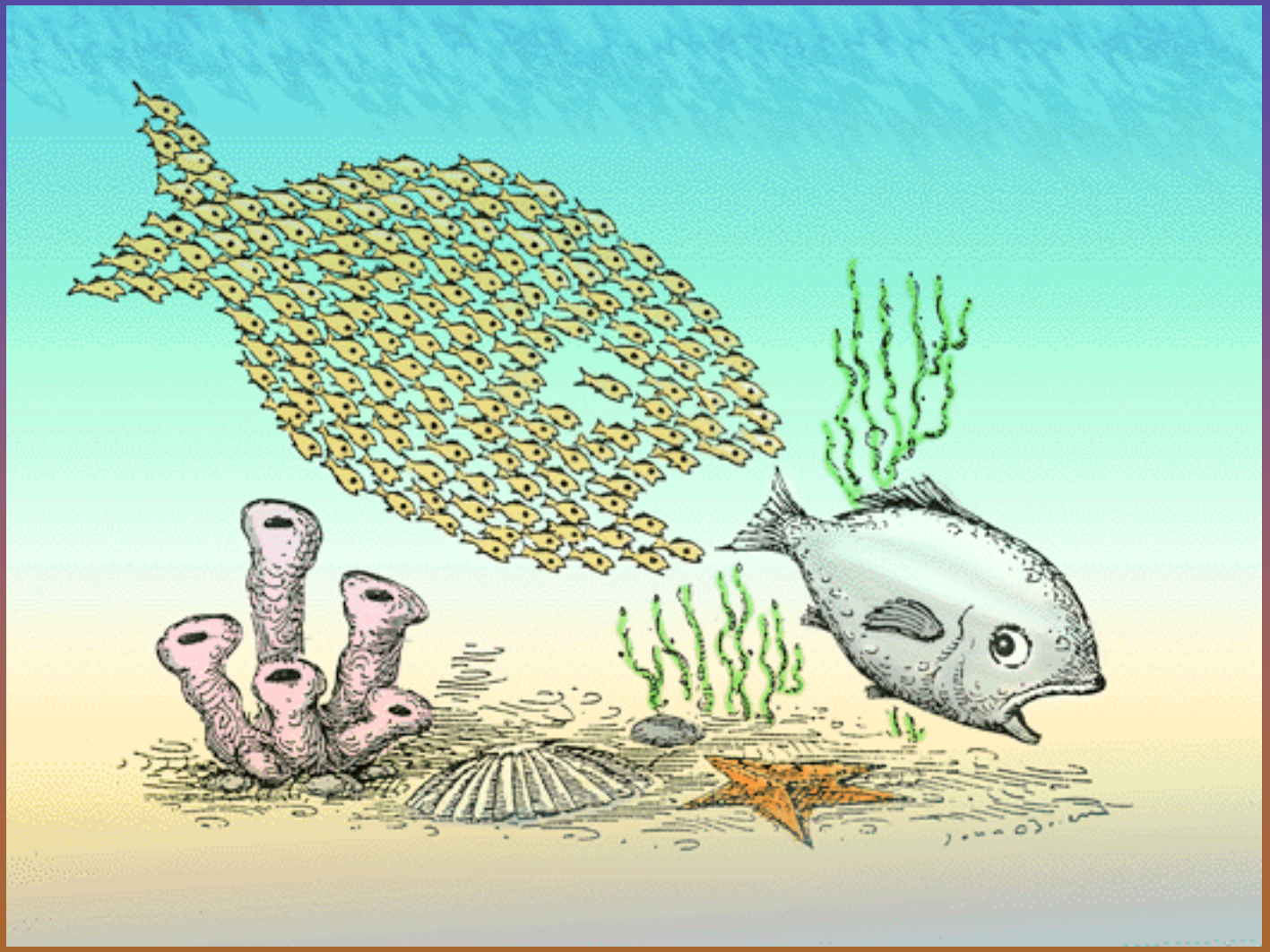
Any kind of support - external funding or internal (released time, funding) - always comes with strings attached. Something tangible is expected to come out of such support.

“I didn’t know that I was supposed to know or do something” is NOT an excuse.

Let us focus on the common good of the Department, the College and the University.

"The big won't beat the small - the fast will beat the slow."

- John Chambers, President, Cisco Systems



Thank You.

I look forward to continuing to work with you.

Any questions?