invites the public to the

36th Sir Winston Scott Memorial Lecture

to be delivered by

Barbadian Prof. The Hon. Cardinal Warde

Professor of Electrical Engineering,

Massachusetts Institute of Technology

Internationally-recognised scientist and distinguished educator, recipient of numerous honours and awards including The Companion of Honour of Barbados, November 2003

ON THE TOPIC

"Science, Technology and Business Education Reform for the Caribbean"

Monday, November 21, 2011 - 8:00 p.m.

at the Frank Collymore Hall.

Science, Technology and Business Education Reform for the Caribbean

Prof. Cardinal Warde

Interim Executive Director of the Caribbean Science Foundation

and

Professor of Electrical Engineering

Massachusetts Institute of Technology

November 20, 2011

MIT Photonic Systems Group

Department of Electrical Engineering & Computer Science

warde@mit.edu

My Limited Credentials

MIT Faculty Director for:

1. STEM (Science Technology Engineering and Math)

A five-week summer program for students entering 6th,7th 8th or 9th grade followed by a 9-month mentoring program

2. SEED (Saturday Engineering Enrichment and Discovery)

Hands-on curriculum strengthens foundational math, science and communication skills of 9th and 10th graders

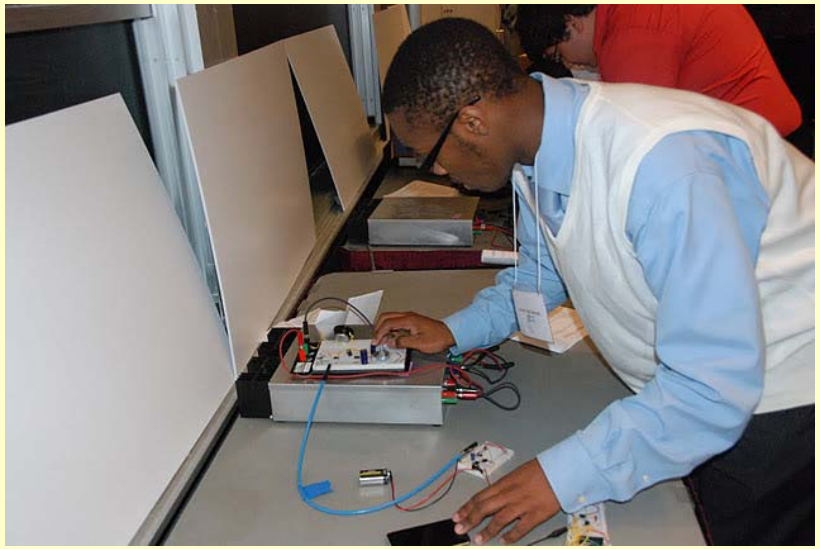
3. MITES (Minority Introduction To Engineering and Science)

6-week residential program for high school seniors

Core courses: Physics (I , II, or III), calculus (I, II, or III), Humanities, and either chemistry, biochemistry, or biology)

Hands-on Enrichment Courses: Digital Design, Engineering Design, Genomics, Architecture or Electronics

Also served on two advisory boards of the New England Board of Higher Education



A MITES Superstar

SEED students at work

Challenges in the Region

- Weak entrepreneurial culture
- High unemployment
- High import bill - Low exports
- Weak Infrastructure (roads, schools, ports, etc.)
- Inadequate inter-island transportation systems
- Digital divide
- Educational systems in need of reform
- Low levels of relevant research and development
- Food insecurity
- Energy insecurity
- Inadequate health care problems
- Poverty and crime
- Environmental damage at sea and on land

The Challenges of Education Reform

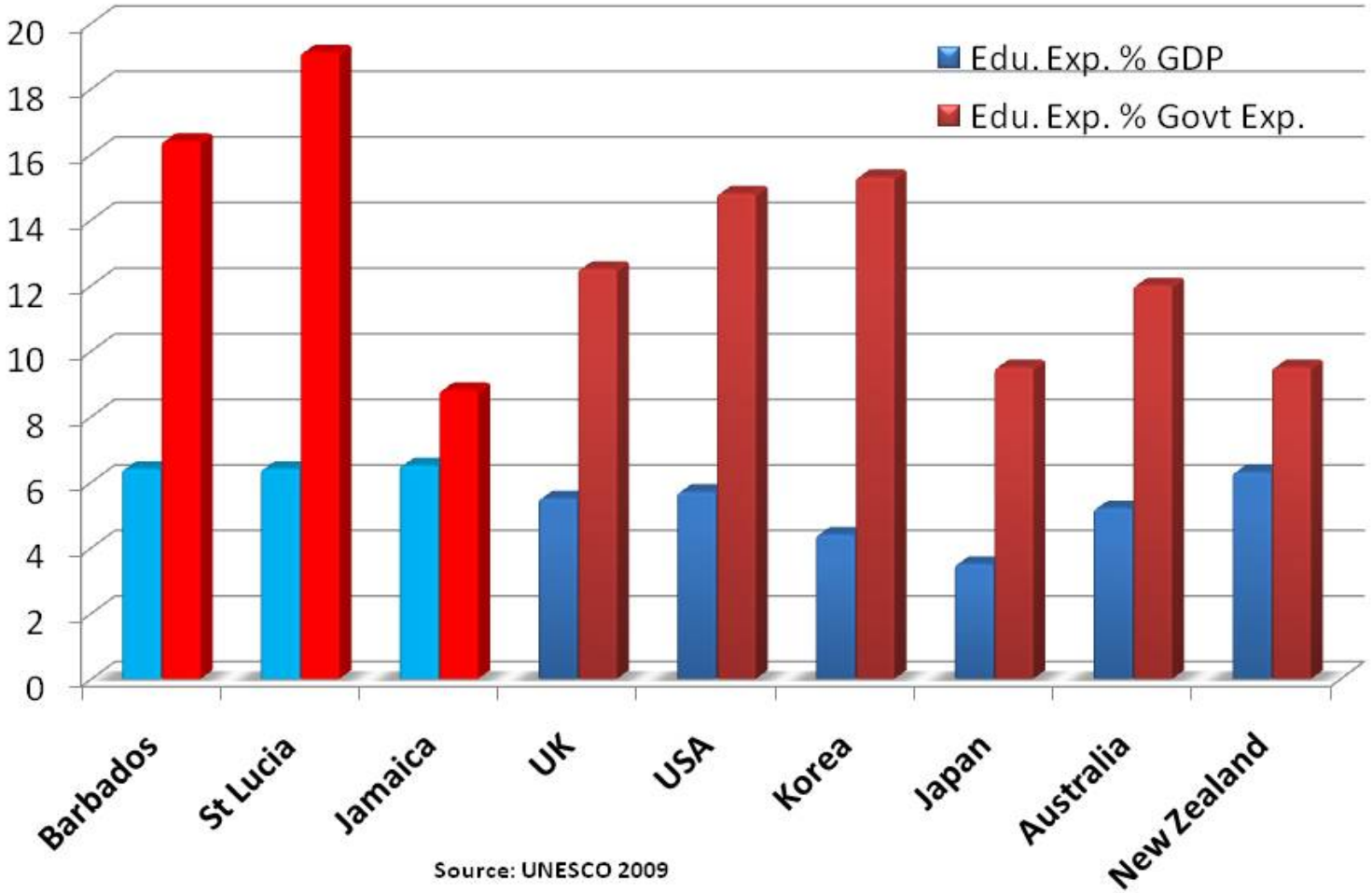
- What is it?
- Why do we want it?
- Is it really necessary?
- What is the purpose of Education?
- How do we achieve it?

Literacy Rate by Country

Rank	Country	Literacy Rate [between 1995 and 2005]
1	Georgia	100.0
2	Cuba	99.9
2	Estonia	99.8
2	Latvia	99.8
5	Barbados	99.7 [2003 UNESCO data]
5	Slovenia	99.7 [2007 UNESCO projection]
5	Belarus	99.7
5	Lithuania	99.7
5	Ukraine	99.7
5	Armenia	99.7
11	Kazakhstan	99.6

Source: http://en.wikipedia.org/wiki/List_of_countries_by_literacy_rate

Comparative Expenditure on Education



Source: Registrar's blog at www.CXC.org

A few Questions for "Barbados"

- **We boast greater than 97% literacy. That's truly impressive!!**
- **Why are we a nation buried in debt? Why can we not feed ourselves?**
- **Yes, we have computers in the classroom. What happened?**
- **Why are we still lagging behind in reforming our educational system?**
- **In love with the 11+ exam? Why? Brainwashed?**

Signs of Hope

1. **The will to change in face of limited budgets is still lacking in most countries, but we are beginning to talking about it in the Region**

2. **I understand that St. Kitts has eliminated the 11+ exam**

3. **CXC is taking positive action and will have to significant leadership role in the way forward**

4. **Re-examine the guiding principles on which CXC operates (your constitution)**

Signs of Hope (continued)

WHY WE NEED TO REDEFINE EDUCATION

There are five main reasons why we need to redefine education in the Caribbean:

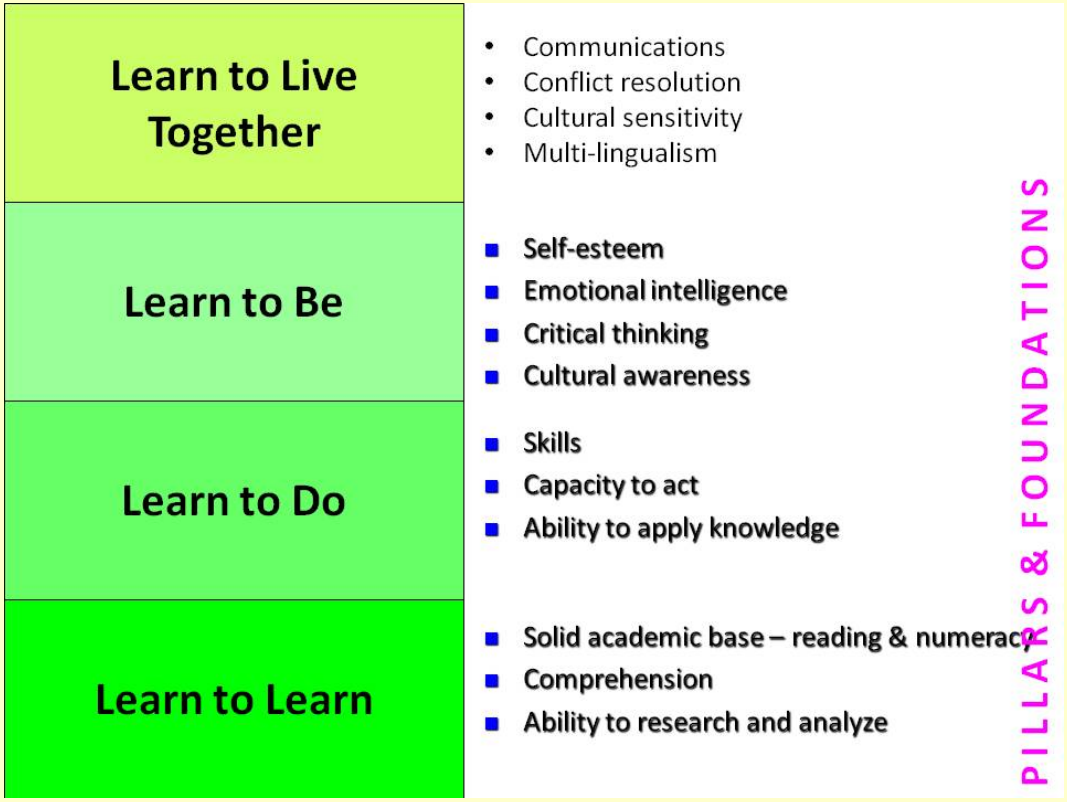
1. **Tinkering with the system no longer works; we need a new vehicle of human empowerment and social transformation**
2. **The implications of the internationalization of education in a globalized world**
3. **The rapid obsolescence of knowledge in the information revolution**
4. **Our education systems are no longer working**
5. **Education is too rapidly becoming a panacea for all problems**

Source: Registrar's blog at www.CXC.org

CXC's Guiding Principles include:

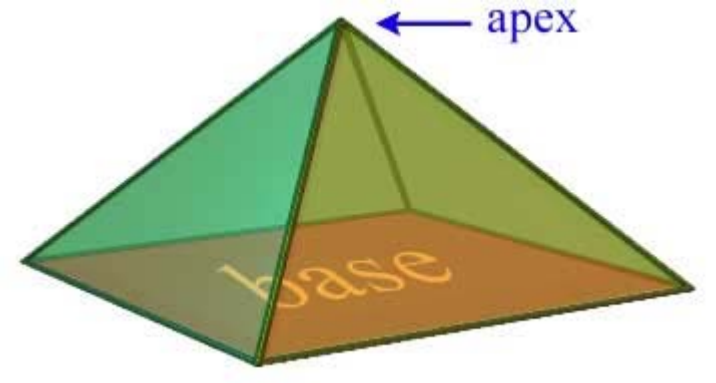
1. Ideal CARICOM Person (adopted as far back as July 1997 by Caribbean Heads of Government)

2. UNESCO Imperatives for Learning specifies the abilities that ought to be developed



The Leaky Pipeline

The Pyramid Principle



Choices:

Make the base larger and plug the leaks

http://www.mathsisfun.com/geometry/pyramids.html

Low-Cost Approaches

Children are naturally curious. Exploit it early
Ignite curiosity early

Hands-on learning the key

Purchase science-based toys for your children

Learn from low-cost approaches and examples in Chile, France, Venezuela

Use of Computers in Education

1. Good for repetitive learning 24/7 at any pace
   (a) Salman Khan -- founder and faculty of Khan Academy (www.khanacademy.org)
   (b) Dr. Janak Sodha at UWI (Barbados)

2. Information searching and researching
   complements libraries
   Can enhance creativity
   Information is power – innovation

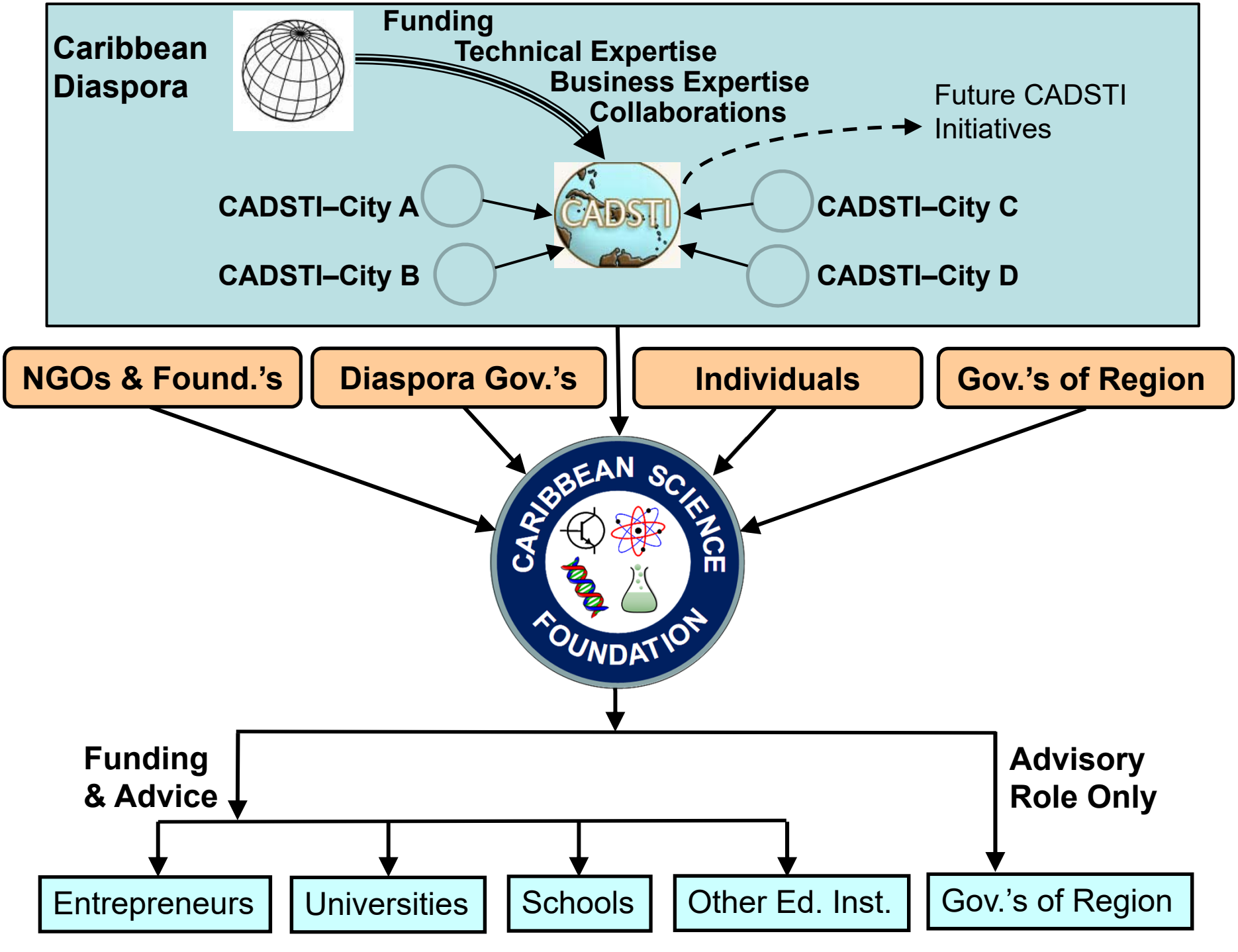
3. Demonstrations and simulations
   (not a total replacement for the hands-on experience)

Nuture the Superstars, Especially the Nerds

- While you need the "science is cool" factor for the masses,
- Identify exceptional talent in S or T in the early years (not necessarily the most scholarly)
- Identify the creative geniuses in the early years
- More Mathematics Olympiads
- More Science Fairs
- More Science museums
- Feature winners on TV
- Teachers must have clear sense of what to do when they spot talent – new mentors, incubators, internships, special summer programs, etc.
- Send some to CSF!!

Teacher Training in STEM

- CSF with private sector will intervene here!
- Must find ways to motivate the teachers like we do the children
- We will show by example what is possible with trained teachers and our STEM-rich curriculum in a few pilot programs.


Caribbean Diaspora
Funding
Technical Expertise
Business Expertise
Collaborations
Future CADSTI Initiatives
CADSTI–City A
CADSTI–City B
CADSTI–City C
CADSTI–City D
CADSTI
NGOs & Found.'s
Diaspora Gov.'s
Individuals
Gov.'s of Region
CARIBBEAN SCIENCE FOUNDATION
Funding & Advice
Advisory Role Only
Entrepreneurs
Universities
Schools
Other Ed. Inst.
Gov.'s of Region

Governing Council

Sen. The Hon. Franka Alexis-Bernardine – Min. of Ed. Grenada
Mr. Nicholas Brathwaite - Partner & CTO, Riverwood Capital
Dr. Jeanese Badenock – UWI, Barbados
Dr. Basil Burke - UWI Consulting
Prof. John-Paul Clarke - Georgia Institute of Technology
Dr. Sheena Francis- UTech, Jamaica (Young Scientists Rep)
Dr. Ken Harewood - formerly North Carolina Central University
Dr. Jermey Matthews - Associate Editor, AIP
Mr. Dodridge D. Miller- CEO, Sagicor Insurance
Prof. Baldwin Mootoo - UWI, Trinidad - Treasurer
Prof. Suresh Narine - Trent University, Ontario, Canada
Mr. Hollick Rajkumar - Managing Director, HRC Associates
Senator-Professor Harold Ramkissoon - UWI, Trinidad & Tobago
Mr. Ravi Ramkissoon - Oracle Corp, Redwood Shores, CA

Governing Council (continued)

Mr. Robert Riley, BP, London
Dr. Brian Tom - Cambridge University, Cambridge, England
Dr. Dinah Sah – Biotech and Pharmaceutical R&D Consultant
Prof. Maya Trotz -Univ. of South Florida, Tampa, FL, USA
Dr. Arnoldo Ventura - Former Science Adviser to Jamaica PM
Mr. Richard Vieira- BMO Capital Markets
Professor Cardinal Warde - MIT (President of CADSTI)
Mr. Gervase Warner - CEO, Neal & Massy
Mr. Richard Williams - RFW Associates
Chair of the Caribbean Council for Science and Technology

Honorary Board of Governors of CSF

- Prime Minister responsible for S&T in the CARICOM
- President of Caribbean Association of Industry and Commerce
- President of the Caribbean Academy of Sciences (CAS)
- Executive Secretary of CARISCIENCE
- Hon. P. J. Patterson (former prime minister of Jamaica)
- Mr. Bowen Wells (former UK MP)
- Mr. Chris Rowlands (former Director of 3i Investments - Managing Partner for Asia)
- Sir Harold W. Kroto (1996 Nobel Laureate, chemistry)
- Dr. DeLisle Worrell, Governor of the Central Bank of Barbados

Caribbean Science Foundation: Mission

Assist with the diversification of the economies of the Caribbean Region, and to help raise the standard of living. Specifically, the CSF will help:

- **Stimulate technology-based entrepreneurship - by identifying and funding science and technology projects in new and existing enterprises that are relevant to the economic development needs of the Region.**
- **Accelerate education reform that supports technology-based entrepreneurship - by promoting and funding programs that: (i) focus on the STEM (Science, Technology, Engineering and Math) disciplines, (ii) business and entrepreneurship education, and (iii) foreign languages and communication skills in schools, universities and other educational venues.**
- **Provide scientific and engineering advisory services to Caribbean governments - by working with CADSTI to leverage the expertise that resides in the Diaspora.**

CSF's Education Initiatives

- **Curriculum Pilot Development: STEM, Innovation, foreign languages, humanities, business and entrepreneurship in primary schools and high schools**
- **Will include learning by doing, and competitive project-based assignments, often in teams. Winners will be celebrated**
- **Partnerships with Ministries of Education**
- **Partnerships with the business community**
- **Partnerships with CXC**
- **Partnerships with Universities in the Region**
- **Ignite discussions on re-engineering the university**
  - Professors as entrepreneurs
  - Incubator formation when none exists
  - HS student Internships and special programs

MAJOR AREAS OF FOCUS FOR CSF

Major technology areas of focus include:

- **Energy, Water and Materials**
- **Transportation**
- **Agriculture and Food Science**
- **Manufacturing**
- **Information and Communication Technologies (ICT)**
- **Environmental Science and Engineering**
- **Medicine and Health Care**
- **Crime Prevention**

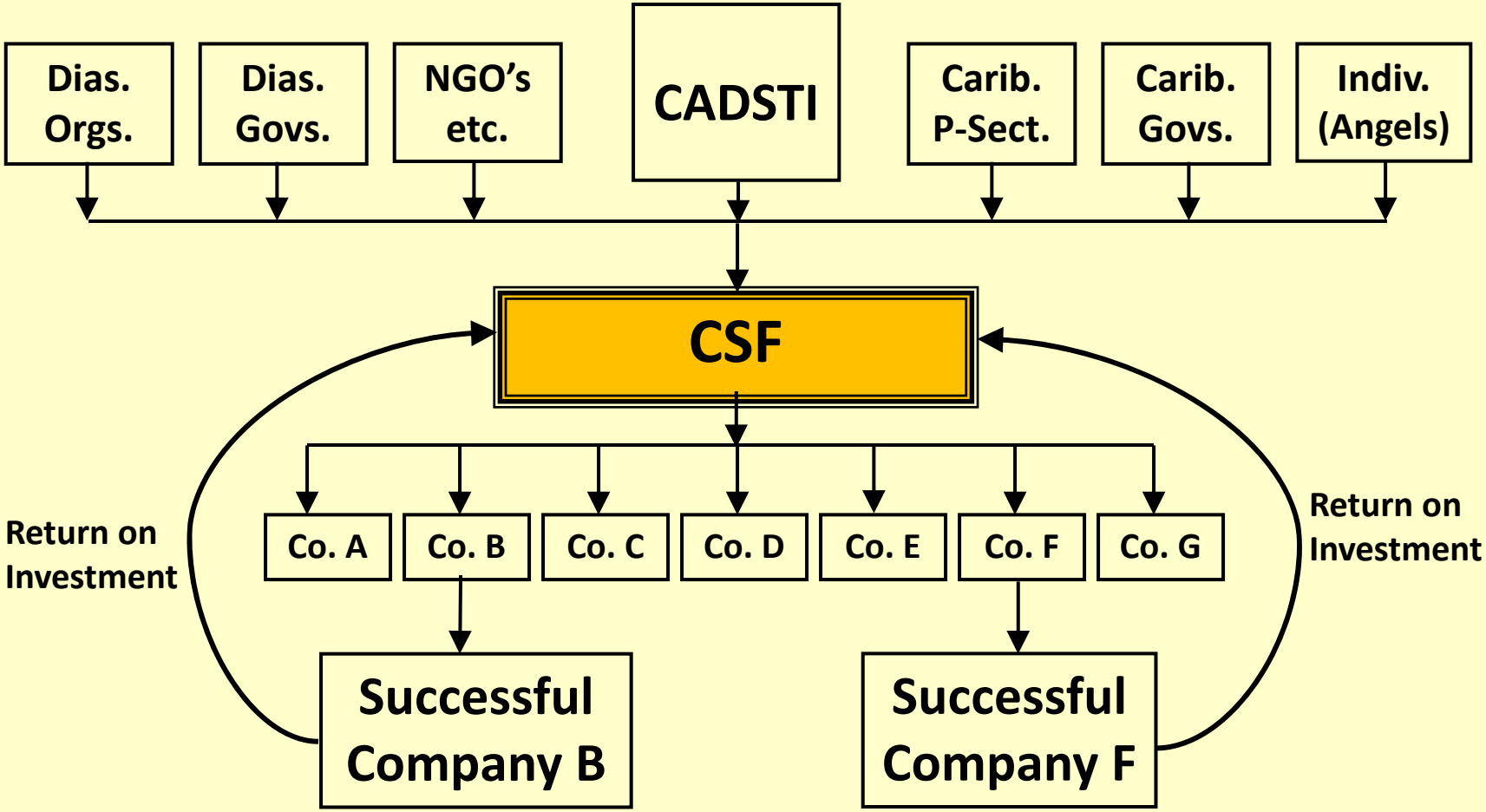
CSF Advisory Role to Governments and industry

- Assembles scientific advisory bodies
- Assists with the harmonization of regulations (especially safety) and the setting of industry standards, especially in rapidly evolving areas such biotechnology, nanotechnology and genetic engineering.
- Assisits in the formation of agreements and creation of funds together with governments and NGO's to actively support and encourage industrial R&D cooperation between Caribbean industries and industries overseas.
- Helps the Governments of the Region to identify national needs as well as suitable technologies that match those needs.
- Assists in identifying and removing impediments, while helping to build the infrastructure for mutually beneficial economic and technological development

Funding Breakdown Goal by Percentage

Donor	Year 1	Year 2	Year 3	Year 10
International agencies/organizations	50%	50%	50%	40%
Caribbean Countries	5 %	5 %	5 %	5%
Caribbean Private Sector	10%	10%	9%	8%
Dividends (CSF-invested companies)	-	-	-	15%
Diaspora Organizations	10%	10%	10%	8%
Banks & Credit Unions	2%	2%	2%	2%
CAIC	1%	1%	1%	1%
Individuals	2%	2%	2%	2%
Private Foundations/Philanthropies	10%	10%	11%	9%
Diaspora Governments	10%	10%	10%	10%

Sustainability Model



Preliminary 3-year Budget

Expense	Year 1	Year 2	Year 3
Salaries	$ -	$ 200,000	$ 500,000
Employee Benefits	-	40,000	100,000
Part-time Help	20,000	30,000	50,000
Seed Capital Fund	1,500,000	3,000,000	6,000,000
Educational Activities	50,000	250,000	500,000
Outreach Activities	10,000	50,000	100,000
Country Rep. Programs	15,000	25,000	40,000
Advertising	15,000	25,000	30,000
Conferences	100,000	125,000	130,000
Publications	5,000	10,000	20,000
Travel	15,000	25,000	40,000
Office Expense	5,000	20,000	35,000
Rent	-	25,000	40,000
Utilities	-	5,000	15,000
Other OVHD Expenses	35,250	124,500	240,000
TOTAL	**$ 1,770,250**	**$ 3,954,500**	**$ 7,840,000**
GRAND TOTAL			**$ 13,564,750**

The Kibagare Good News Center School Nairobi, Kenya

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My Cliches

… the next "Google" can start in Caribbean!

We are limited only by our imagination!

warde@mit.edu

http://caribbeanscience.org

http://cadsti.org