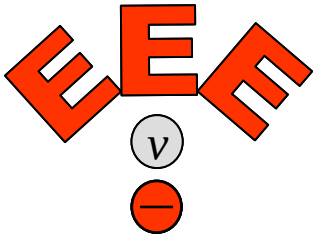
ucc

Coláiste na hOllscoile Corcaigh, Éire
University College Cork, Ireland



INVENTING WITH LIGHT
A Personal Journey

Nabeel A. Riza

UCC Chair Professorship in Electrical Engineering
Head of UCC Department of Electrical & Electronic Engineering
& Associate Academic Member, Tyndall National Institute
University College Cork (UCC)
Ireland
http://eee.ucc.ie

Note: The EEE Dept. LOGO Above is also an Example of an Invention by Prof. Riza.

Public Lecture at the LUMS School of Science & Engineering (SSE), Lahore, April 6, 2012.
Sponsor: Khwarizmi Society; Physics Dept. LUMS and SSE LUMS.

ucc

Coláiste na hOllscoile Corcaigh, Éire
University College Cork, Ireland

UNIVERSITY COLLEGE CORK , CORK, IRELAND.
Founded 1845

WHAT IS AN INVENTION?

SOMETHING NEW → No One in the World
Has Proposed the Invention
Per Dated and Witnessed
Written, Video & Audio Records
(in Patents, Books, Papers, Presentations)

EXAMPLES OF INVENTIONS:

A New Physical LAW --- Force = Mass x Acceleration

A New Chemical Process ---- Chemical Vapour Deposition (CVD)

A New Made-Made Material --- Silicon Carbide, Synthetic Diamond

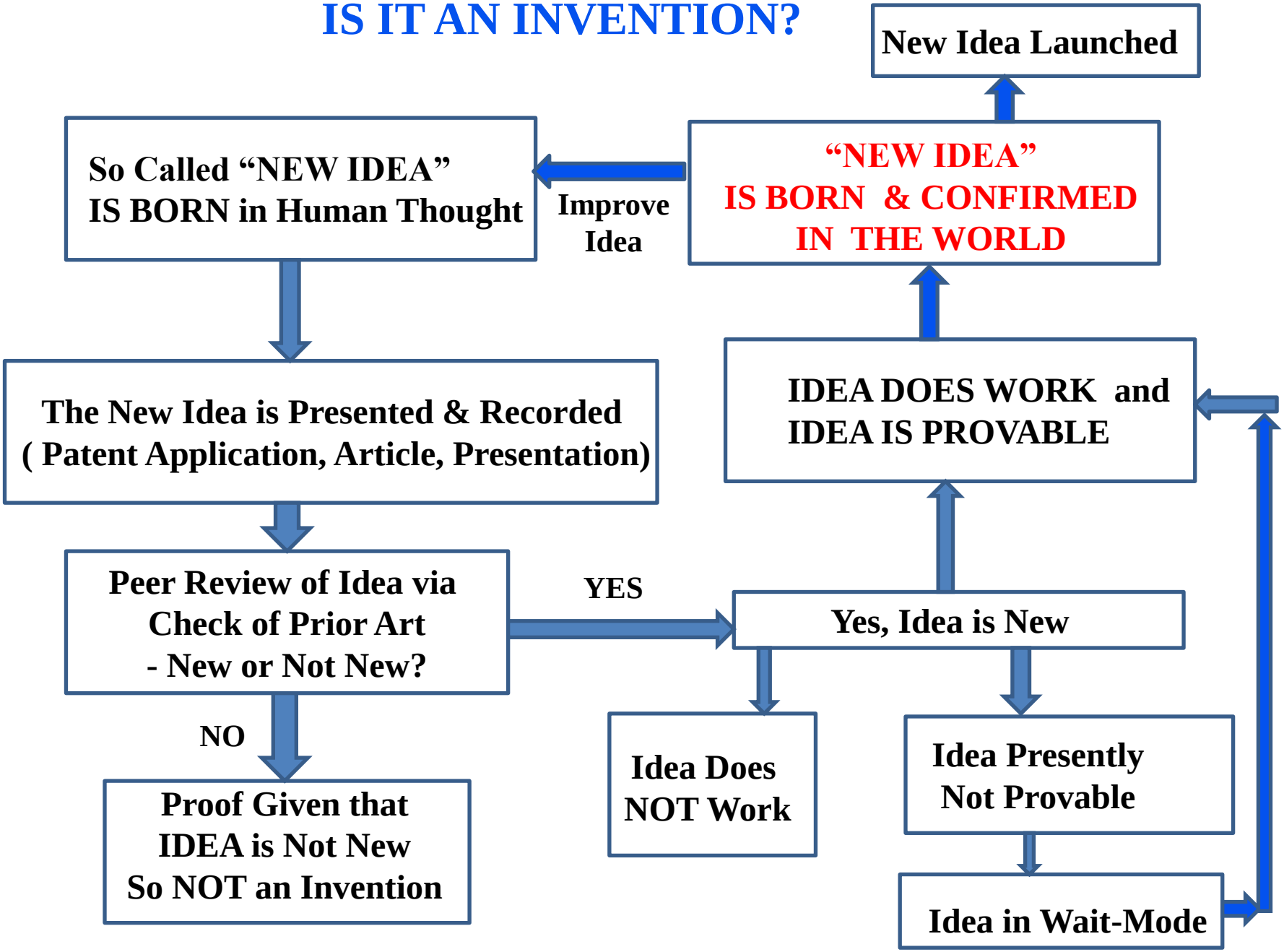
A New Design ---- Vacuum Sealing the Filament Light Bulb

A New Language --- Braille (Physical Bumps Coding); Morse Code

A New Concept --- The Internet (interconnected computers)

A New Contraption --- Radar, Television, Camera, Electronic Transistor

IS IT AN INVENTION?



AN INVENTION USING LIGHT

A NEW THERMOMETER IS NEEDED FOR DIRECTLY MEASURING GAS TEMPERATURE IN POWER PLANTS OPERATING OVER 1500 DEGEE-C.

Note: Present Thermometers Break-Down under the Extreme Long-Term Power Plant Conditions

Why?

OPERATING PLANT AT HIGHER TEMPERATURE LEADS TO BETTER SYSTEM EFFICIENCY & GREENER OPERATIONS

The Issued 3 Patents of the New Thermometer

N. A. Riza and * F. A. Perez, US Patent 7,327,472, Feb.5, 2008.
N. A. Riza and F. A. Perez, US Patent 8,035,822, Oct.11, 2011.
N. A. Riza and F. A. Perez, US Patent 8,096,704, Jan.17, 2012.

TRUE FRIEND → TRUST & BELIEF → CAN MAKE A NATURAL CO-INVENTOR

- **Dr. Frank Perez, Ph.D. Mechanical Engg. Caltech, Caltech Apartment-Mate (1987-89), Co-Founder KAOS Caltech Soccer Team, True Friend, and Colleague & Business Partner on Start-Ups Nuonics, Inc. and Nusensors, Inc.**

GE's H system Gas Turbine

Uses Firing Temperature of 1430 °C

R. Matta, et.al, " Power Systems for the 21st Century," GE Power Systems Publication GER3935B, Oct. 2000.

How does Extreme temperature Measurement get done today?

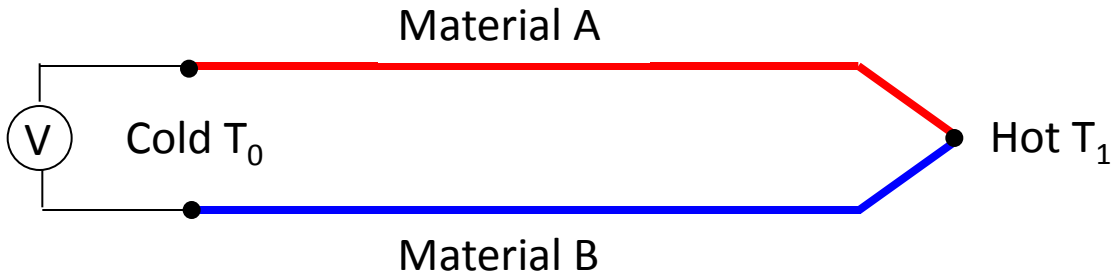
Platinum/Rhodium High Temperature Thermo-Couple (TC) All-Electrical Technology is used to Measure Extreme Temperature

Note:
Need to Encase in Custom Magnesia (MgO) or Alumina Insulating Ceramics

TC Thermometers Break-Down under Next-Gen Design (> 1500 °C) Combustion Chamber Conditions

Image courtesy: Cybernetics Technical Industries Inc.

Thermocouple Design



- Dissimilar materials A and B

- Net EMF as measured by the voltmeter is a function of the temperatures T_0 and T_1 and composition of the two materials (Seebeck effect* --- Thomas Johann Seebeck 1821)

- Net EMF = $V_A(T_1,T_0) - V_B(T_1,T_0)$ measured in volts

EMF: Electromotive Force – Measure of Electric Potential/Voltage

*http://www.uni-konstanz.de/FuF/Physik/Jaeckle/papers/thermopower/node1.html

Is There An Extreme Temperature Sensor Design Without the TC & Optical Fiber Probe Packaging & Reliability Issues?

James Bond --- " Diamonds Are Forever"

Movies Can Inspire an Invention!

Look for a Carbon Base Material – They are Indestructable!

RELIABLE OPTICAL CHIP SOLUTION: THICK SINGLE CRYSTAL SILICON CARBIDE

Melting Temperature ~ 2500 °C
Resistant to Chemical Attack (Acids, Hot Gases)

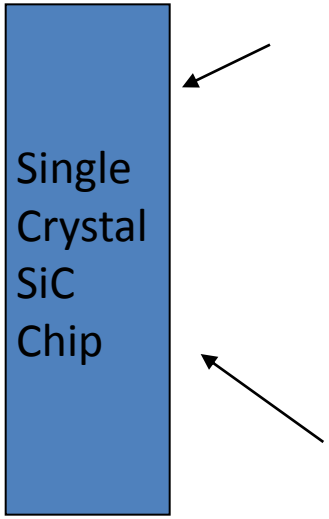
Mechanically Robust

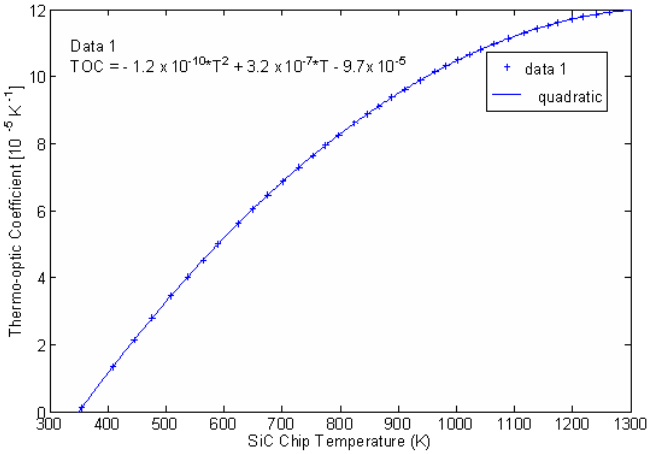
-- Handles 1 GPa (10,000 atm) Yield Stress
-- Allows Elastic Deformation in the Small Deflection Regime Due to Pressure

Excellent Atomic Scale Flatness
Minimal Optical Wavefront Spoiling

High 2.55 Refractive Index
Strong 20% SiC/Air Reflectivity
At EYE SAFE Infrared Band (1550 nm)

Natural Interferometer Chip





*** Refractive Index "n" Changes With Temperature T**
& dn/dT (Thermo-Optic Coeff.) Changes Quadratically with T

For SiC, can make the 2-Beam Interference Approximation:

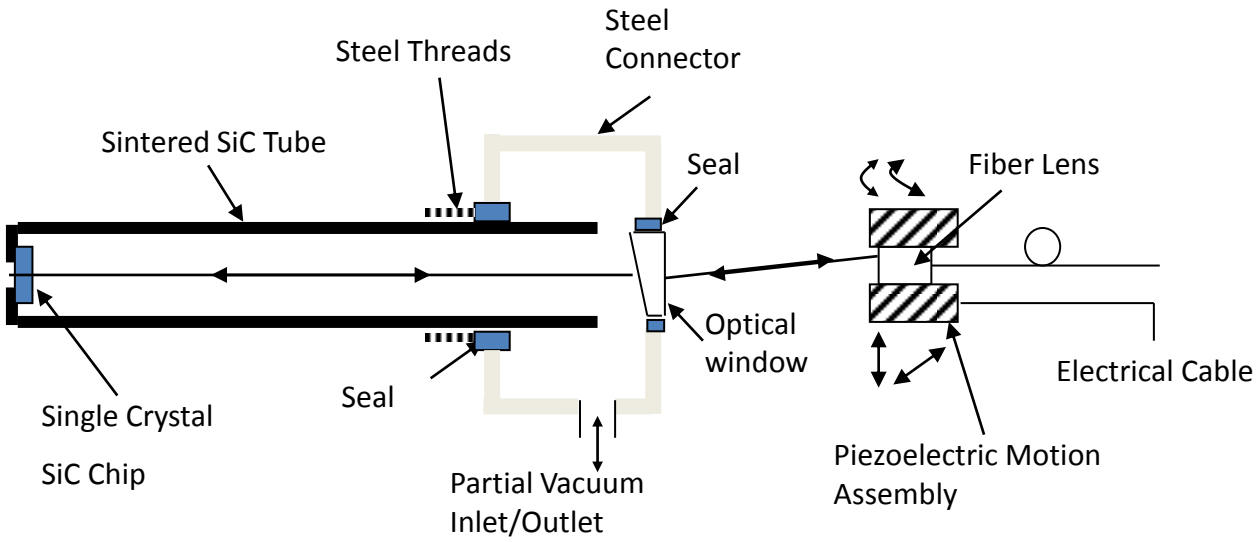
$$P_m = K \cdot R_{FP} \approx K\left[R_1 + (1-R_1)^2 R_2 + 2(1-R_1)\sqrt{R_1 R_2}\cos\theta\right] \quad \theta = \frac{4\pi n(T) d(T)}{\lambda}$$

What is new about our Thermometer?

Uses a Hybrid Access/Packaging Approach

Wireless + Wired Optics

Extremely Hot Thermal Isolation Cool Section



Summary: What is new about our approach?

- Single Crystal SiC + Sintered SiC Probe
- Single material (CTE matched) – Robust frontend for extreme zone
- Temperature Reading Independent of Intrinsic % Increasing Temperature Error

Eliminated Fundamental TC Limitations

Front-End Probe

Unassembled

Assembled

SIGNS OF A PURE INVENTOR OVER A LIFE-TIME

(Some Inherent & Some Developed Over Time)

- **LOVES WHAT HE/SHE DOES**
- **INDEPENDENCE OF THOUGHT AND ACTIONS**
- **FEARLESS – AT EASE AT BEING ALONE/ISOLATED- A LONE EXPLORER**
- **SELF BELIEF IN ONE'S STRENGTHS AND LIMITATIONS**
- **OBSERVANT OF EVERYTHING [Sight, Sound, Smell, Behaviour (human, animal), etc]**
- **HUNGER TO LEARN FROM ALL (Competitors, Friends, Strangers)**
- **ACCEPTANCE OF MISTAKES WITH HUMILITY**

SIGNS OF A PURE INVENTOR OVER A LIFE-TIME

(Some Inherent & Some Developed Over Time)

- **SHORT CELEBRATIONS OF SUCCESS AND DOWN TIME FOR FAILURES**
- **DEEP CONCENTRATION ABILITY AND ABILITY TO BLOCK-OUT (Trance)**
- **ABILITY TO CHANGE THOUGHT DIRECTIONS WITHOUT REGRET**
- **ABILITY TO FOCUS AND DEFOCUS WITH EASE (Switch between The BIG picture and The Super Zoomed-In View)**
- **SEEKS THE TRUTH WITH PROOF VIA HIS/HER INVENTION**
- **INNOVATION WORKS MOSTLY HAVE SINGLE INVENTORSHIP**
- **ENHANCED SENSE OF HUMOUR!! (State of a Relaxed Mind)**

Proof of Single Inventorship
(26 out of 42 Patents)

1. N.A. Riza, U.S.A. Patent No. 5,117,239, May 26, 1992.
2. N.A. Riza, European Patent No. 92303635.4, July 07, 1992.
3. N. A. Riza, U.S.A. Patent No. 5,187,487, Feb.16, 1993.
4. N. A. Riza, U.S.A. Patent No. 5,191,339, March 02, 1993.
5. N. A. Riza, U.S.A. Patent No. 5,231,405, July 27, 1993.
6. N. A. Riza, U.S.A. Patent No.5,274,381, Dec.28, 1993.
7. N. A. Riza, U.S.A. Patent No.5,274,385, Dec.28, 1993.
8. N. A. Riza, U.S.A. Patent 5,307,073, April 26, 1994.
9. N. A. Riza, U.S.A. Patent No. 5,329,118, July 12, 1994.
10. N. A. Riza, USA Patent No. 5,512,907, April 30, 1994
11. N. A. Riza, USA Patent No. 5,568,286, Oct.22, 1996.
12. N. A. Riza, USA Patent No. 5,694,216, Dec. 2, 1997.
13. N. A. Riza, USA Patent No. 5,731,790, March 24, 1998.
14. N. A. Riza, Patent No. 5,718,226, Feb.17, 1998.
15. N. A. Riza, US Patent 6,031,658, Feb.29, 2000.
16. N. A. Riza, Patent No. 6,222,954, April 24, 2001.
17. N. A. Riza, Patent No. 6,282,336, August 28, 2001.
18. N. A. Riza, Patent No. 6,360,037, March 19, 2002.
19. N. A. Riza, Patent No. 6,525,863, Feb. 25, 2003.
20. N. A. Riza, Patent No. 6,563,974, May 13, 2003.
21. N. A. Riza, Patent No. 6,687,036, Feb.3, 2004.
22. N. A. Riza, Patent No. 6,859,578 B2, Feb. 22, 2005.
23. N. A. Riza, Patent No. 6,885,807, April 26, 2005.
24. N. A. Riza, Patent No. 6,922,233, July 26, 2005.
25. N. A. Riza, US Patent No. 7,978,346, July 12, 2011.
26. N. A. Riza, US Patent 8,107,056, Jan.31, 2012.

INVENTOR OR OTHER?

NOT ANYONE

CAN BE

SHOULD BE

WILL BE

CAN BE TRAINED TO BE

AN INVENTOR

The Entire Bachelor's Degree Graduating Class of a University

Pure Inventors In the Class

SOCIETIES AND LEARNING INSTITUTIONS MUST FIND AND FOSTER INVENTORS FOR THE BETTERMENT OF HUMANKIND

INVENTORS - PAST and PRESENT
– CONNECTED BY THE KNOWLEDGE TREE –

Strangers Connected by:

- **Study the Same Field (e.g., Light, Computing)**
- **Study the Same Problem (e.g., Making a Better Liquid Crystal Optical Switch)**
- **Study at the Same Location (e.g., University, Corporation)**
- **Belong to the Same Culture (e.g., Country)**
- **Belong to the Same Tradition (e.g., Religion)**

Past Inventors - An Inspiration for Present Inventors

PERSONAL JOURNEY WITH INVENTORS - PAST and PRESENT

MY FIRST YEAR AT CALTECH

Photo: Caltech Class on Computation
May 31, 1985.

RICHARD FEYNMAN
(1918 – 1988)
Nobel Prize

Professor, Caltech
Co-Inventor of the
Quantum Theory
For Electrodynamics
(Light-Matter Interaction Explained via quantum fields)

My Course Instructor:
Computation Class 1985

PERSONAL JOURNEY WITH INVENTORS - PAST and PRESENT

FELLOW CALTECH ALUMNUS

CHARLES TOWNES
(1918 –)
Nobel Prize

Ph.D. Caltech
Co-Inventor of the
LASER

Photo: Orlando, USA Jan. 11, 1999.

PERSONAL JOURNEY WITH INVENTORS - PAST and PRESENT

TEACHER @ CALTECH

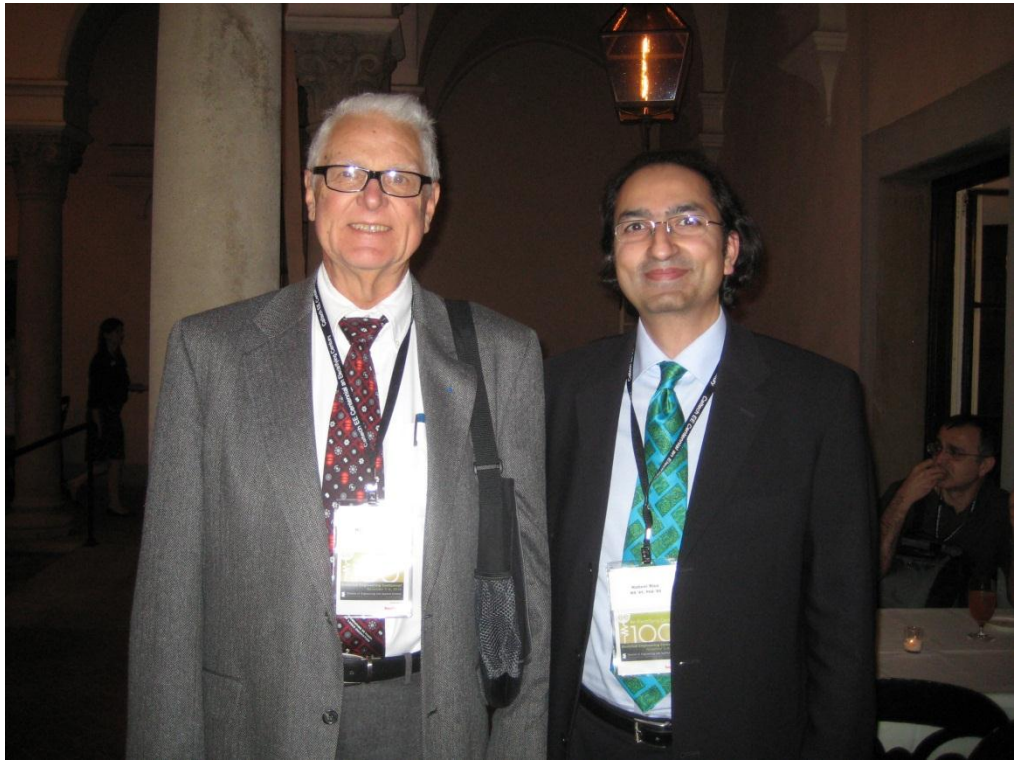


Photo: Caltech EE 100 Year Celebration
Nov. 5-6, 2010.

WILLIAM BRIDGES
(1934 –)

Professor Emeritus, Caltech
Inventor of the
Argon Ion Gas Laser

My Course Instructor:
Guided Waves Class 1984-85

PERSONAL JOURNEY WITH INVENTORS - PAST and PRESENT

ROLE MODEL INVENTOR @ CALTECH

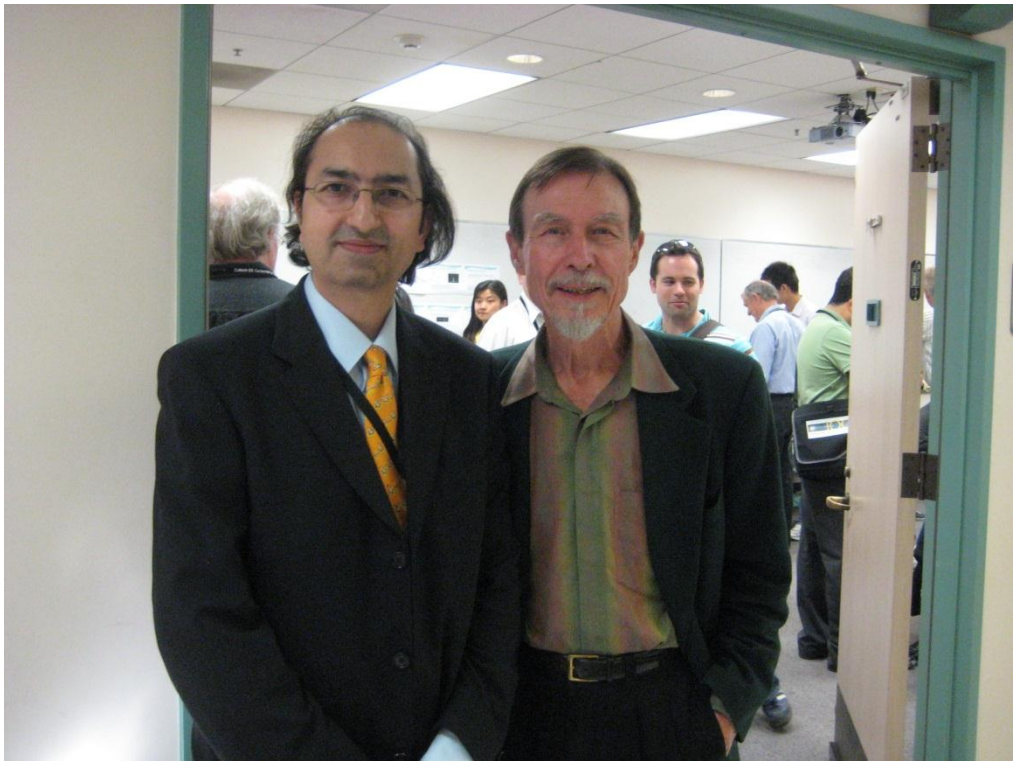


Photo: Caltech EE 100 Year Celebration
Nov. 5-6, 2010.

CARVER MEAD, Ph.D. Caltech
(1934 –)

Professor Emeritus, Caltech
Inventor * of the
HEMT Semiconductor Device
Amplifier Circuit used in RF Electronics
for cell phones, radar, and satellite communications

***Also Co-Invented**
VLSI Electronics Design

HEMT: High Electron Mobility Transistor

PERSONAL JOURNEY WITH INVENTORS - PAST and PRESENT

MY LAST YEAR AT CALTECH

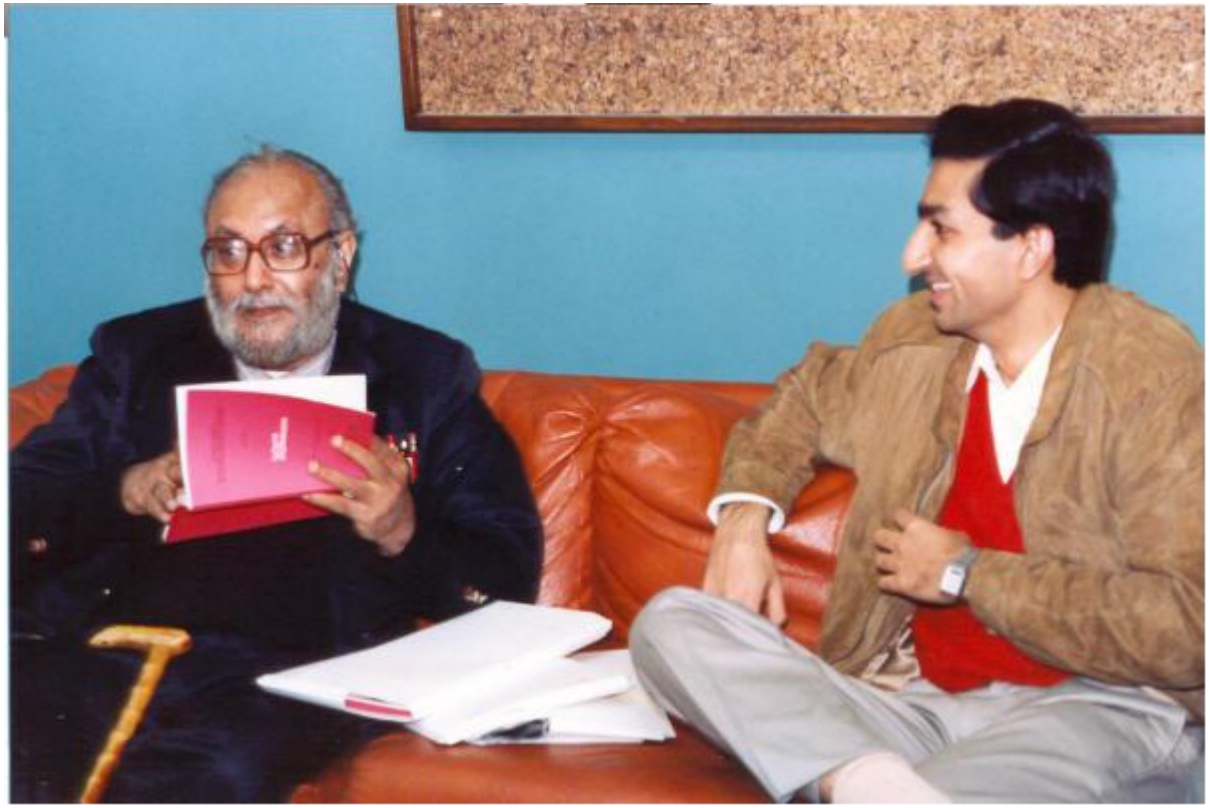


Photo: Caltech, 1989, The Year I completed my PhD from Caltech to start my independent invention-based career.

Born in Pakistan

ABDUS SALAM
(1925 – 1996)
Nobel Prize

Co-Inventor of the
Theory Unifying the Electromagnetic Force with The Weak Nuclear Force

The Timing Was Perfect!

A Role Model For a Pakistani Student in his Formative Years

PERSONAL JOURNEY WITH INVENTORS - PAST and PRESENT

@ UNIVERSITY COLLEGE CORK (UCC), IRELAND

George Boole (1815 – 1864)

UCC CHAIR Professor (1849-1864)

Inventor of Boolean Algebra FOUNDATIONS OF DIGITAL COMPUTERS

PERSONAL JOURNEY WITH INVENTORS - PAST and PRESENT

@ UNIVERSITY COLLEGE CORK (UCC), IRELAND

John Tyndall
Born Ireland, 1820 – 1893

Discoverer of The Tyndall Effect
Light is scattered by very small particles in its path and SCATTERING IS STRONGER FOR SMALLER WAVELENGTHS

Demonstrator of the water light-pipe, a forerunner To The Optical Fibre

University College Cork is Home to the Tyndall National Institute

PERSONAL JOURNEY WITH INVENTORS - PAST and PRESENT

ACCLAIMED WORLD-WIDE AS THE FATHER OF OPTICS

Iraqi Muslim Scientist

ALHAZEN
(965 – 1039)

Inventor of the
Principle of Light Travels
In a Straight Line &
Design of the Pin-hole Camera

One debt to Iraq: The genesis of computing

Mathematician conjured up algebra

We're seriously considering bombing the Iraqis into Jell-O. Big deal, most people in the the USA seem to think. Aside from selling us oil and a few rugs, the nation never did anything for us anyway.

But just so you know — just in case it might alter your thought patterns a little bit — the computer industry of today would not exist if it were not for an Iraqi.

Technology

By Kevin Maney

Kevin Maney's column appears Thursdays

This would be a guy named Abu Abd-Allah ibn Musa al'Khwarizmi. He lived from 770 to 840. Somewhere in there, he invented algebra, which was then called al-jabr. If you look at his last name — al'Khwarizmi — it's where the word algorithm came from.

"The way we use equations today came from him," says Amir Aczel, a history of mathematics professor at Bentley College in Waltham, Mass. Since computers and computer programs couldn't have been developed without these kinds of equations, by extension all those sickeningly rich twenty-something Silicon Valley entrepreneurs ought to be bowing in Iraq's direction instead of cheering on the warplanes.

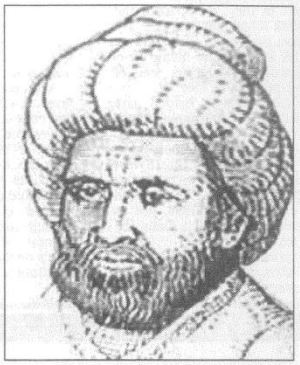
In fact, a lot of tech types know and pay respects to al'Khwarizmi. I asked Bill Pulleyblank, star algorithm researcher at IBM, if he ever heard of al'Khwarizmi. "Indeed, a famous name!" he spurted, then listed a few of al'Khwarizmi's achievements.

Al'Khwarizmi was actually born in what is now Uzbekistan in central Asia. His parents migrated to just outside of Baghdad, Iraq, when he was a child. He was, apparently, a genius, and as a young man was invited to be a scholar at a government-sponsored institution called the House of Wisdom in Baghdad.

Already, there's a lesson here for the USA. We've got things like Bell Labs and Stanford University, but when you think about research for the ages, you really need a place called House of Wisdom. Besides, it would be so cool to have a business card that said, "Vice President, House of Wisdom."

Anyway, al'Khwarizmi pulled together a number of strings of mathematical thought from the ancient Greeks and the Babylonians. The Greeks had done a lot to develop the science of mathematics, but once the Greeks fell and Rome rose, that work pretty much stopped. The Romans, not much for pure science, were much more interested in using math for practical things, like conquering the world.

Al'Khwarizmi pulled math out of that Roman funk and revived it, adding concepts of his own and publishing a landmark book with the catchy title, *The Compendious Book on Calculation by Completion and Balancing*. Hey, it's just as good a title as *The Discipline of Market Leaders*.



Thank Iraq: Abu Abd-Allah ibn Musa al'Khwarizmi invented algebra, which led to computers.

"The only point of light in the dark ages of mathematics is (Abu Abd-Allah ibn Musa al'Khwarizmi)."

— Amir Aczel, professor, Bentley College

bra," says a paper by Karen Parshall of the University of Virginia.

Al'Khwarizmi went on to quite a career at the House of Wisdom. He wrote an important treatise on astronomy. He ran a gigantic effort that produced the first known map of the world, or the world that was known at the time. His colleagues and successors produced more great mathematical thought.

But Iraq didn't follow through. If it had, maybe it would be the world's high-tech center today — home of great powerhouses like Mohammedsoft.

The Iraqis, like the Romans, ended up being less interested in pure math than practical math. "They were very market-driven," Aczel says. "They wanted to solve equations for amounts of wheat to buy at the best price."

Mathematical thought fell into a dark age for a good 800 years. Important, though, is that al'Khwarizmi's *Compendious Book* was translated into Latin. It could then be read by scholars in Europe, where it sparked a revival of pure mathematics. From then on, the West has been the center of mathematical invention and thought.

Which may help explain the West's long-standing lead in technology vs. the rest of the

ACCLAIMED WORLD-WIDE
AS THE FATHER OF ALGEBRA

Iraqi Muslim Scientist

KHWARIZMI
(770 – 840)

Inventor of Algebra

- **Linear & Quadratic Equation Solutions**
- **Algorithm (Namesake) Methodology**

WHY DOES AN INVENTOR INVENT?

MOST HUMANS CAN BE MOTIVATED TO TRY INVENTING BY PROVIDING:

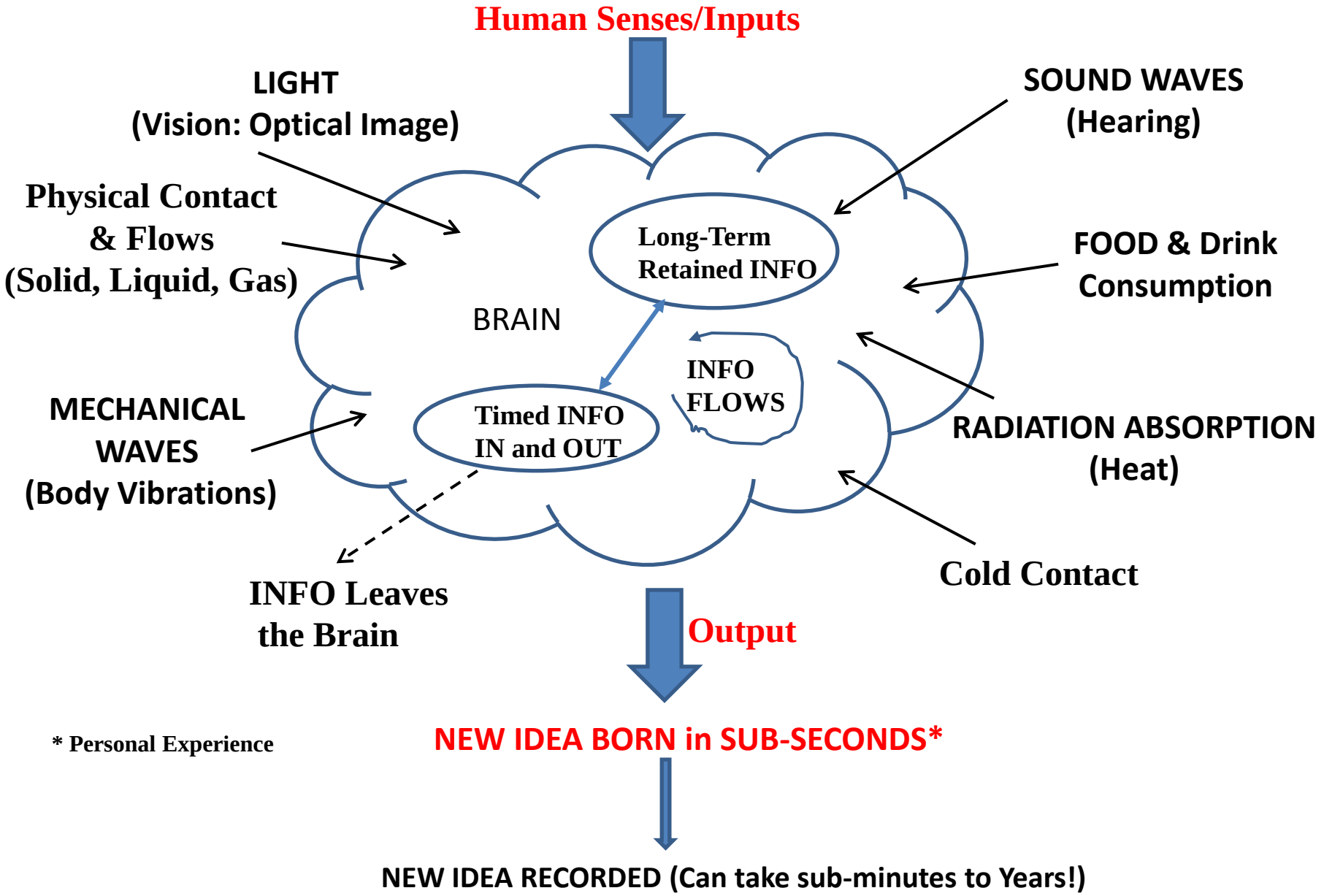
- **MONEY**
- **TITLES AND POSITIONS**
- **LOCAL, NATIONAL, INTERNATIONAL AWARDS/PRIZES**
- **SPECIAL WORKING ENVIRONMENTS**
- **FREE-TIME**
- **TRAVEL OPPORTUNITIES**
- **TEACHING TIME REDUCTION OR ELIMINATION FOR ACADEMICS**

ACCLAIMED URDU WRITER INTIZAR HUSSAIN (my Uncle) WHEN ASKED:

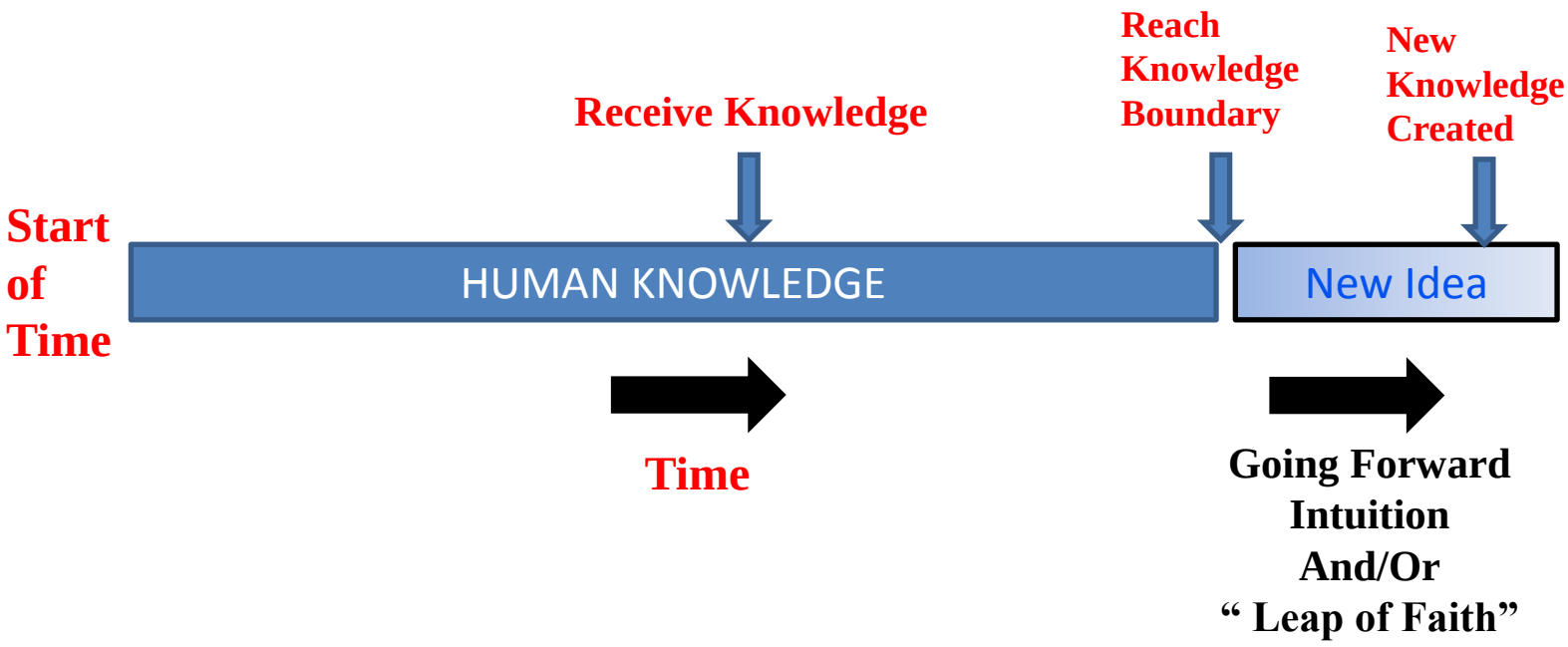
Why Does He Write? **He Replied: Do you Ask a Nightingale why it Sings! IT JUST DOES!**

PURE INVENTORS WILL INVENT ANYWAY
AS THAT IS WHAT THEY NATURALLY LOVE TO DO!

HOW DOES AN INVENTOR INVENT?



Starting the Invention Process:
" INTUITION"
AND/OR Some times Like a Leap-of-Faith



Indiana Jones – The Last Crusade

The Ravine Crossing Scene

" BREAKING" THE INVENTION

WHEN AN INVENTION IS DECLARED, IT COMES UNDER CRITICISM

THE BETTER THE INVENTION, THE STRONGER THE CRITICISM

GENUINE CRITICISM MAKES THE INVENTION STRONGER FOR A LONGER REIGN

UNINFORMED CRITICISM DIVERTS AND DISTRACTS FROM THE INVENTION

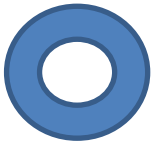
SIMPLER AND CLEARER THE INVENTION, THE HARDER TO "BREAK"
THE INVENTION REIGNS SUPREME FOR A LONG TIME

Example Inventions

The DOT

Connect Dots = Line
(A New Invention)

The Wheel



Ludwig Mies van der Rohe (1886-1969) – Inventor Architect

“Less is More*”

Finding Perfection in Purity

S. R. Crown Hall, The School of Architecture – A Mies van der Rohe Invention (1956)
Illinois Institute of technology (IIT)*, Chicago

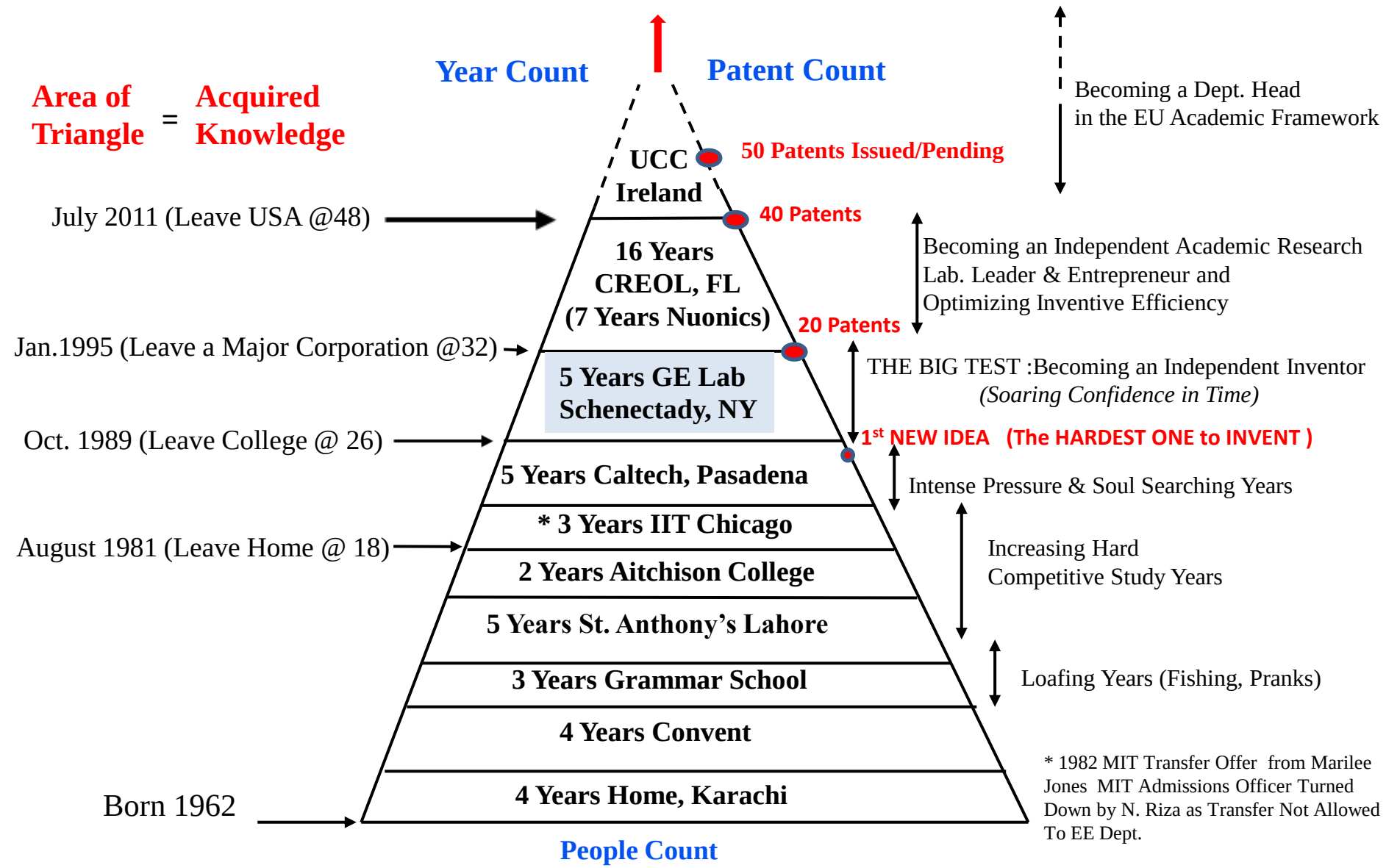
Google Doodle March 27, 2012 Celebrating Mies’s Birthday

**** Author: BS EE IIT 1984.**
Crown Hall Photo Courtesy of www.iit.edu.

*** Mies’s Quote in the New York Herald Tribune, 28 June 1959.**

THE INVENTOR'S CLIMB

SMALL STEPS IN THE CLIMB FOR CLEAREST VISION



* 1982 MIT Transfer Offer from Marilee Jones MIT Admissions Officer Turned Down by N. Riza as Transfer Not Allowed To EE Dept.

INVENTING FOR HIGHER EDUCATION IN PAKISTAN
The History for LUMS SSE

Feb. 2002, Dr. Khurram Afridi (Colleague from Caltech days) Requests I Give a Talk on People and Technology at the April 2002 Pak-Millennium Conference on Higher Education in Pakistan, being held Boston, USA. ***(Official Invitation Letter March 20, 2002 from Dr. Adil Najam, Chairman Conference)***

Change in Plans

Dr. Afridi says: Prof. Hoodbhoy will do "People", so I should address the Topic of "Money"

I wonder! What can I Say about Money? I Start Thinking in "Invention" Mode

Uh! People with Money & Concern for Education Will be at the Conference!

Why not Show Them a Plan that shows that Investing Money in a Small World Class Technology University

WILL MAKE EVERYONE MONEY

The Investors, University Administrators, Faculty, Staff, and Student Graduates
A WIN-WIN FOR ALL
(I WAS IN VENTURE CAPITAL (VC) PRESENTATION MODE IN 2002)

Delivery of the " Plea" and Blue-Print for the Small Technological University on April 14, 2002.

Presentation at the Pak-Millennium Conference on Higher Education in Pakistan, Boston, 2002.

Towards a World-Class Research University in Science and Technology- Money is Critical but Not Enough

PROOF
OF
INVENTION

By

Nabeel A. Riza

April 14th, 2002

Boston, USA

N. A. Riza is Full Professor at College of Optics/CREOL, University of Central Florida, USA and Founder of Nuonics, Inc.

PROOF OF INVENTION

MONEY →

PAK-MILLENNIUM CONFERENCE 2002

Higher Education in Pakistan – Challenges for Reform

Hariri Auditorium
Boston University School of Management
595 Commonwealth Avenue, Boston, MA 02215

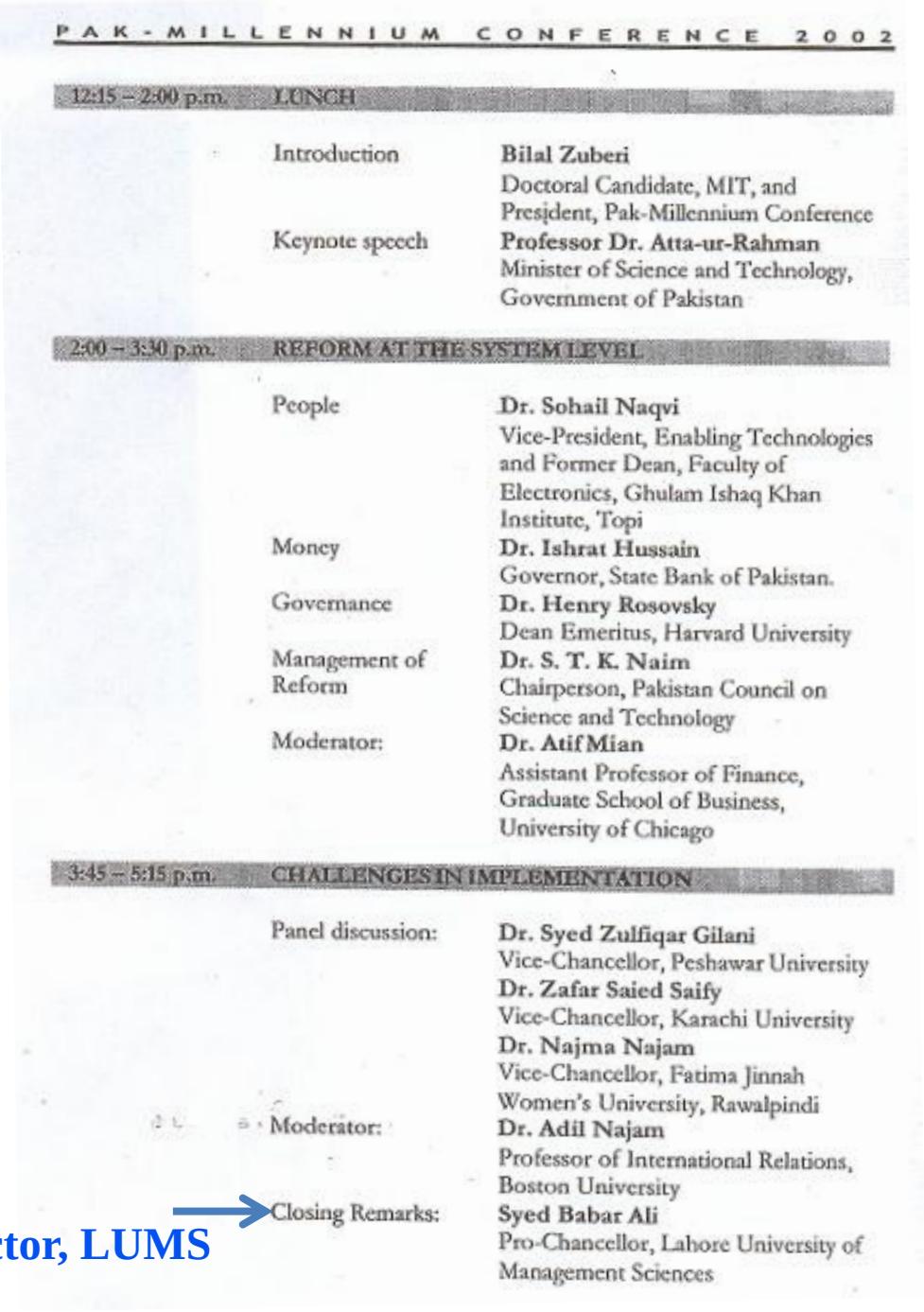
Sunday, April 14, 2002

8:30 – 9:00 a.m.	REGISTRATION	
9:00 – 10:30 a.m.	SETTING THE STAGE	
	Dimensions of the crisis	**Dr. Tariq Banuri** Senior Research Director, Stockholm Environment Institute-Boston
	Current reform efforts	**Dr. Shamsh-Kassim Lakha** President, Aga Khan University and Chair, Steering Committee on Higher Education
	Moderator:	**Hasan Usmani** Axim Systems
10:45 – 12:15 p.m.	REFORM AT THE UNIVERSITY LEVEL	
	People	**Dr. Pervez Hoodbhoy** Professor of Physics, Quaid-e-Azam University, Islamabad
	Money	**Dr. Nabeel Riza** Professor of Optics and Electrical Engineering, University of Florida and CEO, Nuonics, Inc.
	Governance	**Dr. Hamid Kizilbash** Ali Institute of Education, Lahore and Former Professor of Political Science, Punjab University, Lahore
	Management of Reform	**Dr. Tahir Andrabi** Associate Professor of Economics, Pomona College
	Moderator:	**Duriya Farooqui** Research Associate, Kennedy School of Government, Harvard University

PROOF OF INVENTION

The Stage is SET.

Mr. Syed Babar Ali
Founder & Benefactor, LUMS

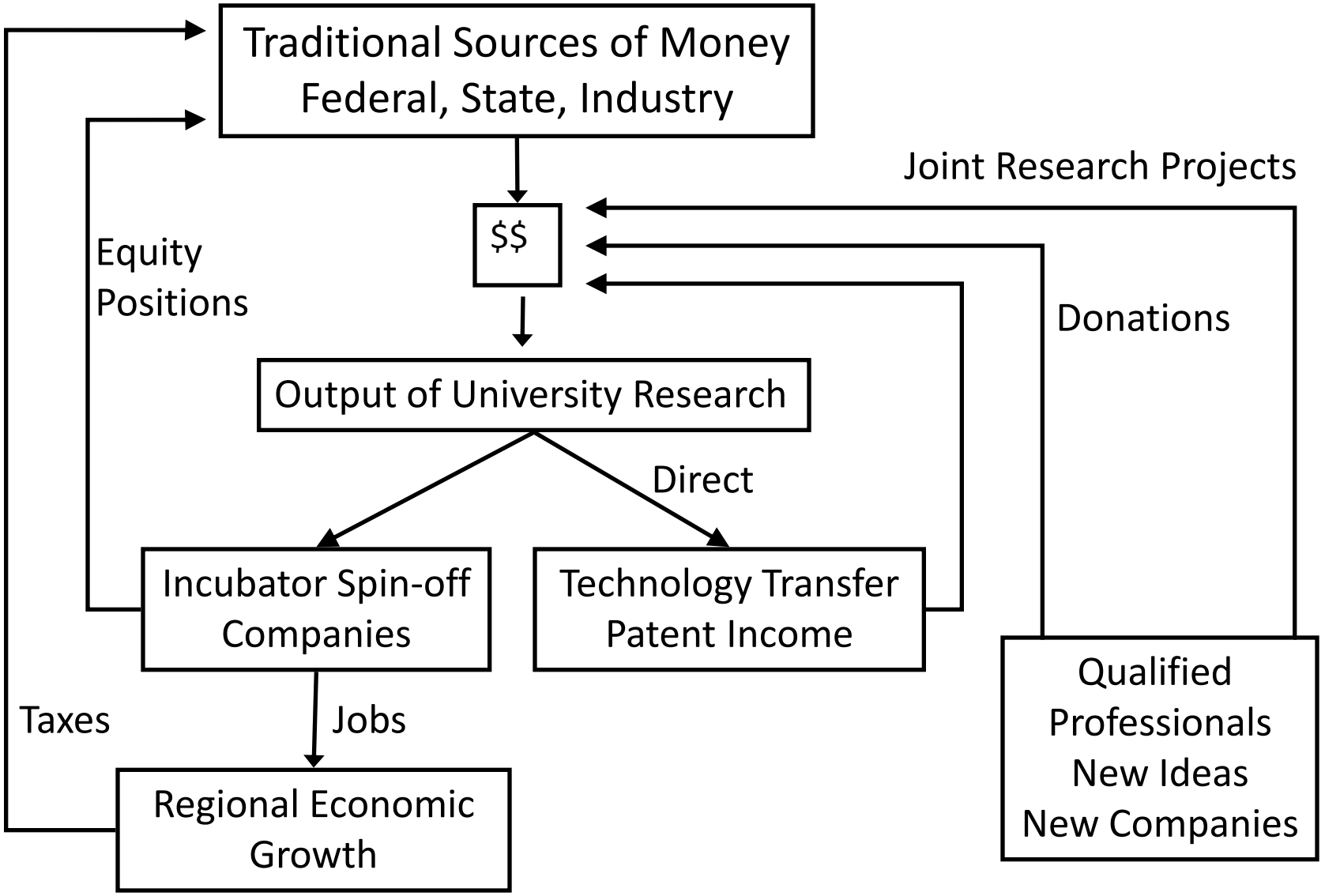


PAK-MILLENNIUM CONFERENCE 2002

12:15 – 2:00 p.m.	LUNCH	
	Introduction	**Bilal Zuberi** Doctoral Candidate, MIT, and President, Pak-Millennium Conference
	Keynote speech	**Professor Dr. Atta-ur-Rahman** Minister of Science and Technology, Government of Pakistan
2:00 – 3:30 p.m.	REFORM AT THE SYSTEM LEVEL	
	People	**Dr. Sohail Naqvi** Vice-President, Enabling Technologies and Former Dean, Faculty of Electronics, Ghulam Ishaq Khan Institute, Topi
	Money	**Dr. Ishrat Hussain** Governor, State Bank of Pakistan.
	Governance	**Dr. Henry Rosovsky** Dean Emeritus, Harvard University
	Management of Reform	**Dr. S. T. K. Naim** Chairperson, Pakistan Council on Science and Technology
	Moderator:	**Dr. Atif Mian** Assistant Professor of Finance, Graduate School of Business, University of Chicago
3:45 – 5:15 p.m.	CHALLENGES IN IMPLEMENTATION	
	Panel discussion:	**Dr. Syed Zulfiqar Gilani** Vice-Chancellor, Peshawar University **Dr. Zafar Saied Saify** Vice-Chancellor, Karachi University **Dr. Najma Najam** Vice-Chancellor, Fatima Jinnah Women's University, Rawalpindi
	Moderator:	**Dr. Adil Najam** Professor of International Relations, Boston University
	Closing Remarks:	**Syed Babar Ali** Pro-Chancellor, Lahore University of Management Sciences

Presentation at the Pak-Millennium Conference on Higher Education in Pakistan, Boston, 2002.

Financial Engine of a Research University



Pak-Millennium Conference 2002

Higher Education in Pakistan: Challenges for Reform

April 13-14, 2002
Massachusetts Institute of Technology &
Boston University
Boston, USA

The Official Conference Report

CONFERENCE REPORT

Pak-Millennium Conference Committee
http://www.pak2000.org
The Boston Group
http://www.thebostongroup.org

The PATH to the LUMS School of Science & Engineering (SSE)

ALL INVENTIONS MUST PROVIDE VERIFIABLE PROOF

The Official Boston 2002 Conference Report States:

Dr. Nabeel Riza

Dr. Nabeel Riza dwelled on the idea of establishing a world class research university in science and technology in Pakistan. Money is a critical factor, he stated, but it is not enough. Although a society needs educated people at all levels including high school, college, and university graduates, it is important to invest in few to create a quality institution of research. You need few highly educated and competent people to pursue and sustain high technology research activities, he argued. Very few people, for instance, in the US are supported by the industry. Dr. Riza suggested that a team of world class researchers should be brought to Pakistan to build institutions of excellence.

Active or former successful scientists and engineers should be gathered for this purpose, he further added. Dr. Riza stressed the importance of creating a "pristine" small environment that would have a great impact on the nation. He advised that traditional and novel sources of money should be exploited for the purpose of establishing the institute. In the US, for example, federal government, state, and industry are major sources of finances for research institutes. In addition, alumni and community also provide funds for research. The research institute in Pakistan could carry out small-scale innovative and balanced research programs supported by the industry, he suggested. Furthermore, the enormous investment should connect to concrete and new products for the industry. He also suggested that a multi-university research center could be established in Pakistan to pursue inter-university collaborative projects.

INVENTING FOR HIGHER EDUCATION IN PAKISTAN

The PATH to the LUMS School of Science & Engineering (SSE)

Boston Conference Talk Slides on Request Provided to Dr. K. Afridi April 2002

2002-2004 Mr. Syed Babar Ali appoints Dr. K. Afridi as LUMS SSE Projector Director
& Project Office & Admin. Team Assigned on the LUMS Campus
N. Riza involved in Early SSE Planning (Faculty Ads & Selection, Tenure Debate, Dean Recommendation (A. Abidi)

Draft SSE Core Curriculum June 2004, Draft Depts Document Nov.2004
1st SSE Development Workshop at LUMS, Jan 2-3, 2005
1st SSE Virtual Project Development Team (VPDT) Meeting, Woburn, MA, March 26, 2005

N. Riza UCLA EE Dept Seminar March 14, 2005 (Briefs A. Abidi on formation of SSE and Available Dean Position)
Early SSE Faculty Applicant M. Sabieh Anwar May 19, 2005 (now with Physics, SSE)
1st SSE Advisory Committee Meeting, Boston, MA, July, 2005

1st SSE Dean Appointed @ LUMS March 2007 – Prof. A. Abidi (from UCLA)

1st Batch of SSE Students Admitted Fall 2008
1st Batch of SSE Student Graduates Expected Spring 2012

Actions and Not Words – Educating the Next Inventors

Prof. Abdus Salam's Advice to Me (1989)

Remember to Help the 3rd World even if you need to make your Career Elsewhere.

*Sample of Ph.D. Students & Post-Docs (PD) Trained 1995-2011 from the 3rd World

From Thailand

Dr. Sarun (Ph.D.)
Director
Thai National
Lab. (NECTEC)
2005 Winner
ICTP/ICO Award
Abdus Salam ICTP
Trieste, Italy

From Pakistan

Dr. Junaid, M.Phil. QAU (PD) → **GIKI EE Dept. Head**

Dr. Zahid, M. Phil. QAU (Ph.D.)
Dr. Muzammil, BS NED (Ph.D.)
Dr. Sajjad BS Naval College/NUST (Ph.D.)
Dr. Farzan BS GIKI (Ph.D.)
Dr. Mumtaz (Ph.D.) BS Comp. Science 2004, LUMS → **LUMS SSE** Started 2010
Dr. Azer BS GIKI (Ph.D.) **Accepted LUMS Offer April 2012.**

4 SSE LUMS Applicants
for 2012 UCC EE PhD Position with FULL Scholarship → 1 SSE Student Selected for UCC

* A Special Thank You to **ALL** my Co-workers including colleagues at GE, Nuonics, & PIPS Lab. Undergraduate and graduate students and Post-Docs.

Request to the LUMS Board

THE TIME IS RIGHT !

*LUMS
SSE
Building

GRADUATION PRESENT
FOR THE 1ST GRADUATING SSE CLASS 2012

LUMS:
LAHORE UNIVERSITY OF MANAGEMENT SCIENCES

↓

LUMS:
LAHORE UNIVERSITY OF MANAGEMENT AND SCIENCE

*** LUMS SSE Bldg Design & Construction Led by SSE Project Director Dr. K. K. Afridi, 2005-2008.**

Slight Name Change – Global Impact

The " New" LUMS:
LAHORE UNIVERSITY OF MANAGEMENT AND SCIENCE *

The New York Times DEC. 18, 2009

" Mr. Ali is an institution in Pakistan. He has started some of the country's most successful companies. But perhaps his most important contribution has been his role in creating the Lahore University of Management and Science, or L.U.M.S., begun as a business school but now evolved into the approximate equivalent of Harvard University in Pakistan."

Note: The LUMS Name Change Originally Suggested by author in 2004. This name also appeared in:
"One Pakistani Institution Places His Faith in Another," New York Times Article by SABRINA TAVERNISE Published in The Saturday Profile Section, December 18, 2009.

THANK YOU TO MY TEACHERS & MENTORS

Mr. Fardy (Science/Physics – St. Anthony's Lahore 1973)
Ms. Zareen Bashrat (Biology – St. Anthony's Lahore 1975-78)

Mr. Hafeez Farouqi (Maths – Private Tutor, Education Dept. Lahore– 1976-78)

Mr. A. D. Bhatti (Maths – Aitchison College – 1979-80)

Prof. Deborah Holdstein (English, IIT Chicago, 1981-84)
Prof. Thomas Wong (Electrical Engg, Circuits & Networks, IIT Chicago, 1981-84)
Prof. S. Meerkov (Electrical Engg, Controls, IIT Chicago, 1981-84)
Prof. H. Messenger (Electrical Engg, E & M, IIT Chicago, 1981-84)

Prof. E. Posner (Electrical Engg, Comm., Caltech, 1984-89)
Prof. C. Papas (Electrical Engg, E & M, Caltech, 1984-89)
Prof. D. Psaltis (Ph.D. Supervisor; Electrical Engg, Caltech, 1984-89)

Dr. Bruce Griffing (Lab. Head, GE Corp. Research Center, Schenectady, 1989-95)

THANK YOU
FOR THE INVITATION

“ Special Thank You to My Family Members”

Department of Physics, LUMS School of Science and Engineering
and
Khwarizmi Science Society, Pakistan
present a Public Lecture

Inventing with Light - A Personal Journey

Personal journey of an inventor in optics,
rising from Karachi to solving pressing problems in
global engineering and higher education...

Date: Friday, April 06, 2012 at 2:30 p.m.
Venue: SSE Building Complex 10-301
Lahore University of Management Sciences (LUMS)
sOpposite Sector U, DHA, Lahore 54792

Speaker

Professor Dr. Nabeel A. Riza

UCC Chair Professorship in Electrical Engineering
Head of Electrical Engineering
University College Cork, Ireland
Recipient of Abbe Medal
International Optical Society Fellow Award
2007 IEEE Fellow Award and the 2010 IEEE Distinguished Lecturer Award

For abstract:
http://www.khwarizmi.org
http://physics.lums.edu.pk

Inventing with Light - A Personal Journey

Abstract

This talk highlights the inventing process – the preparation involved and the small steps to the greater achievements. From his early days as a school boy in Karachi and Lahore to the foundational technology training sites in Chicago, Pasadena, and Schenectady-New York, relayed is a personal journey as an inventor for solving pressing problems in international level engineering and in higher education for Pakistan.

Author N. A. Riza Brief Biography

Born in Karachi, 1962, Dr. Riza attended secondary school at St. Anthony's High School (SC 78) and Aitchison College (HSC 80). He received his BS (EE 84) degree from the Illinois Institute of Technology (IIT) and his MS (EE 85) and PhD (EE 1989) degrees from the California Institute of Technology (Caltech). In 2001, he received the International Commission for Optics ICO Prize and the E. Abbe Medal from Carl Zeiss Foundation-Germany, considered the world's top prizes for optical scientists under 40 years of age. His other notable awards include the 1998 International Optical Society Fellow Award, 2007 IEEE Fellow Award, 2009 Ireland Science Foundation Walton Award, and the 2010 IEEE Distinguished Lecturer Award. Dr. Riza has been awarded 42 Patents and has 300 international publications to his credit.