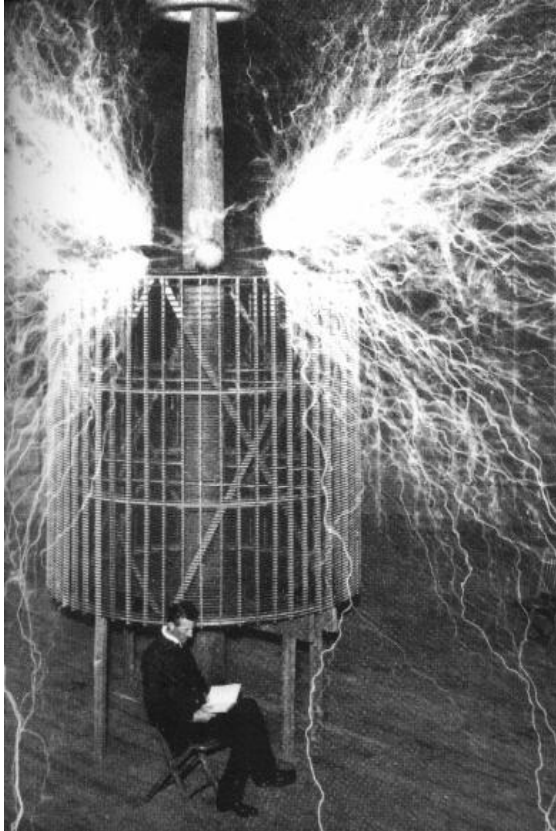


# The Institute of Electrical and Electronics Engineers Past, Present, and Future



Presented by:  
Bob Shapiro  
IEEE  
Communications  
Society  
Director of  
Marketing and  
Industry Relations

# The Institute of Electrical and Electronics Engineers Past, Present, and Future

## 125 Years of Electrical Engineering and Beyond (Including Telecom)

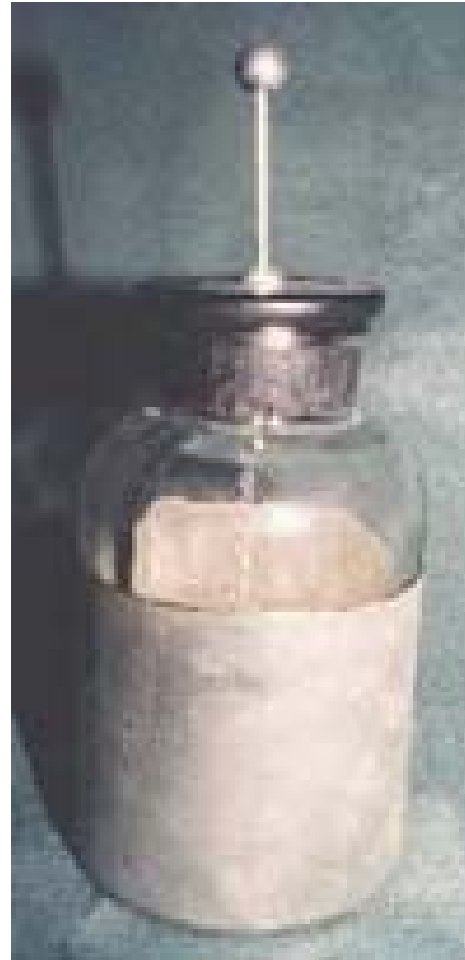
# Otto von Guericke

## L'Electrisee Machine 1663



# Pieter van Musschenbroek of Leyden

## Leyden Jar 1746





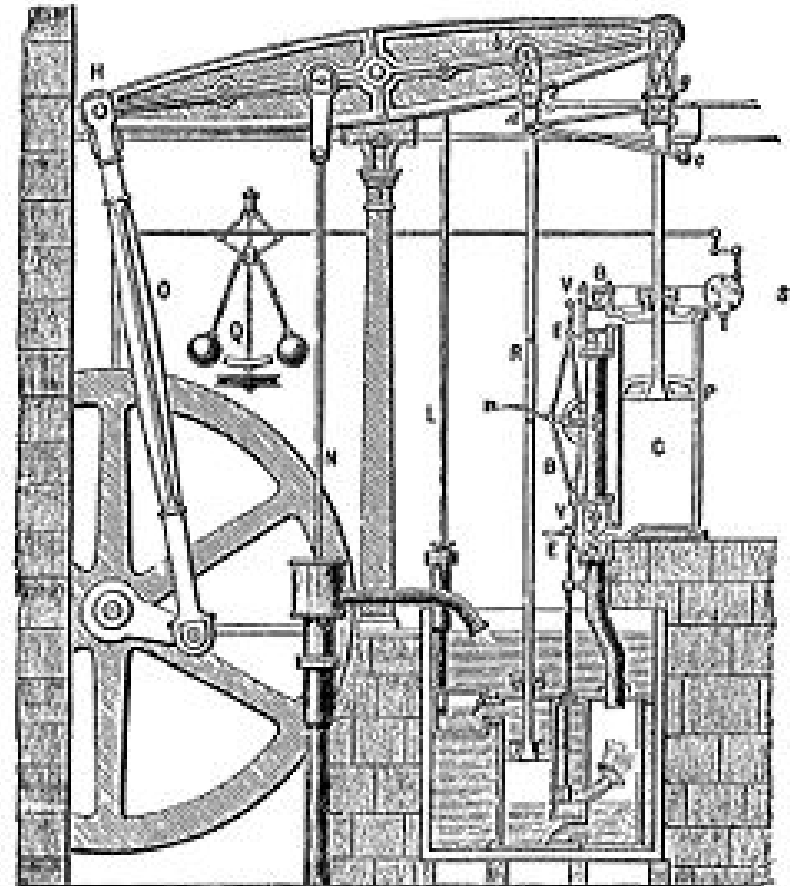
# Benjamin Franklin

## Kite Experiment - 1752



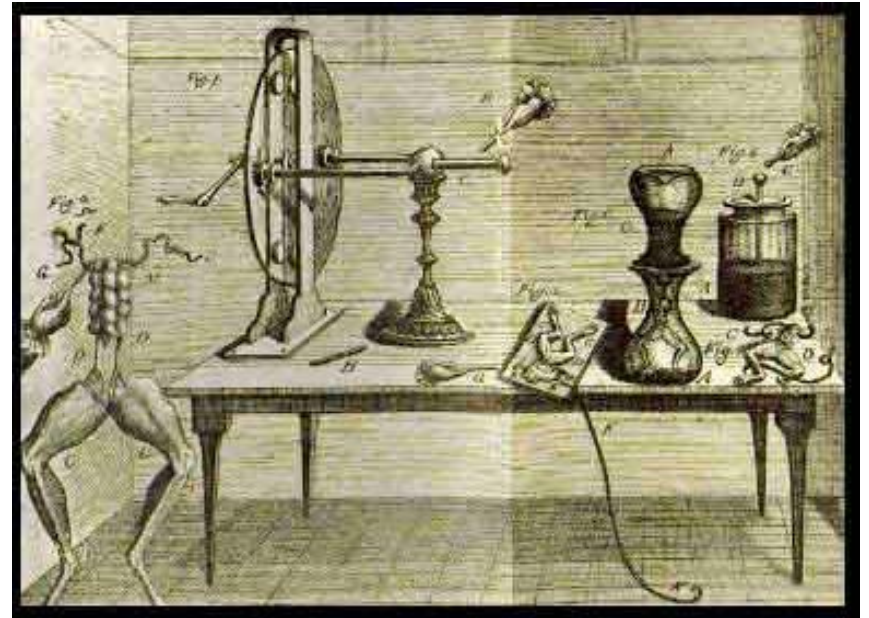
# James Watt

## Steam Engine - 1775



# Luigi Galvani

## Frog Leg Experiment 1780



# Alessandro Volta

## Volta Pile 1799





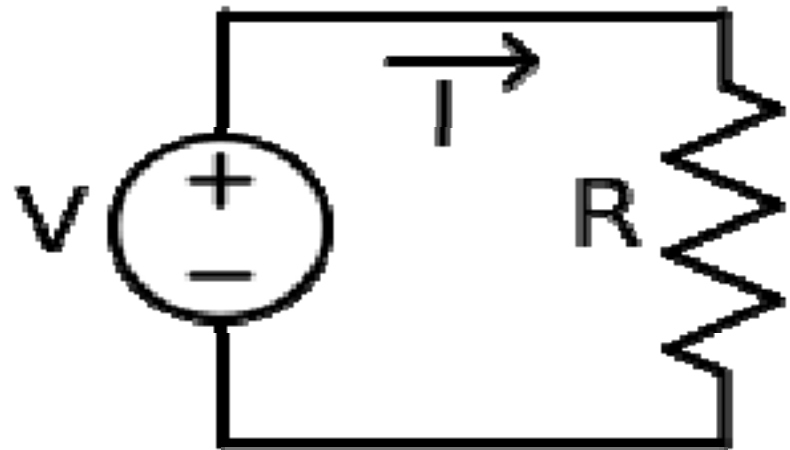
# Andre Ampere

## Ampere Law - 1820



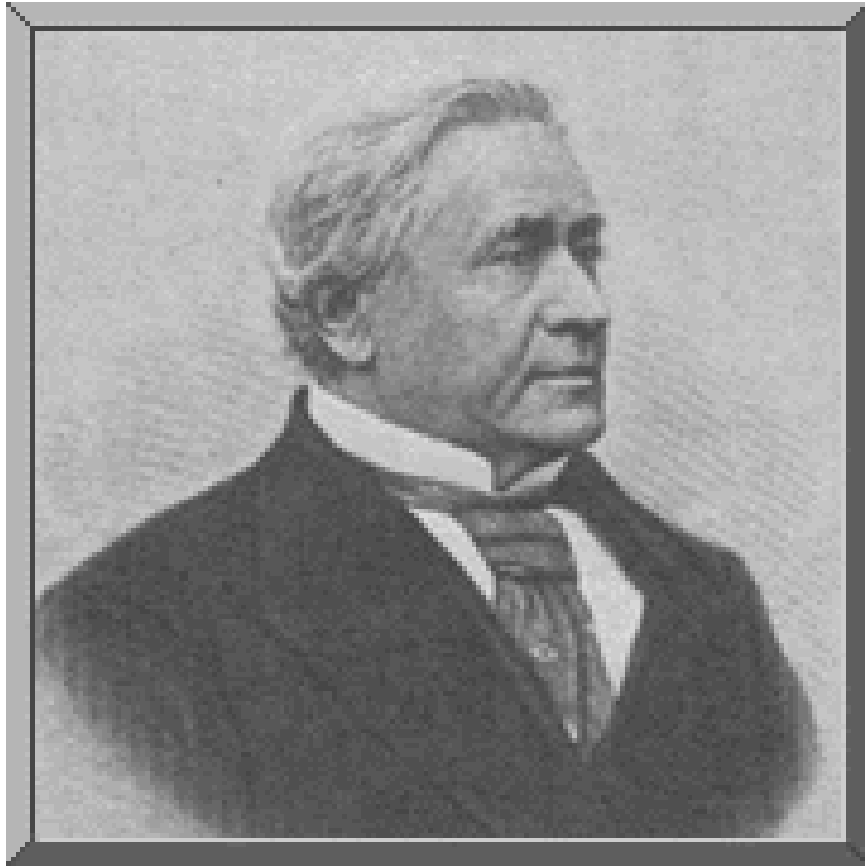
# Georg Simon Ohm

## Ohm's Law 1827



# Joseph Henry

## Electromagnet 1829



# Michael Faraday

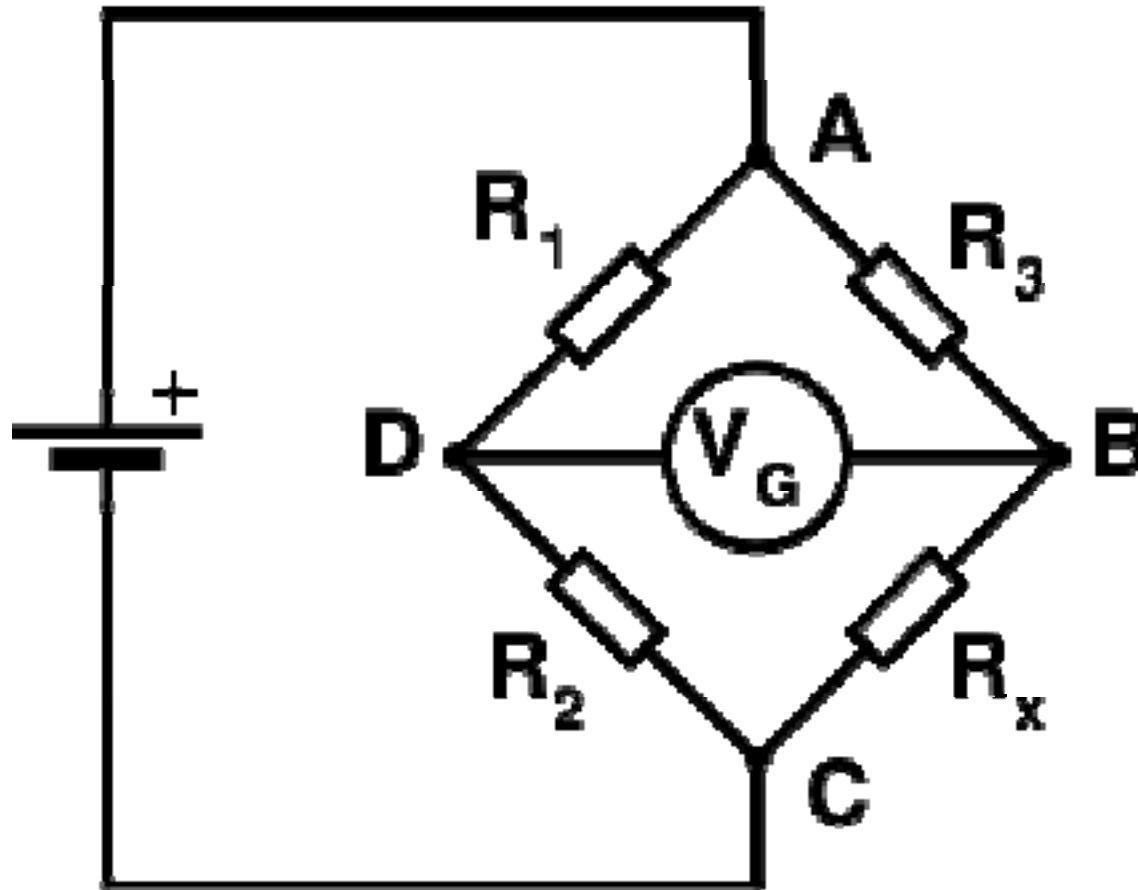
## Induction Ring 1832





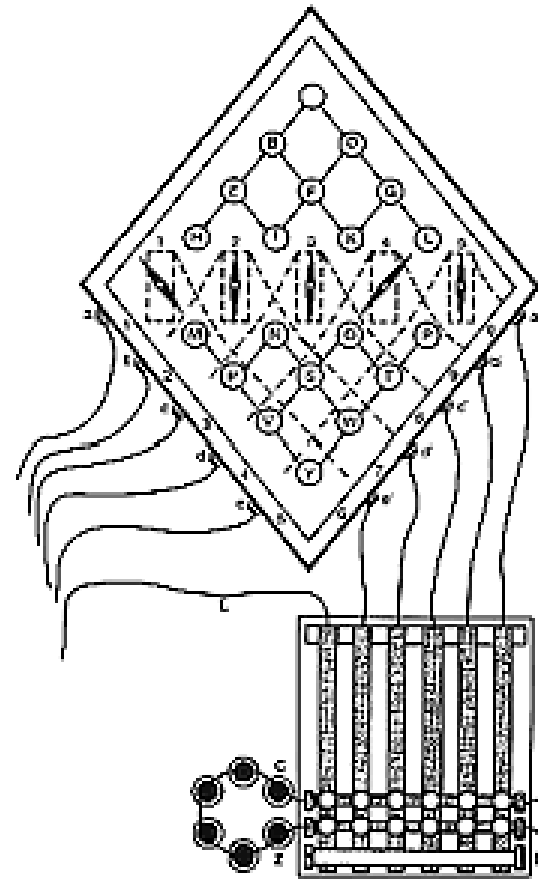
# Samuel Hunter Christie

## Christie's Bridge - 1833



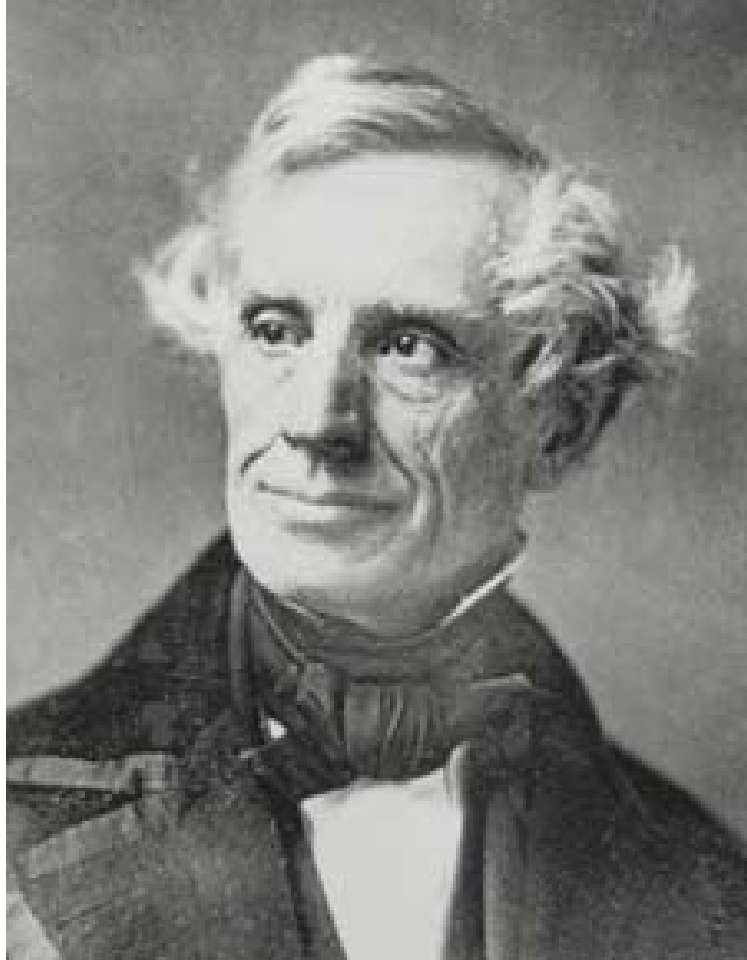
# Charles Wheatstone

## Telegraph 1837



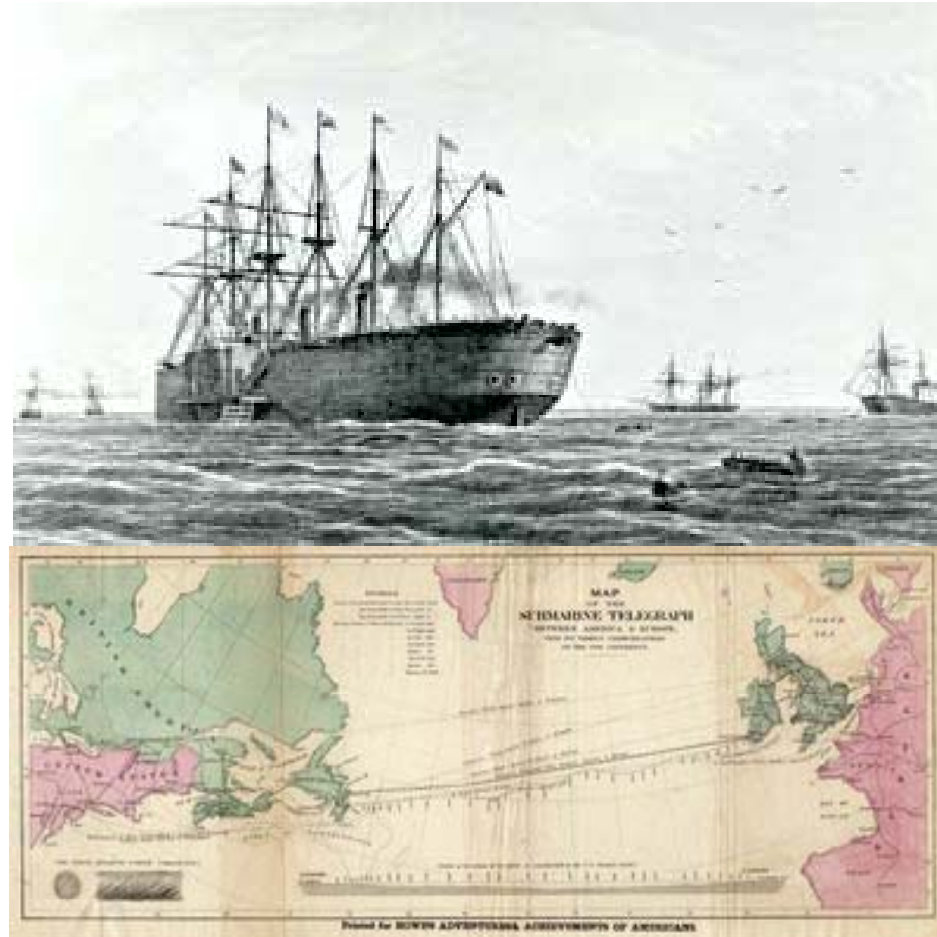
# Samuel Morse

## Morse Code 1844



# Trans-Atlantic Telegraph 1858

The Great Eastern



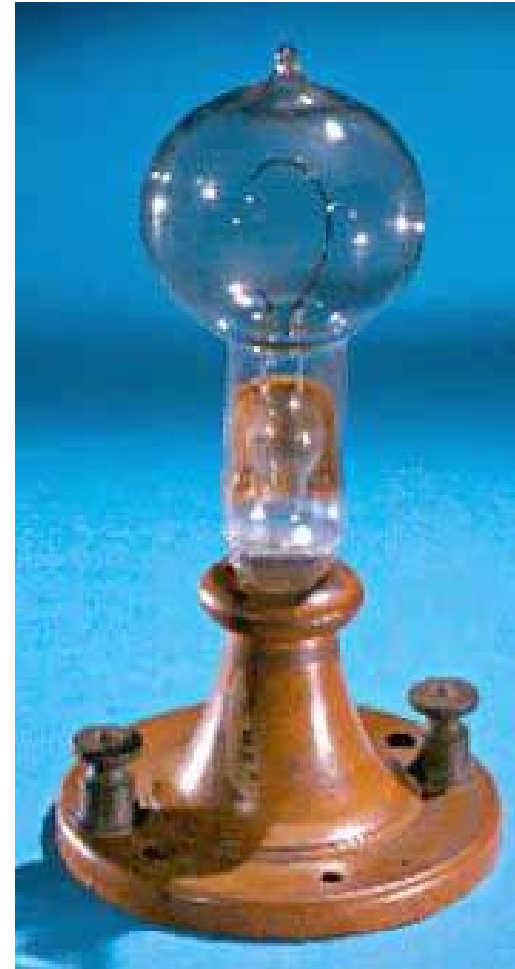


# Alexander Graham Bell

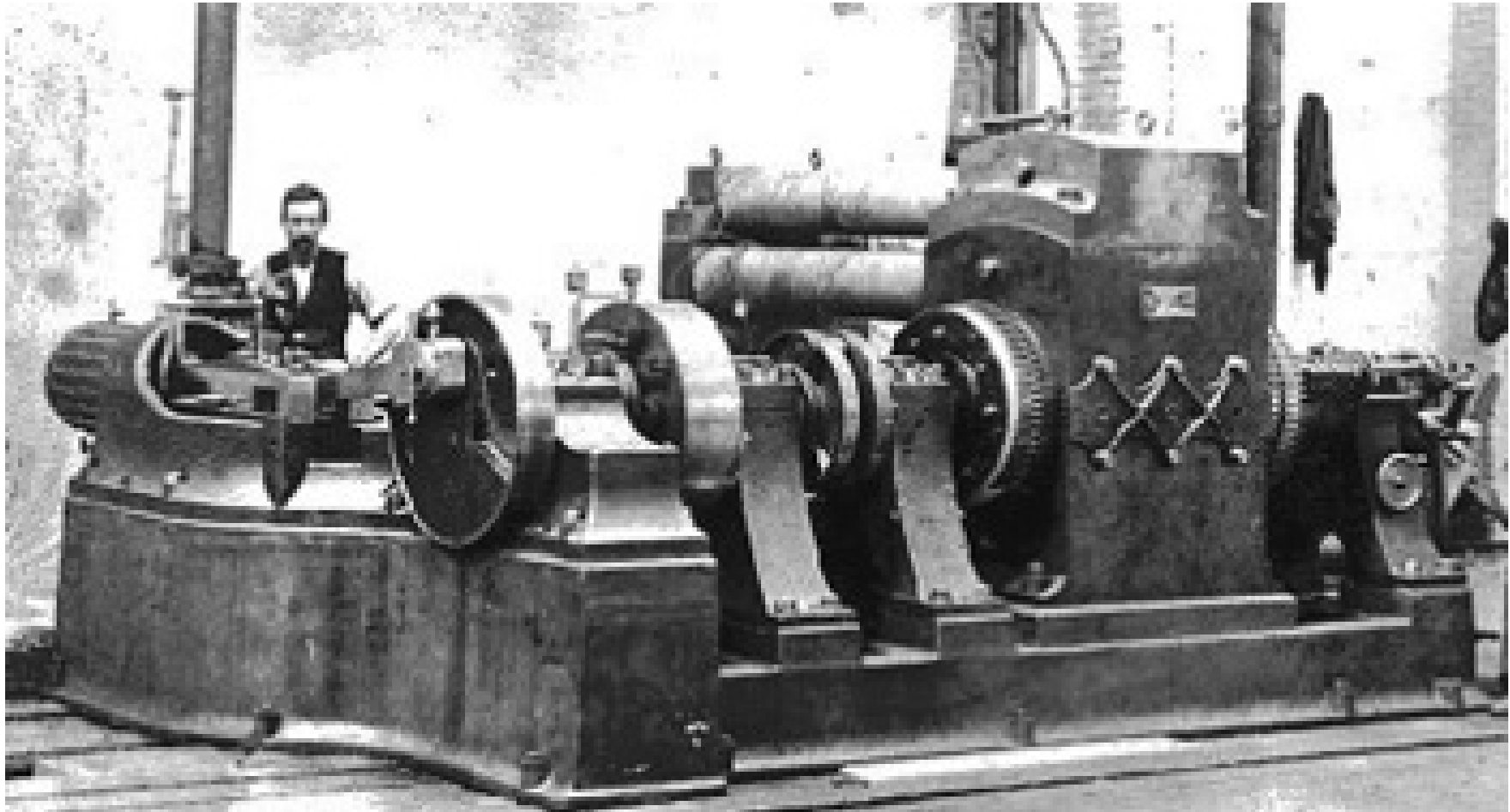
## Telephone 1876



# Thomas Edison Light Bulb 1879

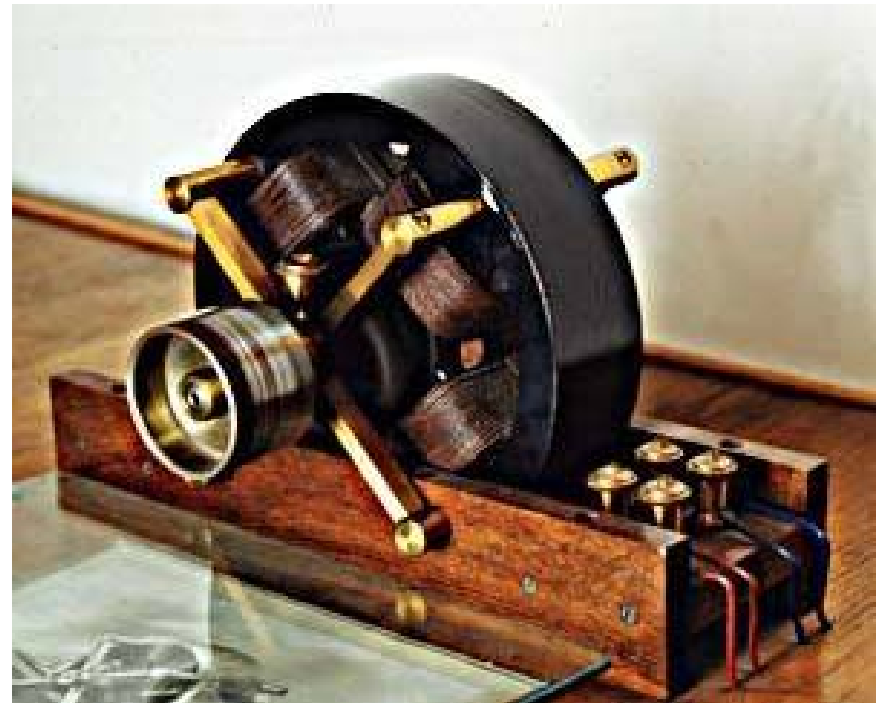


# Edison Electric First Electric Utility Power System 1882



# Nikola Tesla

## AC Motor 1883







# American Institute of Electrical Engineers



- Nathaniel S. Keith drafted and placed a call in the April 15, 1884 issue of "*The Operator*"
  - The call endorsed by twenty-five prominent figures in electrical technology including Thomas Edison, Elihu Thomson, Edwin Houston, and Edward Weston
- May 13th, 1884 - Electrical practitioners met at the American Society of Civil Engineers headquarters in New York to form the American Institute of Electrical Engineers
- 1st President - Norvin Green, president Western Union Telegraph
- 1<sup>st</sup> First Secretary - Nathaniel Keith
- 1<sup>st</sup> Treasurer Rowland R. Hazard – elected
- Six Vice-Presidents:
  - Alexander Graham Bell, Charles D. Cross, Thomas A. Edison, George A. Hamilton, Charles H. Haskins, and Franklin L. Pope

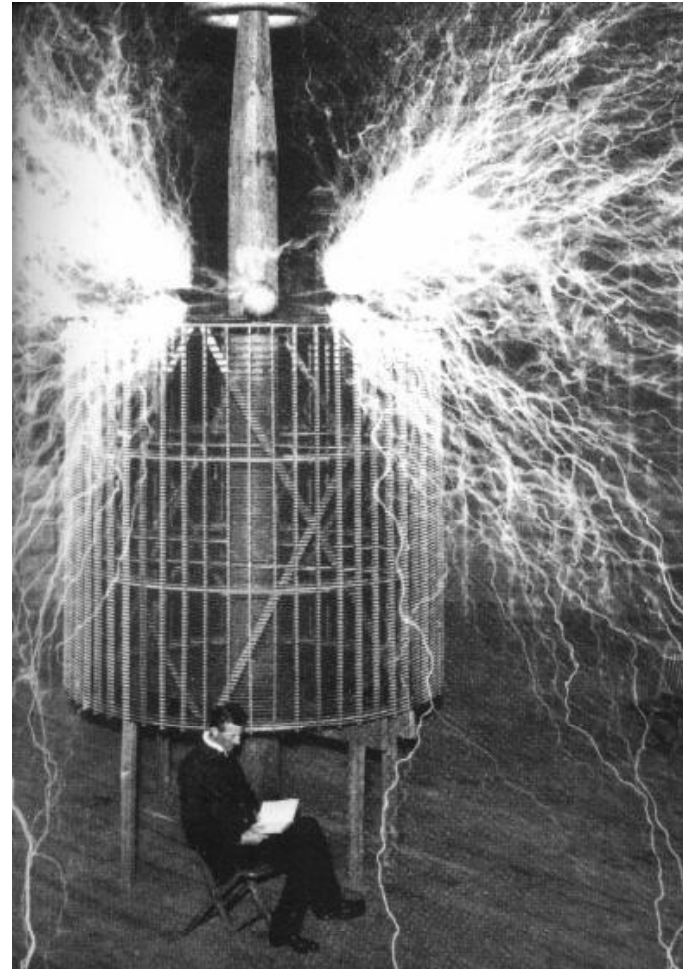
# American Institute of Electrical Engineers



- First AIEE technical session
  - Philadelphia Exhibition - October 7-8, 1884
    - Franklin Institute
    - *Paper published in the first issue of the Transactions of the AIEE*
      - "Notes on Phenomena in Incandescent Lamps," by Edwin Houston
        - » "Edison Effect," became the foundation of electronics
- AIEE developed standards for the engineering profession and the electrical industry
  - Earliest efforts directed toward standardizing units, definitions, and nomenclature relating to basic electrical science
  - First action - adopted the name "Henry" for the practical unit of inductance in 1890

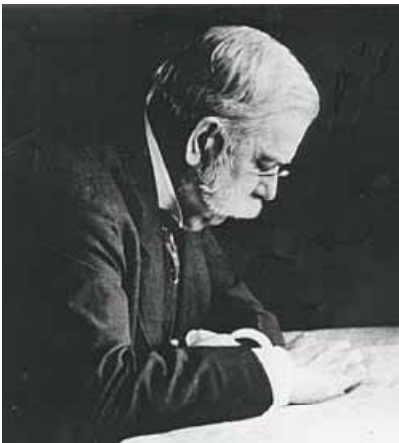
# Nikola Tesla

## Radio-Controlled Boat 1886





# AC vs. DC Wars - 1887



# Heinrich Hertz

## First Radio Wave 1888



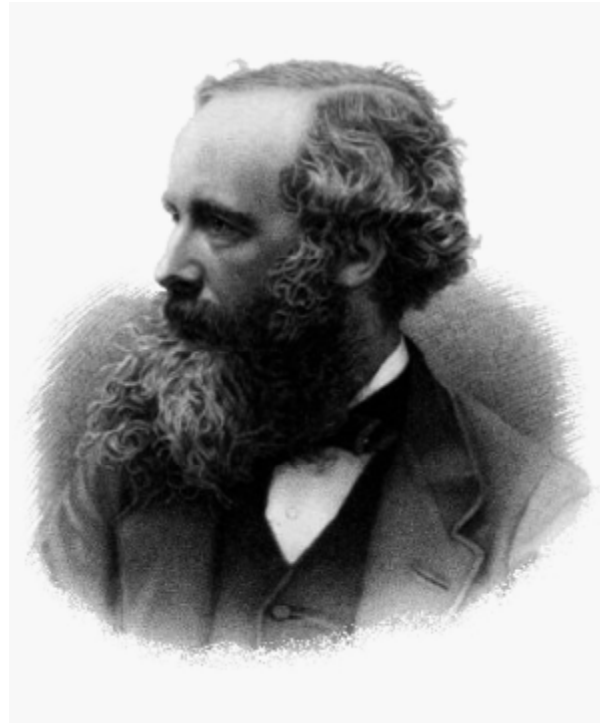
# Guglielmo Marconi

## First Transatlantic Wireless Communications 1901



# James Maxwell

## Inventor of Radio



# Alexander Popov

## Inventor of Radio



# American Institute of Electrical Engineers



- 1902
  - First AIEE Local Sections established
    - Chicago, IL and Ithaca, NY
  - First AIEE Student Branches
    - Lehigh University
- 1903
  - First Local Section outside the U.S.
    - Toronto, Canada
  - Technical Committee
    - The High Voltage Transmission Committee

# John Fleming

## Valve Diode - 1904





# Reginald Fessenden

## First AM Broadcast - 1906



# Institute of Radio Engineers



- AIEE oriented to electrical power and telecommunication industries
- Society of Wireless Telegraph Engineers was started in Boston by John Stone – 1907
  - SWTE membership initially limited to employees of Stone Wireless Telegraph Company
    - Membership later opened to employees from Reginald Fessenden's National Electric Signaling Company
  - The Wireless Institute started in New York by Robert Marriott – 1909
- SWTE & The Wireless Institute merge 1912
  - Institute of Radio Engineers established by merger
  - By explicitly excluding the word "American," the radio engineers were attempting to become an international society

# Institute of Radio Engineers



- First issue of the Proceedings of the Institute of Radio Engineers was published in January 1913
- The report of the first Standardization Committee, published in 1913
- IRE reflected the growth of the radio industry
  - Prior to World War I, maritime radio was the most important segment of the industry
    - 1917 - Local Sections
      - Washington, DC
      - Boston
      - Seattle
      - San Francisco
  - Post-war years Domestic broadcasting became more important
    - 1925 – Local Sections – Philadelphia; Chicago; Toronto
    - 1933 – Local Sections – New Orleans

# Institute of Radio Engineers



- 1920-30 - IRE began coordinated standards activities with radio and electrical trade associations
  - National Electrical Manufacturers Association
  - Radio Manufacturers Association
  - Federal Government
    - development of regulations for the broadcasting industry
    - 1927 - Federal Radio Commission

# John Bardeen, Walter Brattain, and William Shockley

## Transistor - 1947



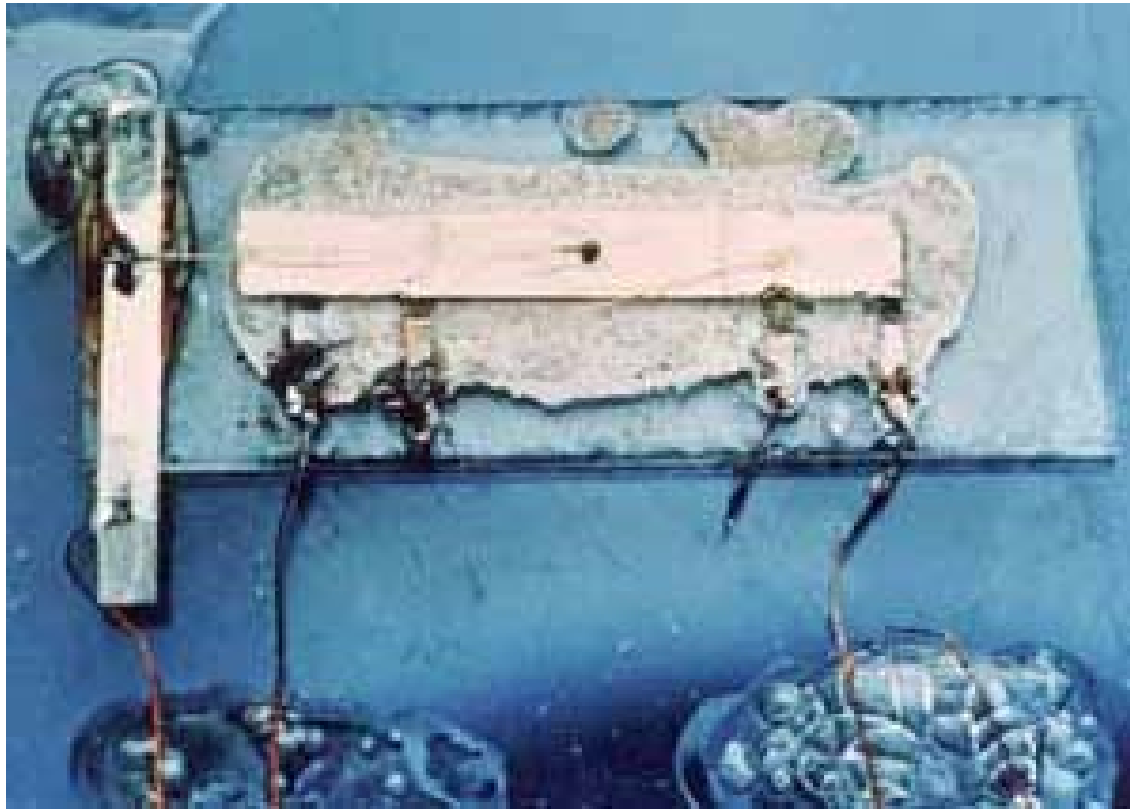
# Institute of Radio Engineers



- 1948 IRE and the Radio and Television Manufacturers Association formed the Joint Technical Advisory Committee
  - Topics
    - FM broadcasting
    - Television interference
    - Standards of good engineering practice
- IRE worked with the National Television System Committees on Standards
  - Commercial black-and-white television service
  - Color television

# Jack Kilby

## Integrated Circuit - 1958

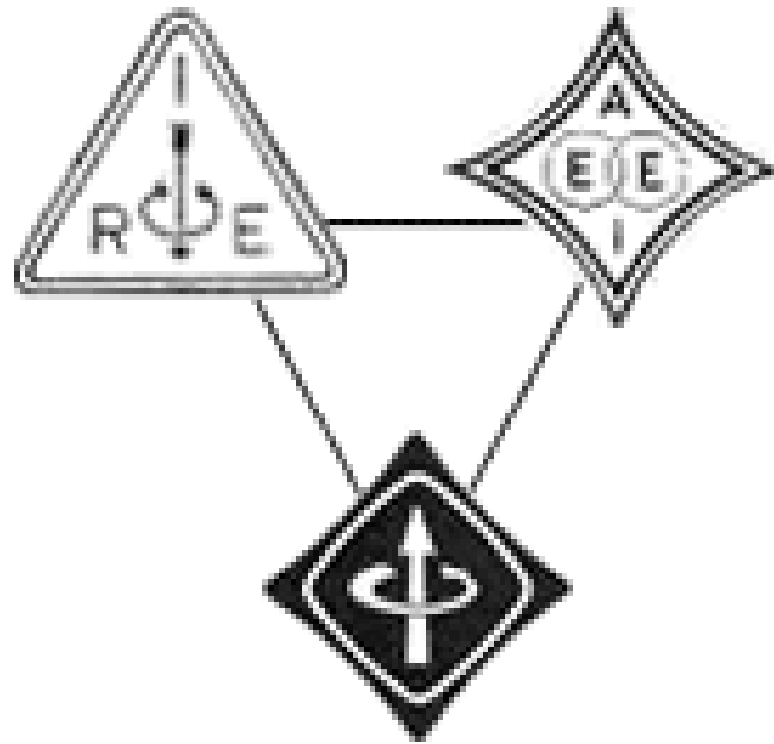




# 1962 IRE and AIEE Membership Numbers

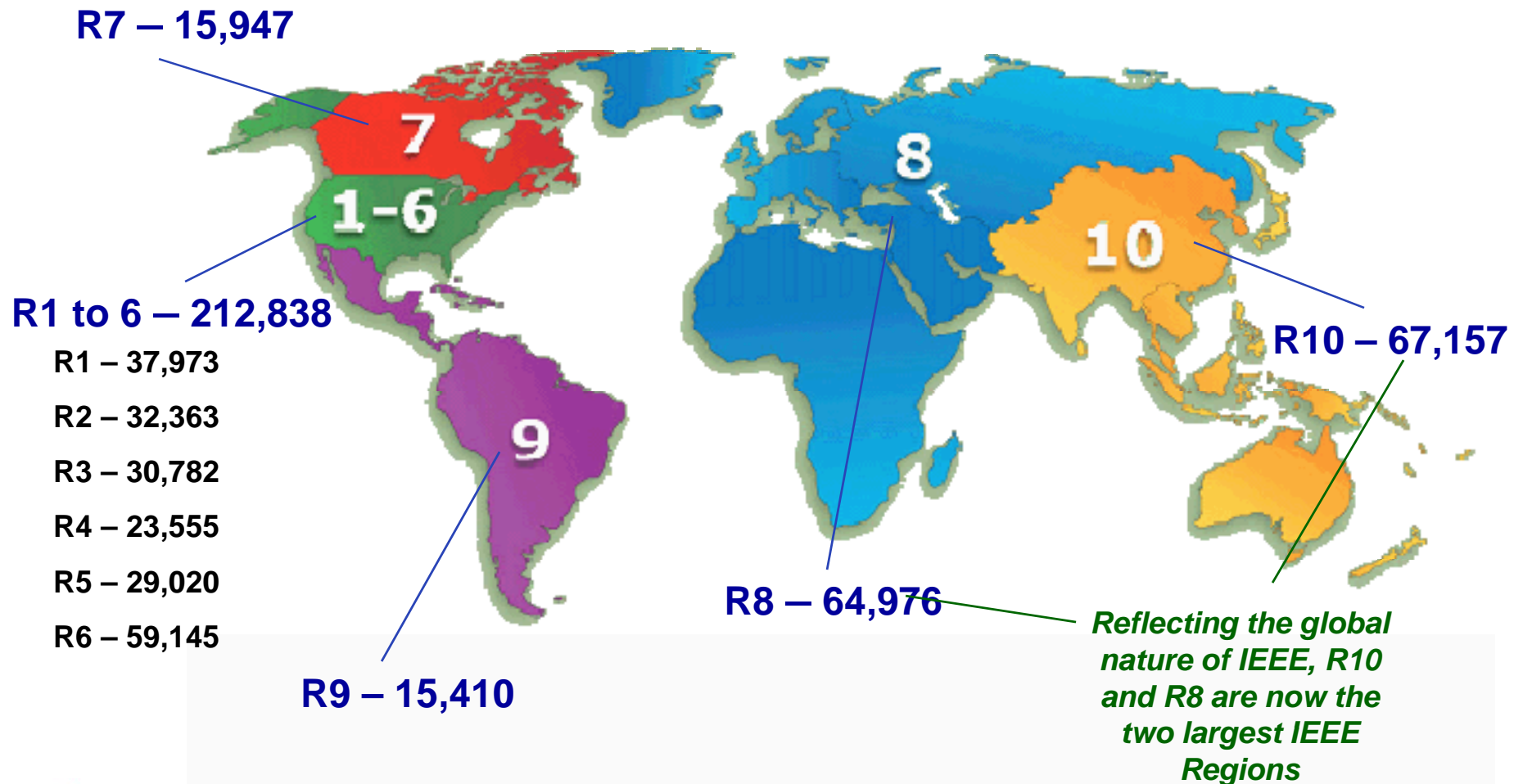
	<b>IRE</b>	<b>AIEE</b>
1947	18,000 members	26,500 members
1957	55,500	50,000
1962	96,500	57,000

# IRE and AIEE Merge to form IEEE – January 1, 1963



# IEEE Membership By Region\*

TOTAL MEMBERSHIP 2008 Yr End – 376,328



# IEEE Societies & Councils

- **38 Societies and 6 Technical Councils**
- **Bringing members together with similar interests**
- **Sponsoring conferences, workshops tutorials, seminars, etc**
- **Developing publications: Journals, Magazines, Newsletters**
- **Recognizing member accomplishments**

# IEEE Societies & Councils

- Aerospace & Electronic Systems
- Antennas & Propagation
- Broadcast Technology
- Circuits & Systems
- **Communications**
- Components, Packaging & Manufacturing Technology
- Computational Intelligence
- Computer
- Consumer Electronics
- Control Systems
- Dielectrics & Electrical Insulation
- Education
- Electromagnetic Compatibility
- Electron Devices
- Engineering in Medicine & Biology
- Geosciences & Remote Sensing
- Industrial Electronics
- Industry Applications
- Information Theory
- Instrumentation & Measurement
- Intelligent Transportation Systems

# IEEE Societies & Councils

- Lasers & Electro-Optics
- Magnetics
- Microwave Theory & Techniques
- Nuclear & Plasma Sciences
- Oceanic Engineering
- Power Electronics
- Power Engineering
- Product Safety Engineering
- Professional Communication
- Reliability
- Robotics & Automation
- Signal Processing
- Social Implications of Tech.
- Solid-State Circuits
- Systems, Man, & Cybernetics
- Ultrasonics, Ferroelectrics & Frequency Control
- Vehicular Technology

## 6 Technical Councils

- Electronic Design Automation
- Nanotechnology
- Sensors
- Super Conductivity
- Systems
- Technology Management

# New Technology Working Groups

- **Biometrics**
- **Digital Intellectual Property**
- **Earth Observation**
- **Power and Alternative Energy Technologies**
- **RFID**
- **Biotechnology and Bioengineering**
- **Distributed Intelligent Networks and Systems**
- **Organic Electronics**
- **Portable Information Devices**



# IEEE Publications

IEEE *SPECTRUM* Magazine  
In print and online

## New Online Features:

- Spectrum Radio
- Webcasts
- RSS Feeds
- Blogs



# The IEEE Standards Association

*A World Leader in Standards Development  
Fostering Technological Innovation*

- The leading developer of global industry standards in a broad-range of industries, including: Power and Energy - Biomedical and Healthcare - Information Technology – Telecommunications – Transportation – Nanotechnology - Information Assurance – Battery Technology
- IEEE-SA offers an established standards development program that features balance, openness, due process, and consensus.

# Continuing Education

## IEEE Expert Now

- More than 65 one-hour interactive online courses in IEEE's technical areas of interest
- Subscriptions available for Corporate, University, Government and Individual Members
- Earn Continuing Education Units (CEUs) and Professional Development Hours (PDHs)

## IEEE Education Partners Program

- Online courses offered from university and corporate institutions at a discount

**Introduction to Fiber Optic Communications Technology**

- Introduction
- Technology
- Fiber
- Transmitters
- Receivers
- Applications
- Backbone networks
- Broadband access
- Future directions

**Wavelength Division Multiplexing (WDM)**

- Two (or more) separate channels over the same fiber by using two (or more) different wavelengths
- Optical filters select wavelength at the receivers
- Optical amplifiers used at intermediate locations

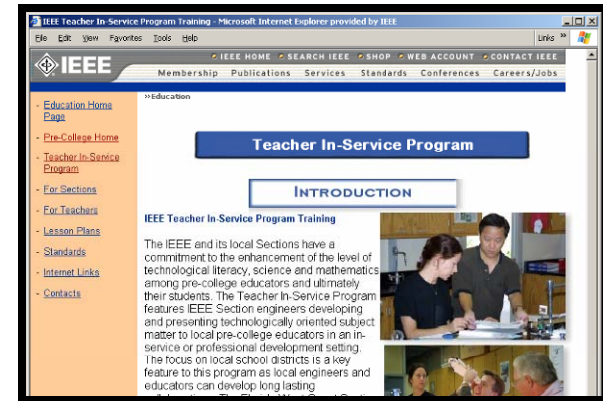
channel 1 → TX  $\lambda_1$  → Filter  $\lambda_1$  → RX  $\lambda_1$  → channel 1

channel n → TX  $\lambda_n$  → Filter  $\lambda_n$  → RX  $\lambda_n$  → channel n

# Building the Pipeline of Professionals

**IEEE Pre-University Programs connect engineers and educators**

**Pre-University Teacher In-Service Program (TISP) for Sections**

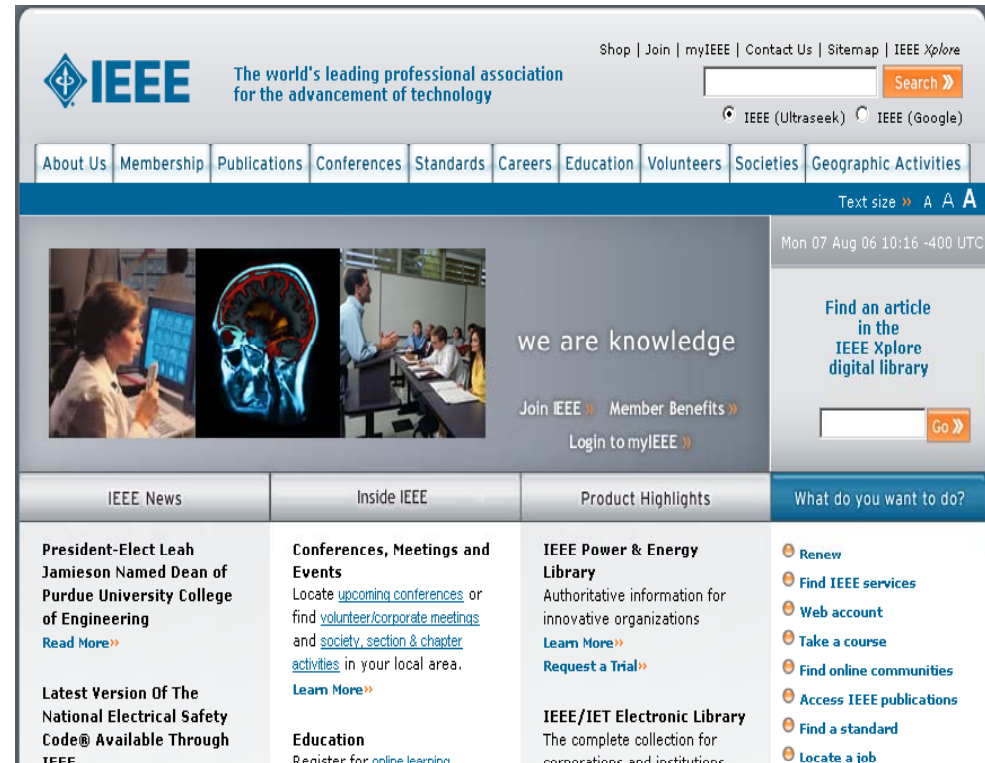


- **Features IEEE volunteers developing and presenting technical subject matter to pre-university educators in a professional development setting**
- **Over 325 IEEE volunteers were trained in 2007, representing 16 countries**
- **42 lesson plans aligned with education standards are available**
- **Overall, more than 1800 teachers have participated in a TISP session led by an IEEE volunteer - impacting over 180,000 students.**

# Access to Information

## IEEE.org Web site

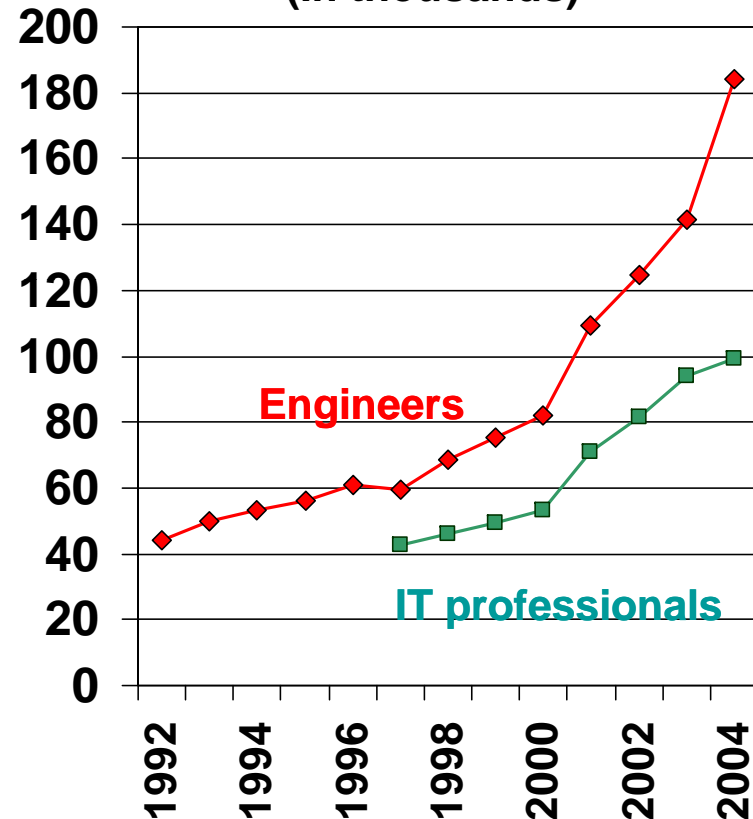
- “What do you want to do?” links for easy access to popular content
- 10 portals organize major content areas
- 24/7 access to IEEE products, services and information
- Ongoing usability testing to inform content and design updates



# India

- GDP growth rate is among the fastest in the world, and investment, both domestic and foreign, contributes over 20% of GDP.
- India is in the midst of a demographic transition with a rising proportion of its population of 'working age' (15-59 years).
- The country is known for software development and growth in knowledge-based industries, as well as a center for the outsourcing of services.

**Output of Degree Level Engineering and IT Professionals in India**  
(In thousands)

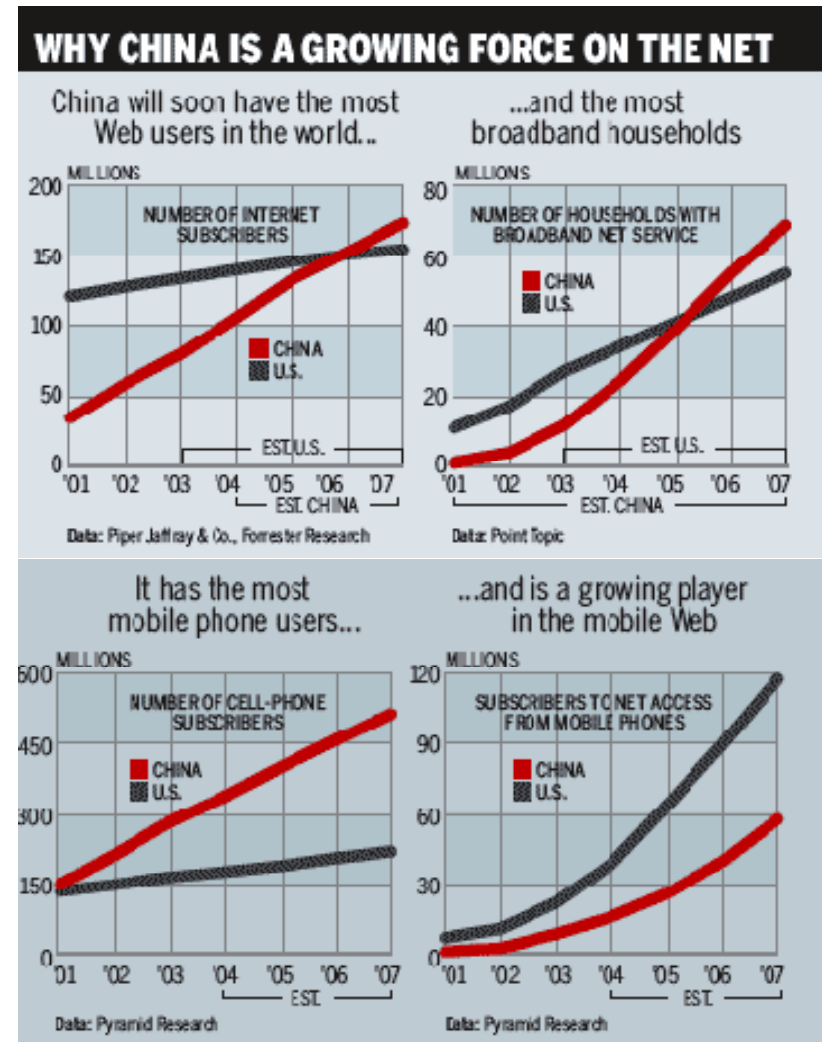


Source: National Association of Software and Service Companies (NASCOM)



# China

- China has come of economic age [*Business Week Online*, Nov 2004]
- China's total volume of imports and exports will reach \$1 trillion in 2004. [*The Journal of Commerce*, Sept 20, 2004]
- China's strong economic growth is driven by a continuing surge in foreign direct investment. Today, more than 400 of the world's 500 biggest companies have a China presence. [*Institutional Investor*, Sept 2004]
- China's educational system—according to it's Ministry of Education— has:
  - 1,984 higher education institutes
  - 3.35 million higher education students with an additional 270,000 enrolled for post-graduate study
  - 400,000 Chinese nationals studying overseas
- China's use of electronic media has exploded. In 1997, 620,000 people in China had Internet accounts and in 2002 that figure stood at 59.1 million. This puts China second in the world for Net connectivity. China may pass the United States in the number of Internet users within two years; it already leads the world in cell phone users.

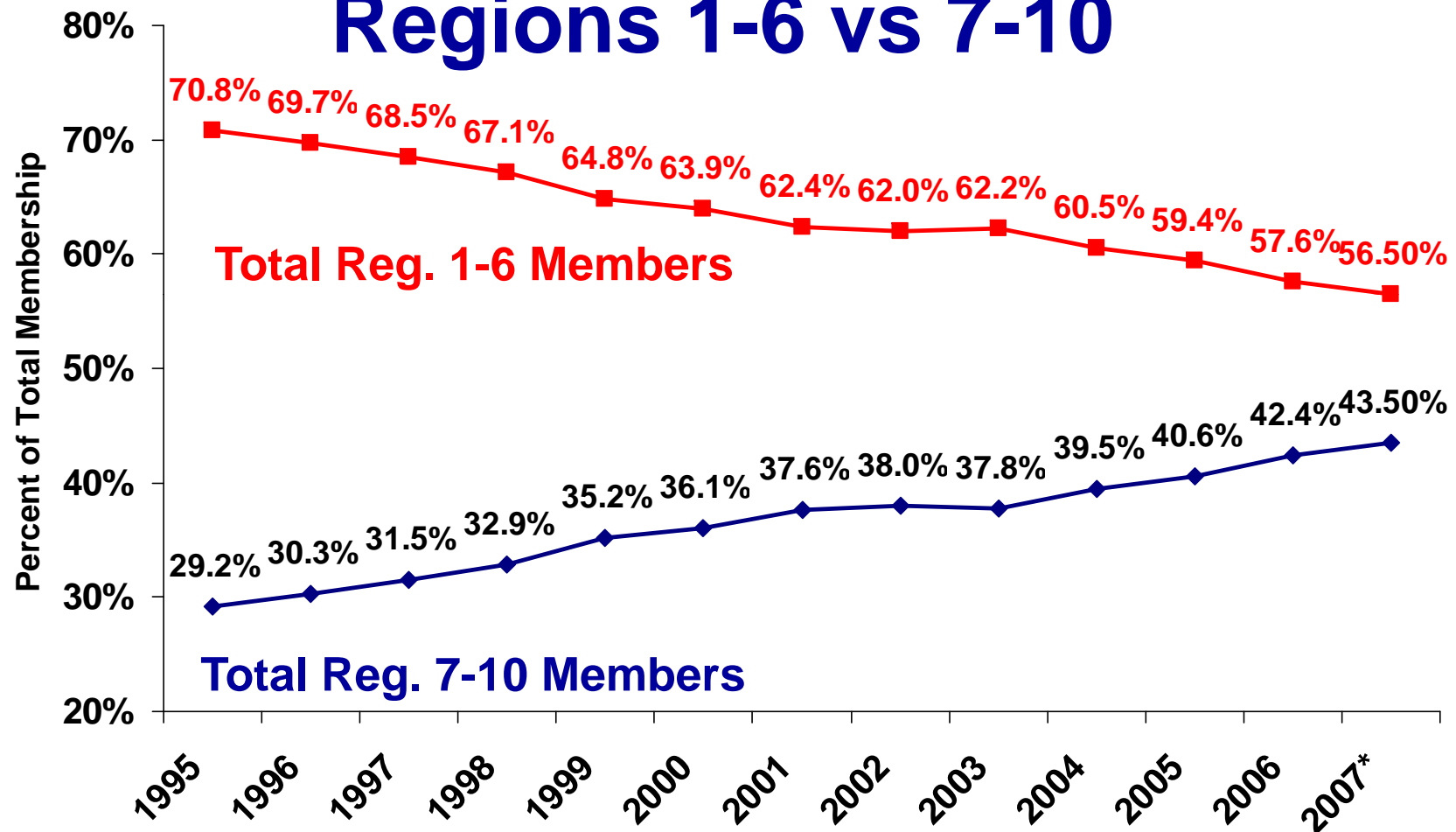


Source: *Business Week*, Mar 2004



# IEEE Membership\*

## Regions 1-6 vs 7-10



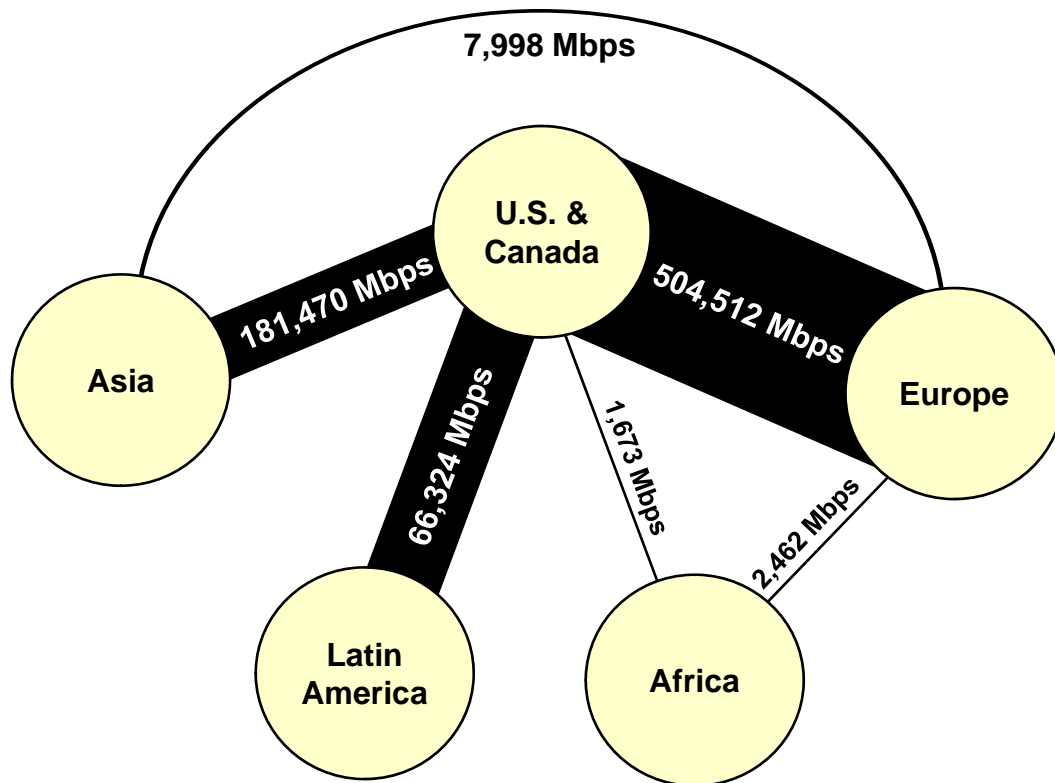
# Networked World

Today, the forces of global economic integration and advances in technology are creating a different and more complex challenge. [NII Innovate America, 2004]

Fully one-third of the world's population will be online within a decade. [The Futurist, Jul-Aug 2004]

15 years from now the majority of the world may be connected to the Internet. [United Nations, Nov 2004]

## Internet Connectivity: 2004



## Work Around the Clock



# IEEE Focus on the Future:

## 9 Strategic Objectives

- Evaluate alternative membership models that are affordable and attractive
- Aggressively position IEEE as a leader in Standards in the global marketplace
- Transform IEEE into a highly respected provider of continuing and professional education products, services and activities
- Protect IEEE's high value IP products from threats derived from alternative publishing business models such as open access
- Make IEEE a highly visible force in global accreditation, certification, and competency demonstrations

# IEEE Must Focus On...

**Enabling technical professionals to distinguish themselves in a globally competitive environment.**

And aggressively deliver value-added products and services to support this strategic focus.

# Thank you...

A special credit to David Pierce, IEEE Region 5  
Director, for his role in preparing this presentation