

# The Radiation Safety Information Computational Center - Half Century of Support To the Nuclear Science Community

Bernadette Kirk

<http://rsicc.ornl.gov>

Nuclear Science and Technology Division

# Outline

- **Prologue**
- **Monologue/Dialogue**
- **Epilogue**

# PROLOGUE

RSICC came into existence in 1962 largely as a result of the report made by Alvin Weinberg and others to the Executive Office of the President of the United States on the “information explosion” and the role of the technical community and government in its preservation and use. This report became known as the Weinberg Report. Its theme was “Information is an integral part of science; without proper handling of information, science cannot function.” The report recommended the establishment of specialized information centers - “to digest and evaluate - to make condensations and reviews -thus saving the time of the individual research scientist and engineer.”

# RSICC Home Page

<http://rsicc.ornl.gov>



RSICC Home Page - Windows Internet Explorer

http://rsicc.ornl.gov/

Google

RSICC Home Page

Oak Ridge National Laboratory | Nuclear Science & Technology Division | Disclaimer

## Radiation Safety Information Computational Center

Delivering the Best Computational Tools for Nuclear Research

# RSICC

Package Index: 1 2 3 A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

- Home
- About RSICC
- Codes & Data
- Registration & Ordering
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- News
- Benchmarks
- BioMedical Applications
- ANS Links
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- RSICC Search
- Contact Us



### RSICC ANNOUNCEMENTS

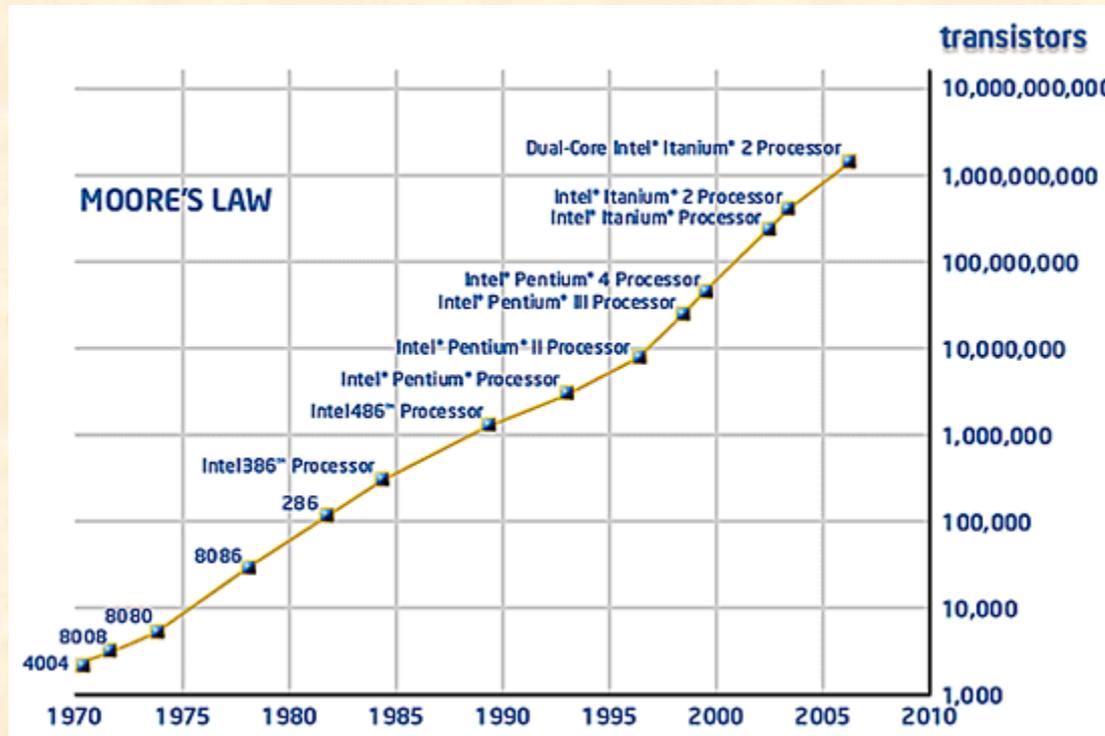
The Radiation Safety Information Computational Center (RSICC) is a Department of Energy Specialized Information Analysis Center (SIAC) authorized to collect, analyze, maintain, and distribute computer software and data sets in the areas of radiation transport and safety.



Trusted sites 100%

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# Moore's Law



<http://www.intel.com/technology/mooreslaw/index.htm>

# Top Supercomputers

TOP500 List - June 2006 (1-100) | TOP500 Supercomputing Sites - Windows Internet Explorer

http://www.top500.org/list/2006/06/100

Rank	Site	Computer	Processors	Year	R <sub>max</sub>	R <sub>peak</sub>
1	<a href="#">DOE/NNSA/LLNL</a> United States	<a href="#">BlueGene/L - eServer Blue Gene Solution</a> IBM	131072	2005	280600	367000
2	<a href="#">IBM Thomas J. Watson Research Center</a> United States	<a href="#">BGW - eServer Blue Gene Solution</a> IBM	40960	2005	91290	114688
3	<a href="#">DOE/NNSA/LLNL</a> United States	<a href="#">ASC Purple - eServer pSeries p5 575 1.9 GHz</a> IBM	12208	2006	75760	92781
4	<a href="#">NASA/Ames Research Center/NAS</a> United States	<a href="#">Columbia - SGI Altix 1.5 GHz, Voltaire Infiniband</a> SGI	10160	2004	51870	60960
5	<a href="#">Commissariat a l'Energie Atomique (CEA)</a> France	<a href="#">Tera-10 - NovaScale 5160, Itanium2 1.6 GHz, Quadrics Bull SA</a>	8704	2006	42900	55705.6
6	<a href="#">Sandia National Laboratories</a> United States	<a href="#">Thunderbird - PowerEdge 1850, 3.6 GHz, Infiniband Dell</a>	9024	2006	38270	64972.8
7	<a href="#">GSIC Center, Tokyo Institute of Technology</a> Japan	<a href="#">TSUBAME Grid Cluster - Sun Fire X64 Cluster, Opteron 2.4/2.6 GHz, Infiniband NEC/Sun</a>	10368	2006	38180	49868.8
8	<a href="#">Forschungszentrum Juelich (FZJ)</a> Germany	<a href="#">JUBL - eServer Blue Gene Solution</a> IBM	16384	2006	37330	45875
9	<a href="#">Sandia National Laboratories</a> United States	<a href="#">Red Storm Cray XT3, 2.0 GHz</a> Cray Inc.	10880	2005	36190	43520
10	<a href="#">The Earth Simulator Center</a> Japan	<a href="#">Earth-Simulator</a> NEC	5120	2002	35860	40960
11	<a href="#">Barcelona Supercomputer Center</a>	<a href="#">MareNostrum - JS20 Cluster, PPC 970, 2.2 GHz, Myrinet</a>	4800	2005	27910	42144

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# Radiation Safety Information Computational Center (RSICC) Historical Background



- **Established in 1962 by USAEC to support its reactor research programs in a research division at Oak Ridge National Laboratory**
- **Embedded in the Nuclear Science and Technology Division (NSTD) at ORNL**

**preserve and disseminate nuclear software  
and data**

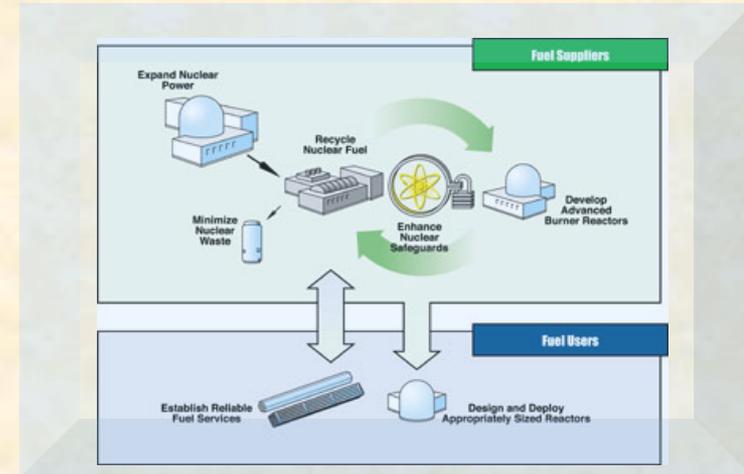
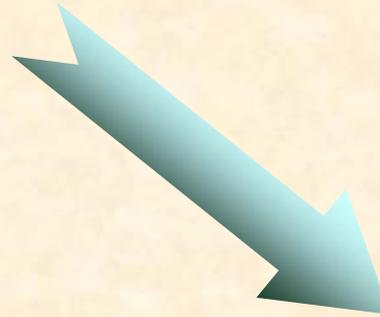
# RSICC History



2006  
GNEP

<http://seniordesign.engr.uidaho.edu/>

1960  
EBR-II



<http://www.gnep.gov>

# RSICC History



2006

GNEP

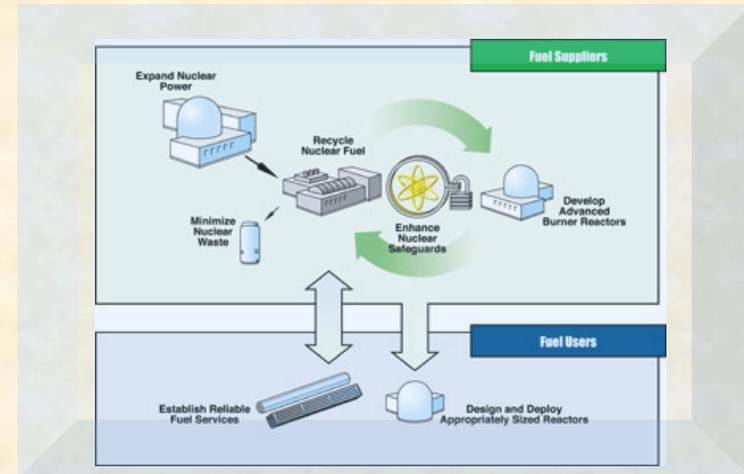
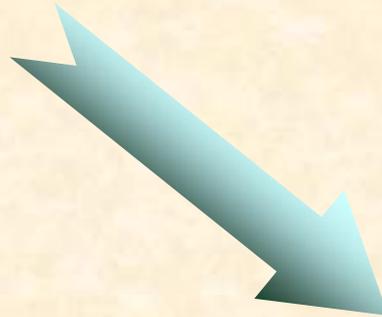
Closed  
fuel cycle

<http://seniordesign.engr.uidaho.edu/>

1960

EBR-II

Closed  
fuel cycle

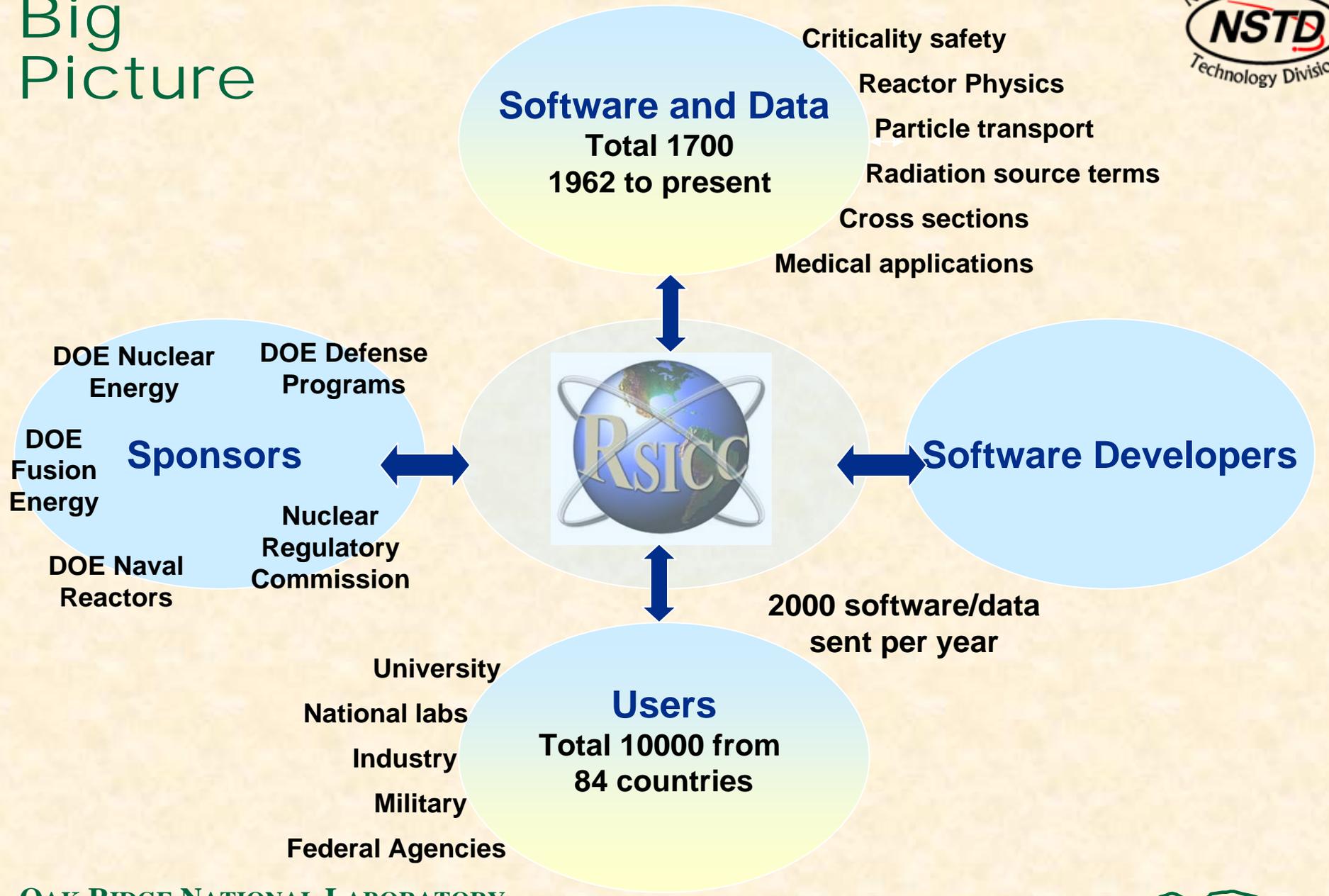


<http://www.gnep.gov>

# Goals

- **Goal A: To acquire and distribute software to provide researchers a centralized source for quality controlled radiation modeling and simulation tools.**
- **Goal B: To ensure the preservation of nuclear computational tools in order to support the next generation of scientists.**
- **Goal C: To support the training of the next generation of scientists by providing internship opportunities to nuclear science students**

# Big Picture



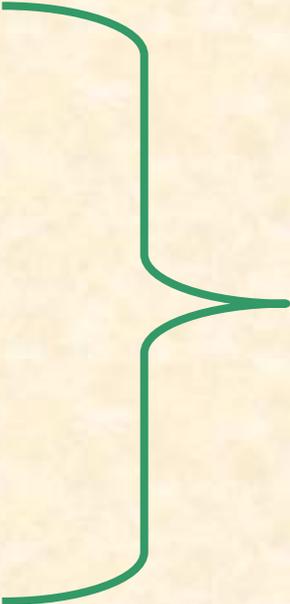
# Software

## 26 Main RSICC Software Categories

ACCELERATOR APPLICATIONS	HUMAN FACTORS ENGINEERING
AUXILIARY MATHEMATICAL METHODS AND UNCERTAINTY ANALYSIS	ISOTOPE GENERATION AND DECAY
BENCHMARKS	MATERIALS AND RADIATION EFFECTS
BIOLOGY AND MEDICINE	NUCLEAR DATA GENERATION FOR TRANSPORT CODE INPUT
CROSS-SECTION DATA, FACTORS, AND COEFFICIENTS	NUCLEAR CRITICALITY SAFETY
DECOMMISSIONING, DECONTAMINATION, AND REUTILIZATION	NUCLEAR DATA POST-PROCESSOR, GRAPHIC DISPLAY, CURVE FITTING
DEFENSE NUCLEAR ANALYSIS	NUCLEAR PARTICLE TRANSPORT IN MATERIALS
DOSE COMPUTATION AND FACTORS	NUCLEAR SYSTEM SAFETY ANALYSIS
EARTH AND ATMOSPHERIC NUCLEAR PHYSICS	NUCLEAR SYSTEMS ANALYSIS
ENVIRONMENTAL TRANSPORT OF RADIONUCLIDES	RADIATION PROTECTION AND SHIELDING
EXPERIMENTAL DETECTOR ANALYSIS AND SPECTRAL ANALYSIS	REACTOR PHYSICS
FUEL CYCLE AND WASTE MANAGEMENT	SPACE NUCLEAR PHYSICS
FUSION ENERGY	THERMODYNAMICS AND FLUID DYNAMICS

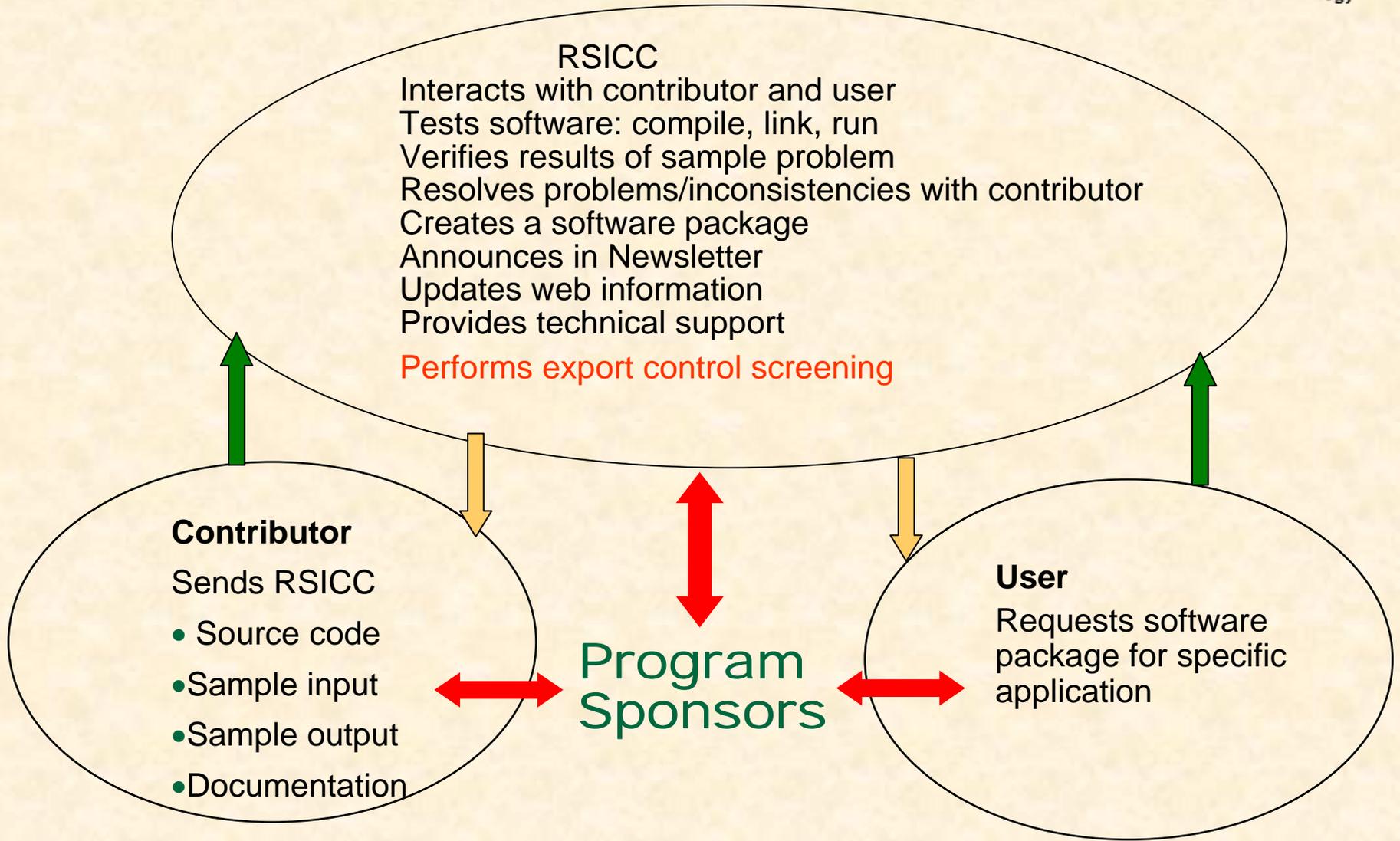
# RSICC Software Package

- **Source Code**
- **Sample problem input**
- **Sample problem output**
- **Documentation**
- **Executable program**



Software package

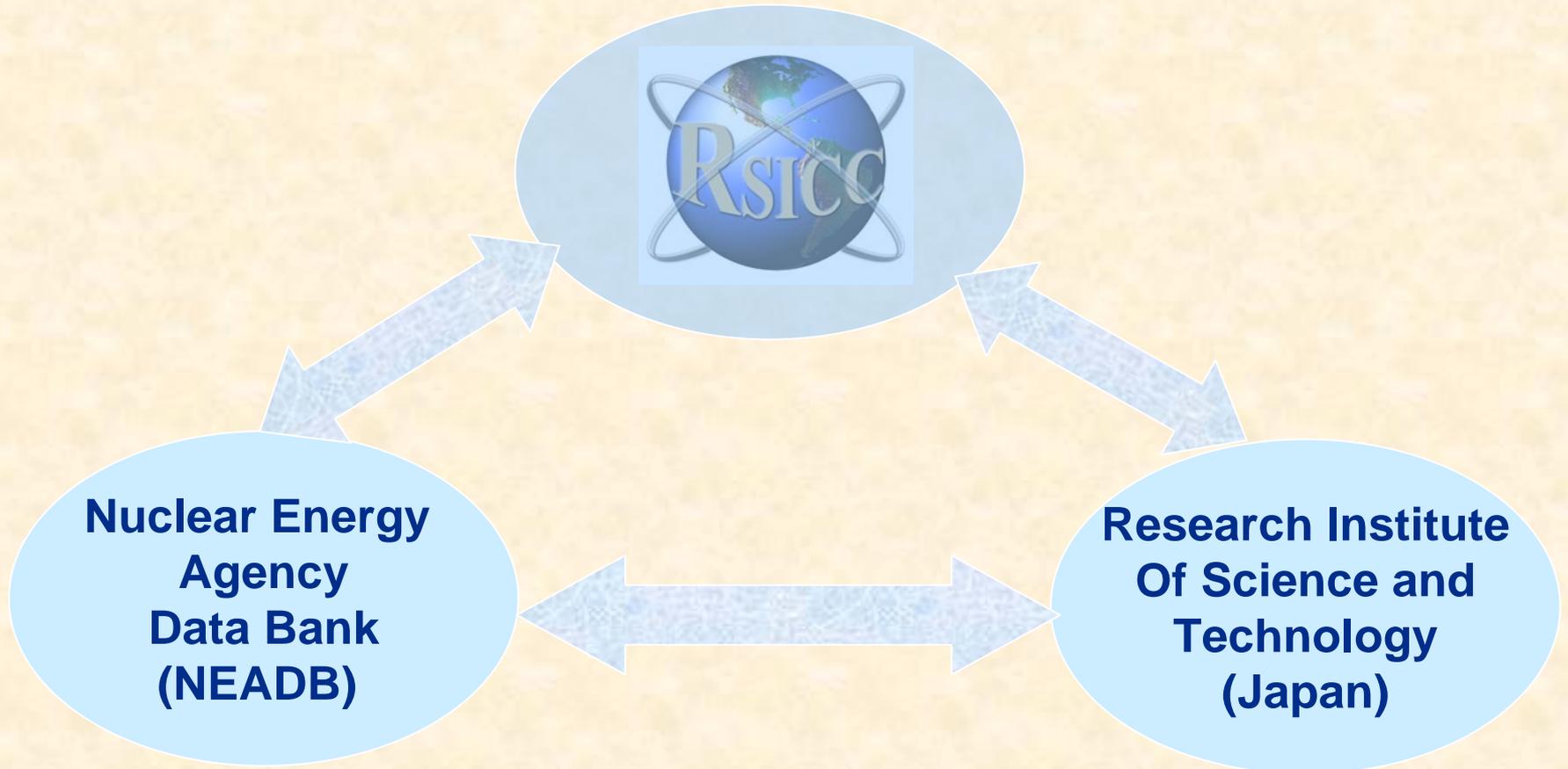
# "LIVE" Collection



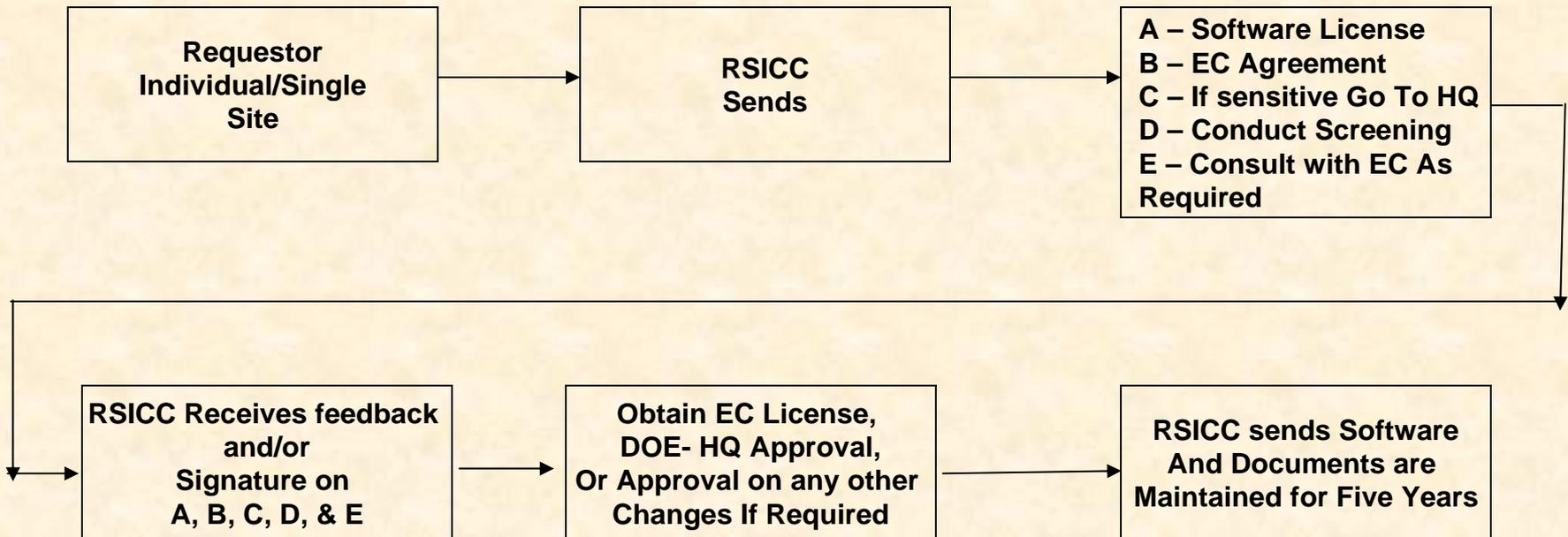
# Quality Services

- ✓ **Quality testing and control of newer versions of software**
- ✓ **Entire collections of software and associated data**
- ✓ **Web-based electronic notebooks for exchange of software needs and ideas**
- ✓ **Technical support**
- ✓ **Statistical information on users and codes**
- ✓ **Monthly Newsletter**
- ✓ **Quarterly Reports**

# International Partners



# Export Control Process



RSICC software has been categorized by the U. S. Department of Commerce as OD999 - export controlled for anti-terrorism.

# RSICC and Universities

- **Provides free software to NE universities**
- **Manages the Nuclear Engineering Students Laboratory Synthesis (NESLS) summer internship program at ORNL to train future nuclear engineers**
- **Over 850 customers from NE universities.**

# Nuclear Engineering Science Laboratory Synthesis (NESLS)



## 10 weeks internships

<b>First Year (Freshman)</b>	<b>\$529/week</b>
<b>Second Year (Sophomore)</b>	<b>\$593/week</b>
<b>Third Year (Junior)</b>	<b>\$653/week</b>
<b>Fourth Year (Senior)</b>	<b>\$726/week</b>
<b>Fifth Year (Graduate)</b>	<b>\$863/week</b>
<b>Masters Completed</b>	<b>\$935/week</b>

**Housing allowance=\$75/week if permanent address is more than 60 miles from laboratory.**

# Moments In RSICC History



# Moments In RSICC History

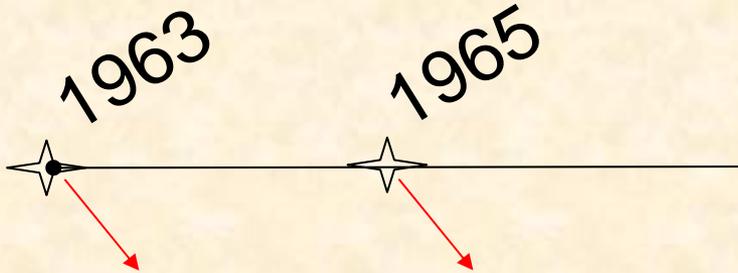
1963



**RSICC Founded**

- First Kernel integration and Monte Carlo codes
- Programmed for IBM 704

# Moments In RSICC History

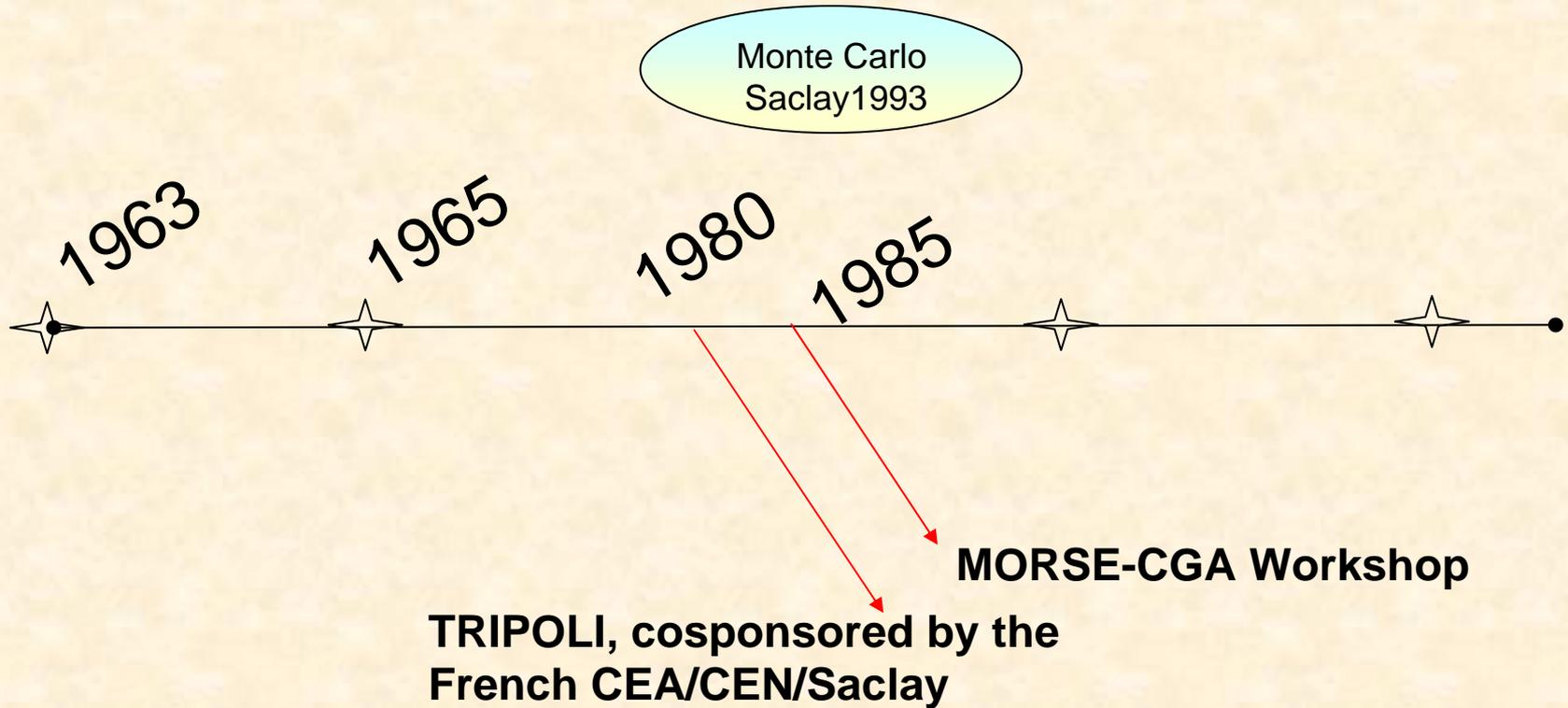


**O5R Monte Carlo Code Workshop**  
**80 participants from 45 institutions**

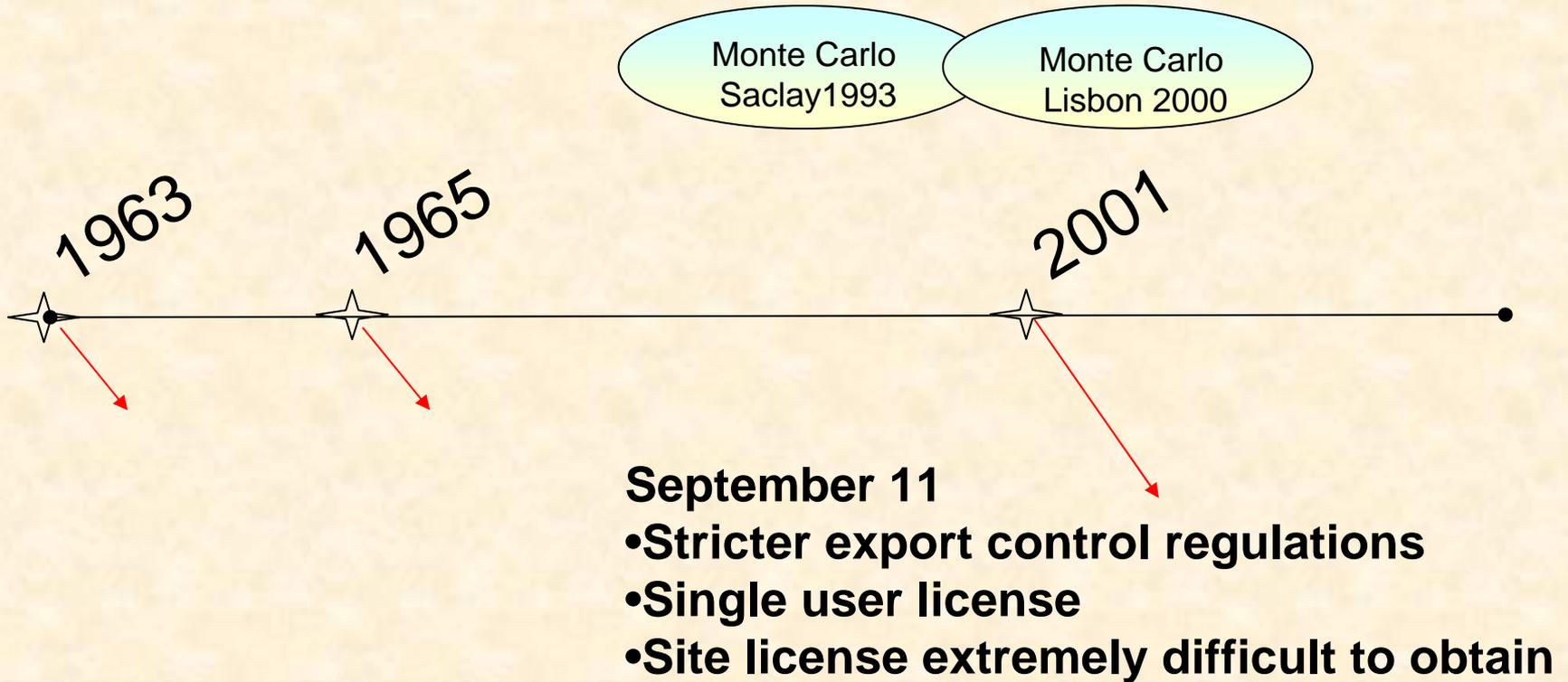
## **Moore's Law**

Electronics, Volume 38, Number 8, April 19, 1965

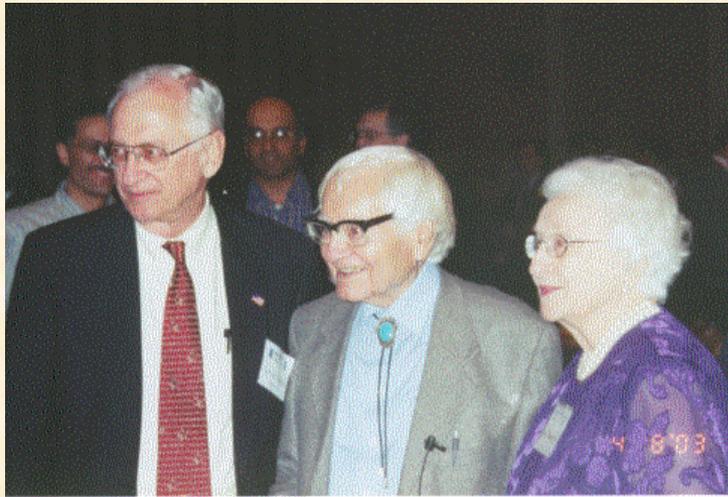
# Moments In RSICC History



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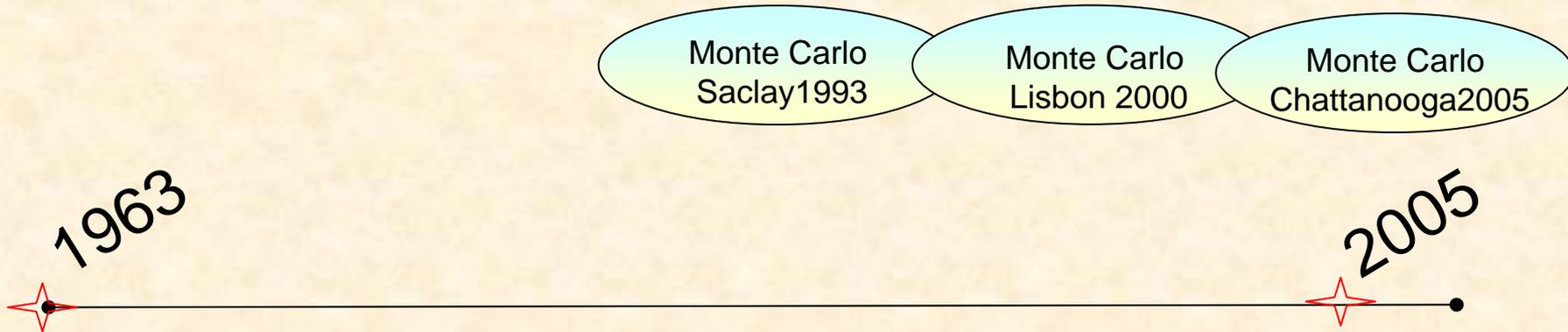
**RSICC celebrated 40<sup>th</sup> anniversary during M&C 2003 in Gatlinburg, Tennessee.**

**Alvin Weinberg delivers his speech on “The Immortal Reactor,” an exploration of the concept of building longevity into the design and construction of the next generation of nuclear power plants.**

# Moments In RSICC History



# Moments In RSICC History

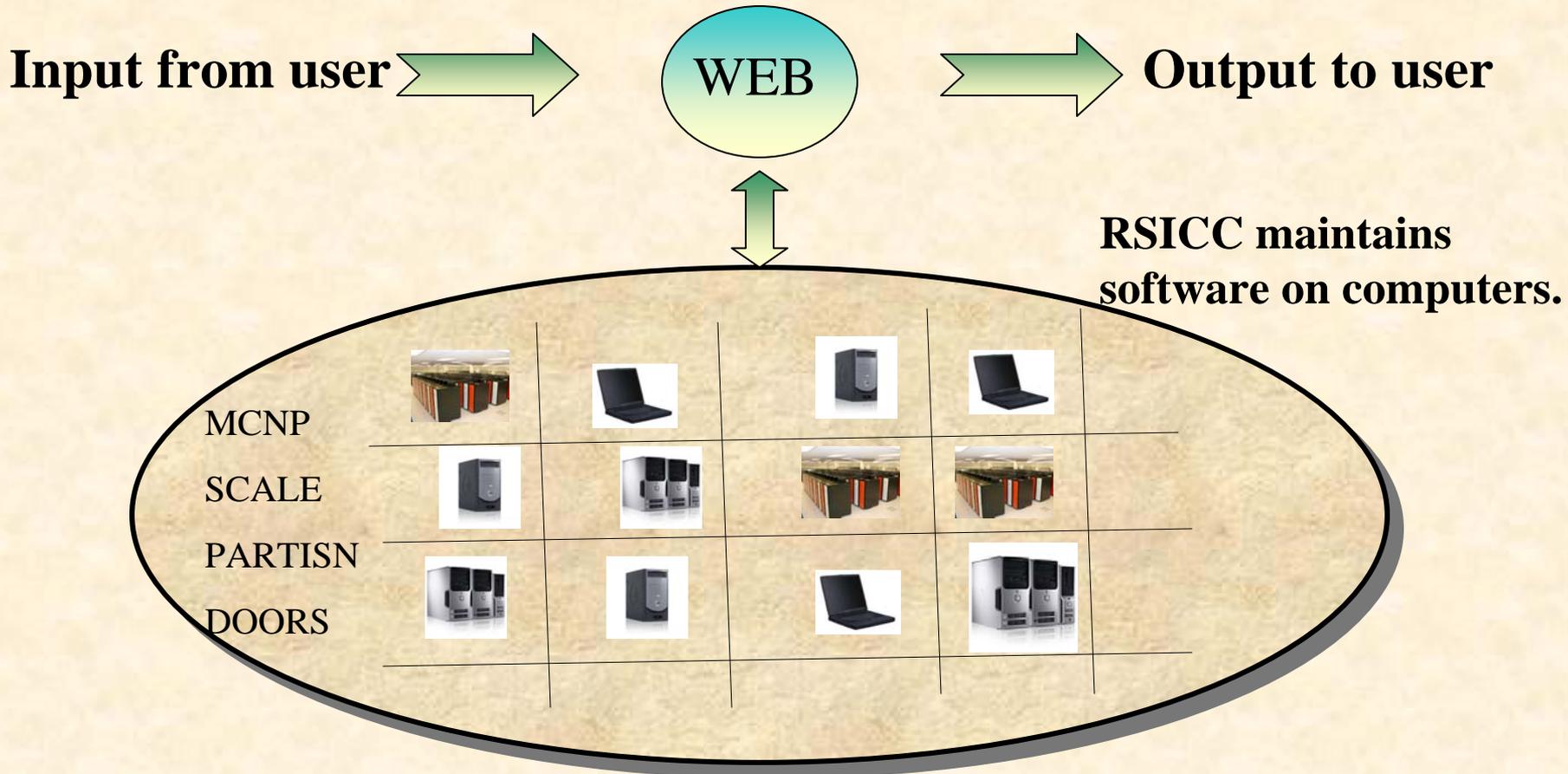


**1700 software/data**  
**Over 215 Monte Carlo software**

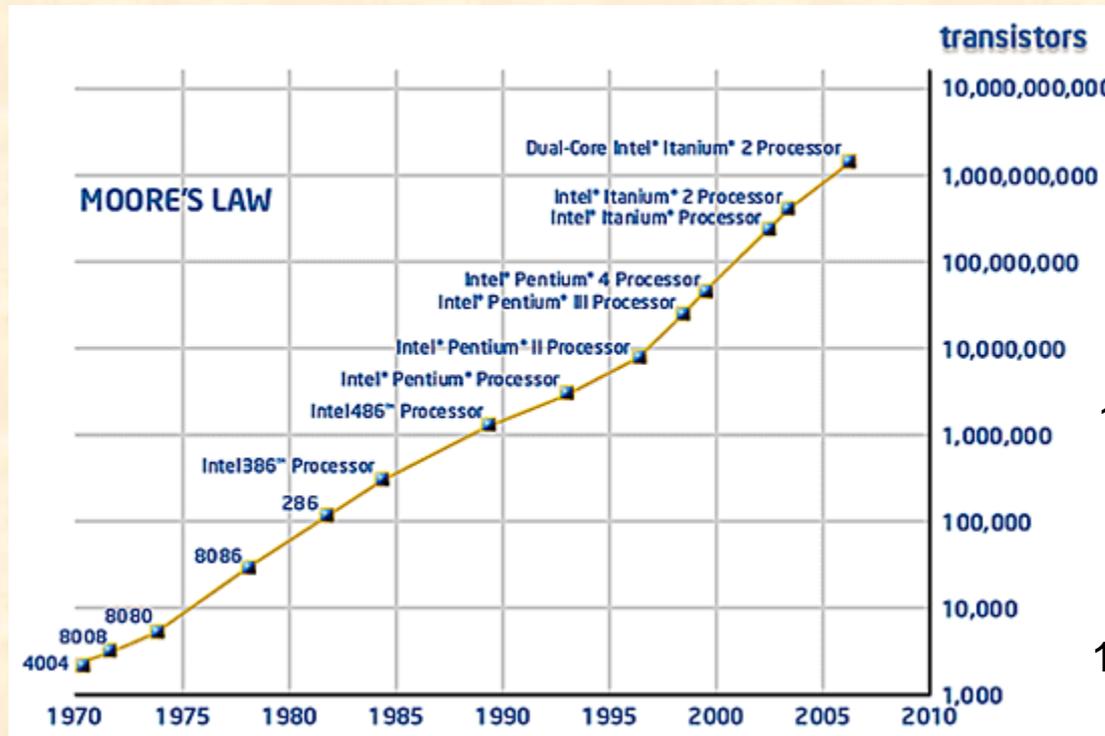
- EGS4
- HETC
- KENO
- MCNP
- MCNPX
- MORSE
- PENELOPE
- TART
- TRIPOLI

# Vision for Future

## Computational Grid for Nuclear Technology Software



# Moore's Law



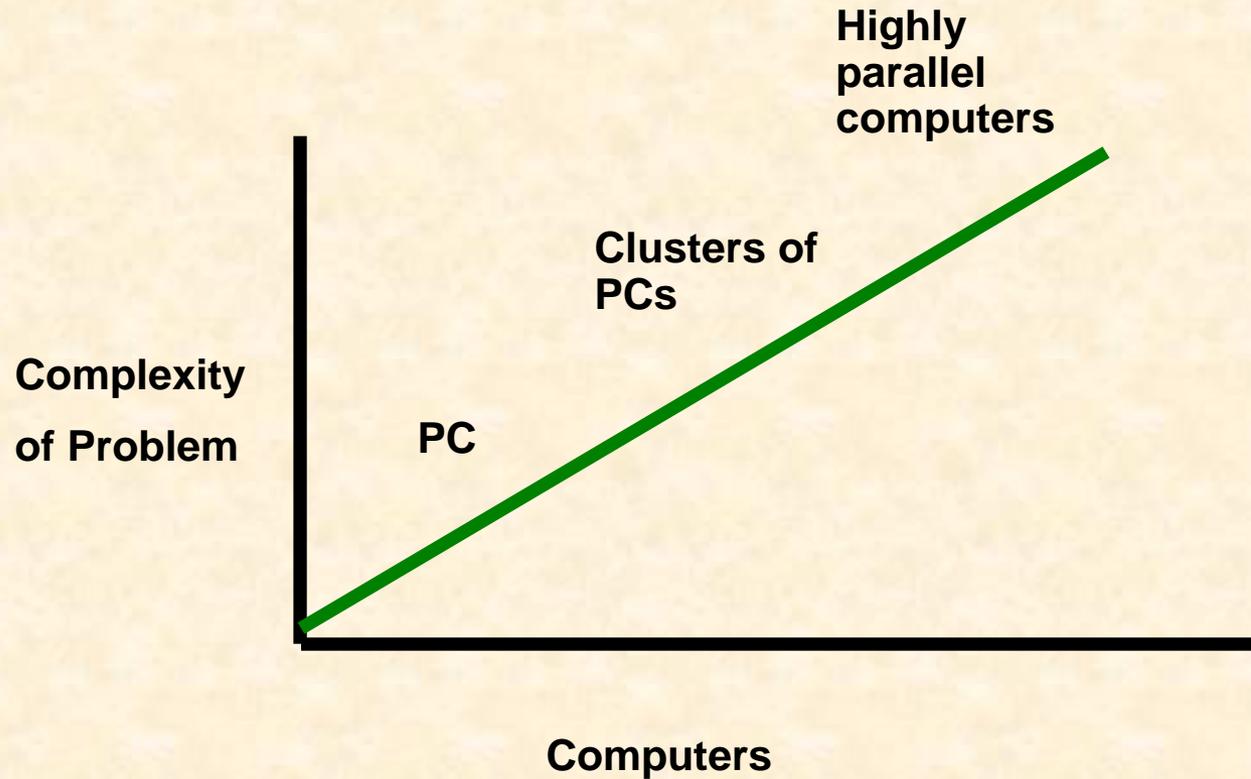
500,000+ lines of coding

100,000+ lines of coding

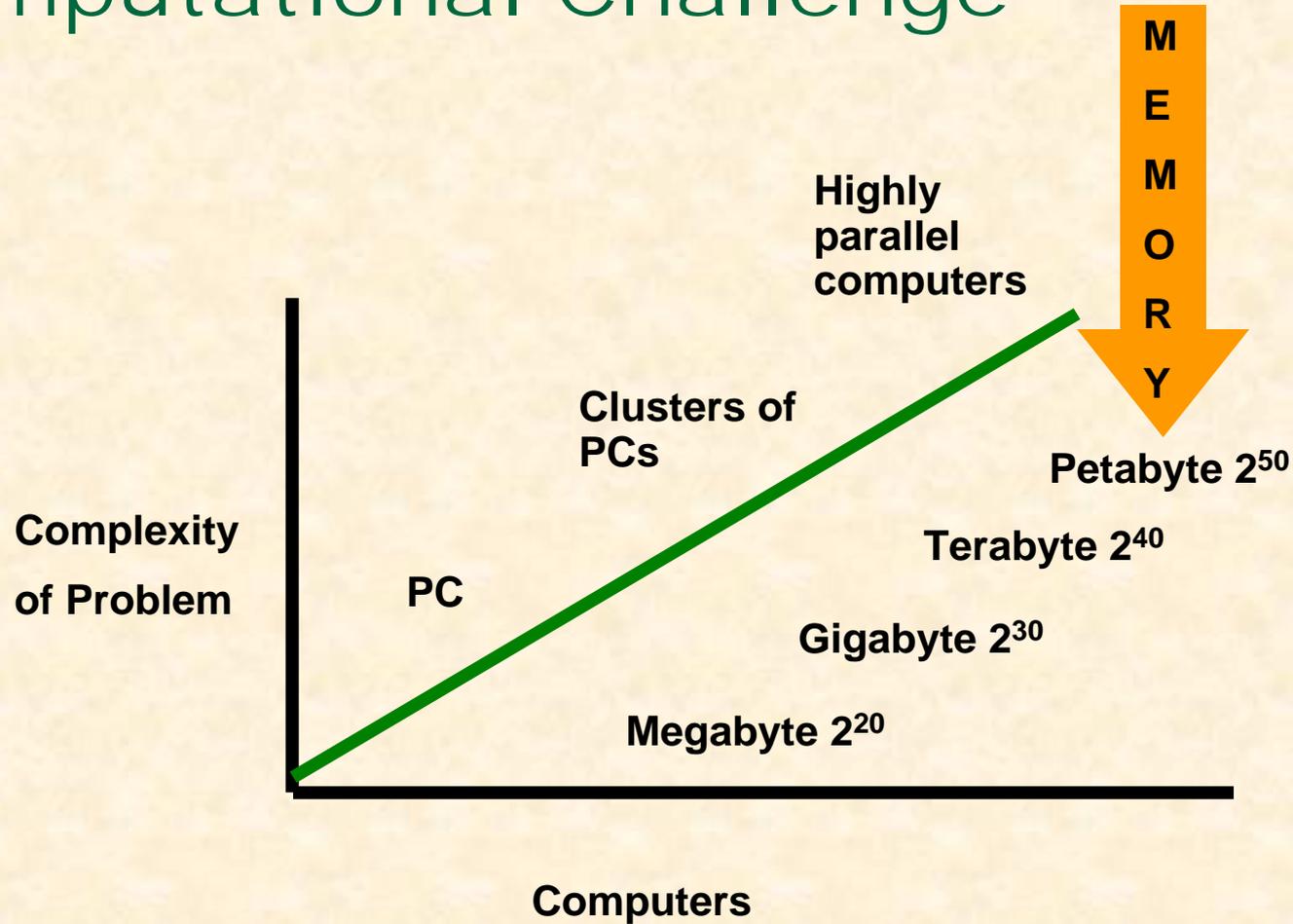
1000+ lines of coding

<http://www.intel.com/technology/mooreslaw/index.htm>

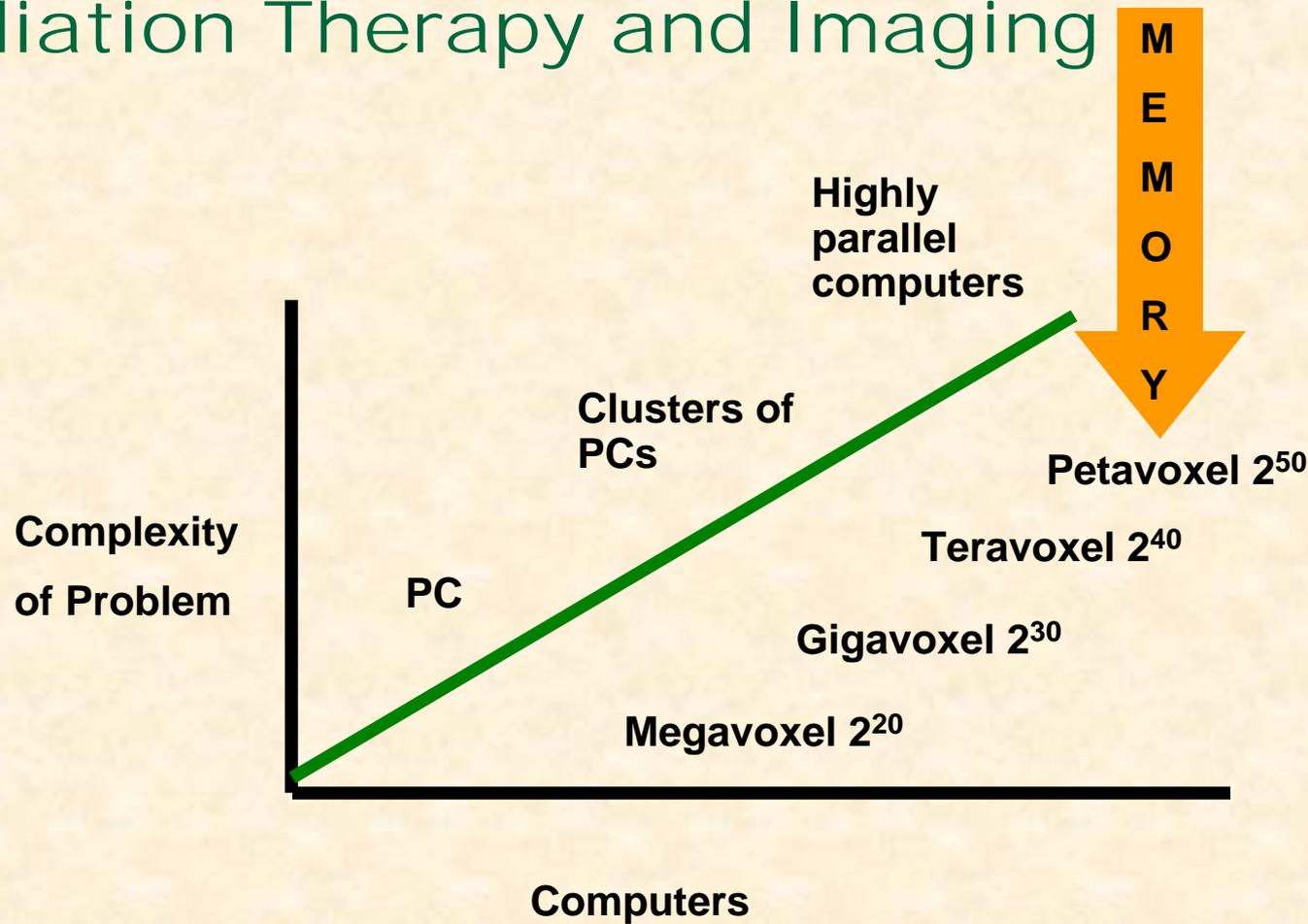
# Computational Challenge



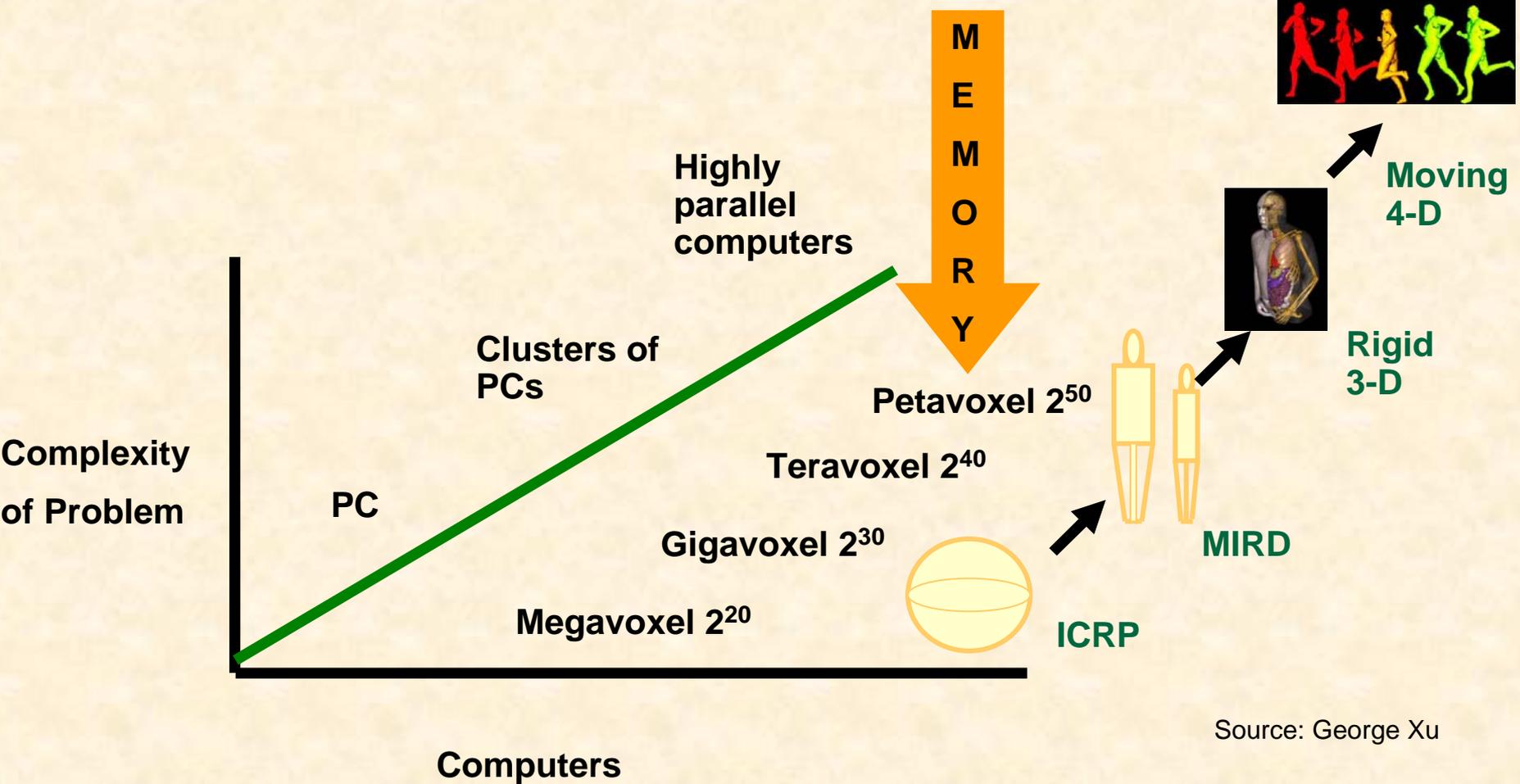
# Computational Challenge



# Computational Challenge for Radiation Therapy and Imaging



# Computational Challenge for Radiation Therapy and Imaging



Source: George Xu

# Epilogue



Betty Maskewitz

"Be kind to your students.  
They will be your future  
funders."