An Overview of CISE@NSF

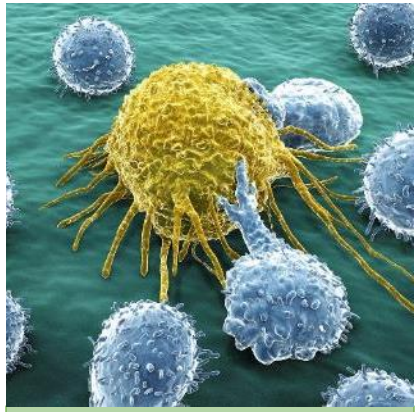
Rance Cleaveland

Division Director, Comp. and Comm. Foundations

National Science Foundation

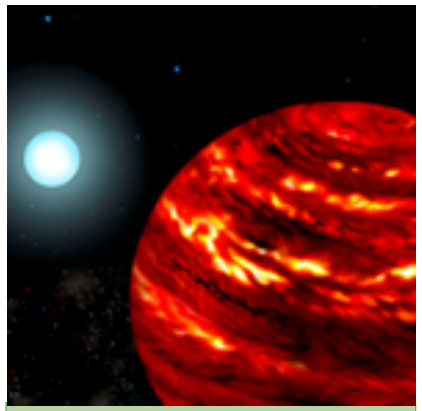
The National Science Foundation

The NSF Promotes Basic Research and Education in:



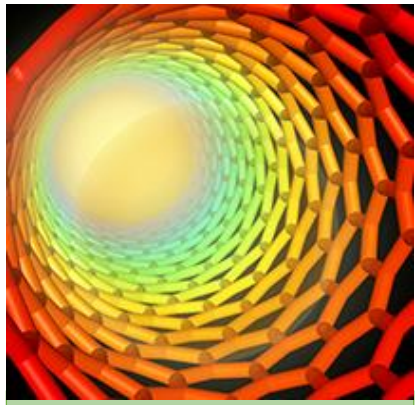
BIO

CISE



MPS

GEO



ENG

EHR

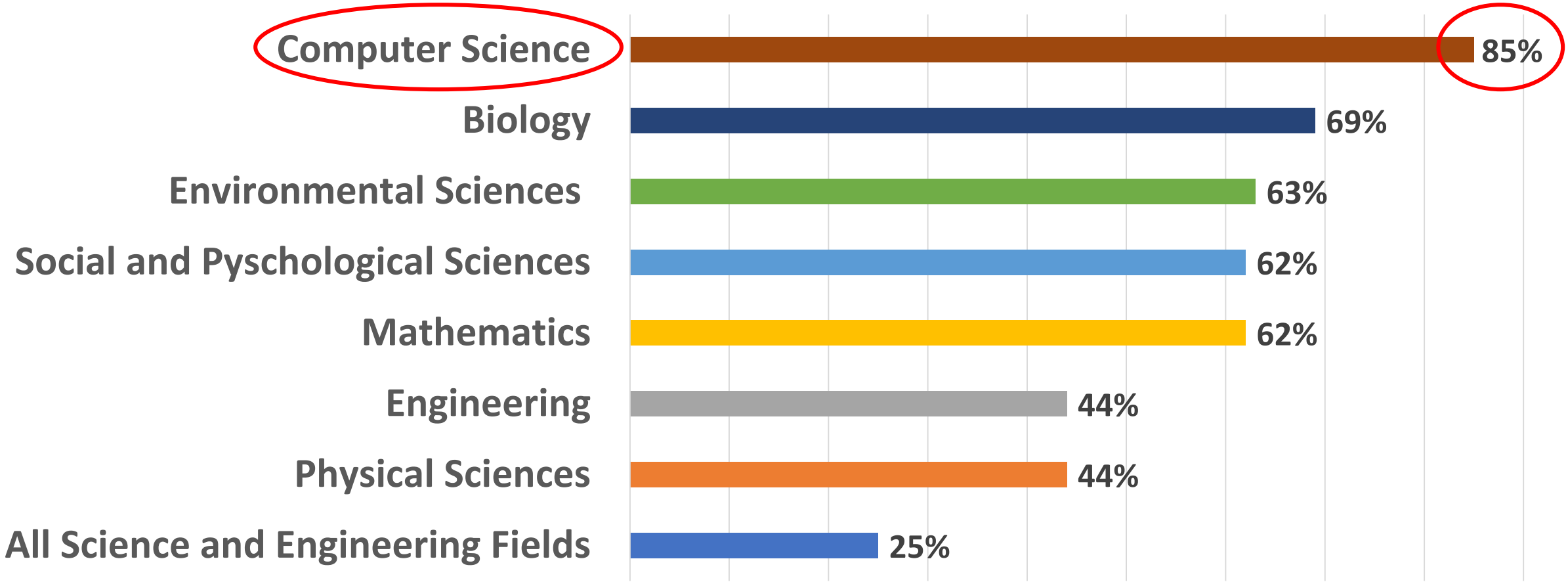
SBE

NSF Facts and Figures

- Annual budget: $8+bn
- Seven research *directorates*
  - BIO (Biological Sciences)
  - CISE (Computing and Information Science and Engineering)
  - EHR (Education and Human Resources)
  - ENG (Engineering)
  - GEO (Geosciences)
  - MPS (Mathematical and Physical Sciences)
  - SBE (Social, Behavioral and Economic Sciences)
- 92+% of budget awarded as grants / contracts to researchers

The NSF Is a Key Pillar of Foundational Research

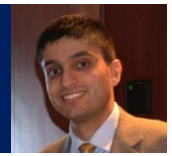
NSF support as a percentage of total federal support for basic academic research



Source: NSF/NCSES, "Survey of Federal Funds for Research and Development." In FY20 NSF Budget Request to Congress

CISE @ NSF

CISE Directorate
Erwin Gianchandani, Acting AD



Office of Advanced Cyberinfrastructure (OAC)
Manish Parashar, OH

- Data
- High Performance Computing
- Networking/ Cybersecurity
- Software

Computing and Communication Foundations (CCF)
Rance Cleaveland, DD

- Algorithmic Foundations
- Communication and Information Foundations
- Foundations of Emerging Technologies
- Software and Hardware Foundations

Computer and Network Systems (CNS)
Ken Calvert, DD

- Computer and Network Systems
- CISE Research Infrastructure
- Education and Workforce Development

Information and Intelligent Systems (IIS)
Henry Kautz, DD

- Cyber Human Systems
- Information Integration and Informatics
- Robust Intelligence

CISE Consists of:

- CCF “Foundations Division”
  Algorithms, HW / arch. / new paradigms, SW, comm. / inf. theory, comp. bio., …
- CNS “Systems Division”
  Operating systems, networking, cybersecurity, cyber-physical systems, …
- IIS “Intelligent Information Systems Division”
  AI / machine learning, human-computer interaction, graphics, database, …
- OAC “Cyberinfrastructure Office”
  High-performance computing, computing infrastructure, …

CISE / CCF Numbers

- Budget
  - CISE: ~$1bn
  - CCF: ~$200m
- Employees
  - CISE: ~120
  - CCF: ~25
- Proposals / Funded / Rate (2018)
  - CISE: 9,151 / 2,099 / 23%
  - CCF: 1,652 / 442 / 27%

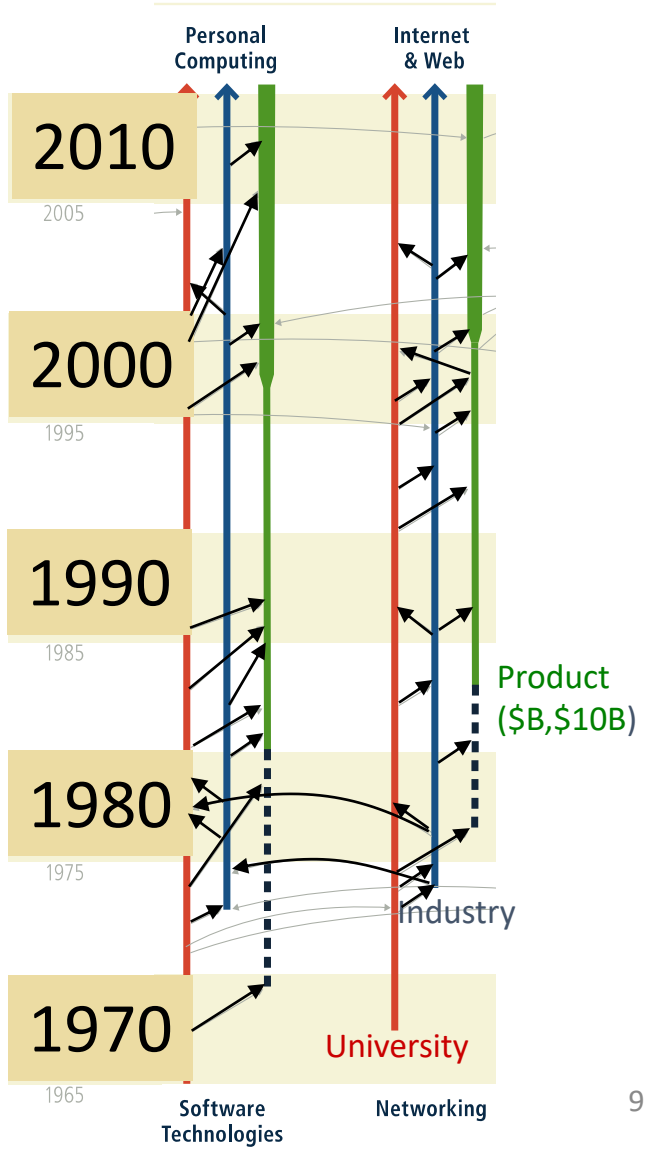
Technical Staff in CISE

- Typically: PhDs
- “Permanent Federal Employees” (~50%)
- “Rotators” (~50%)
  - Come to NSF for 3-4 years from other organizations, typically universities
  - I am a rotator from the University of Maryland at College Park!

CISE-Funded Research Has Remarkable Impact

Advances in computing, communications, information technologies, and cyberinfrastructure:

- **drive industry**
  - IT: 25% of economic growth since 1995;
  - Resulted in a number of billion-dollar industries: networking, software, digital communications, computer graphics, AI and robotics, …
- have profound **impacts on our daily lives**.



Source: National Research Council. 2016. *Continuing Innovation in Information Technology*.

Programs

- CISE distributed grants via programs
  - Each program has a solicitation describing program parameters
  - Researchers respond to solicitations with proposals
  - CISE uses peer-review to evaluate proposals, make funding decisions
- Two kinds of programs
  - Core: any proposal on any topic relevant to division
  - Cross-cutting: specialized topic (e.g. Cybersecurity) involving multiple divisions / directorates

Some CCF-related Cross-Cutting Programs

- Secure and Trustworthy Cyberspace (SaTC)
  - Cybersecurity
  - Largest cross-cutting program in NSF: $53m in FY19 to fund 70+ projects
- Scalable Parallelism in the Extreme (SPX)
  - New paradigms for parallelism
  - $10m for ~10 projects in FY19
- Real-Time Machine Learning (RTML, collaboration with DARPA)
  - Learning in real-time from data streams
  - $10m for ~8 projects in FY19

External Partnerships

- An emphasis in CISE
- Partnerships involve joint sponsorship of programs
- Types of partners
  - Other government agencies
  - Non-profits
  - International organizations
  - Companies

Partnership Model

- Partner, CISE devise joint cross-cutting program, solicitation, financial contributions
- CISE announces program, reviews proposals (with partner input)
- Joint funding decisions made, subject to NSF policies
- Partner manages post-award activities (PI meetings, program review)
- Details formalized in Memoranda of Understanding

Some Recent Commercial Partnerships

- … with Intel
  - Computer Assisted Programming for Heterogeneous Architectures (CAPA)
  - Foundational Microarchitecture Research (FoMR)
- … with Amazon
  - Fairness in AI
- … with VMWare
  - Edge Computing Data Infrastructure (ECDI)
  - Software Defined Infrastructure as a Foundation for Clean-Slate Computing Security (SDI-CSCS)

Farewell Jim Kurose (Outgoing CISE AD)

Thanks!

… for your attention

… to the summit organizers

… to the summit participants

Rance Cleaveland

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