

NIH: Steward of Medical and Behavioral Research for the Nation

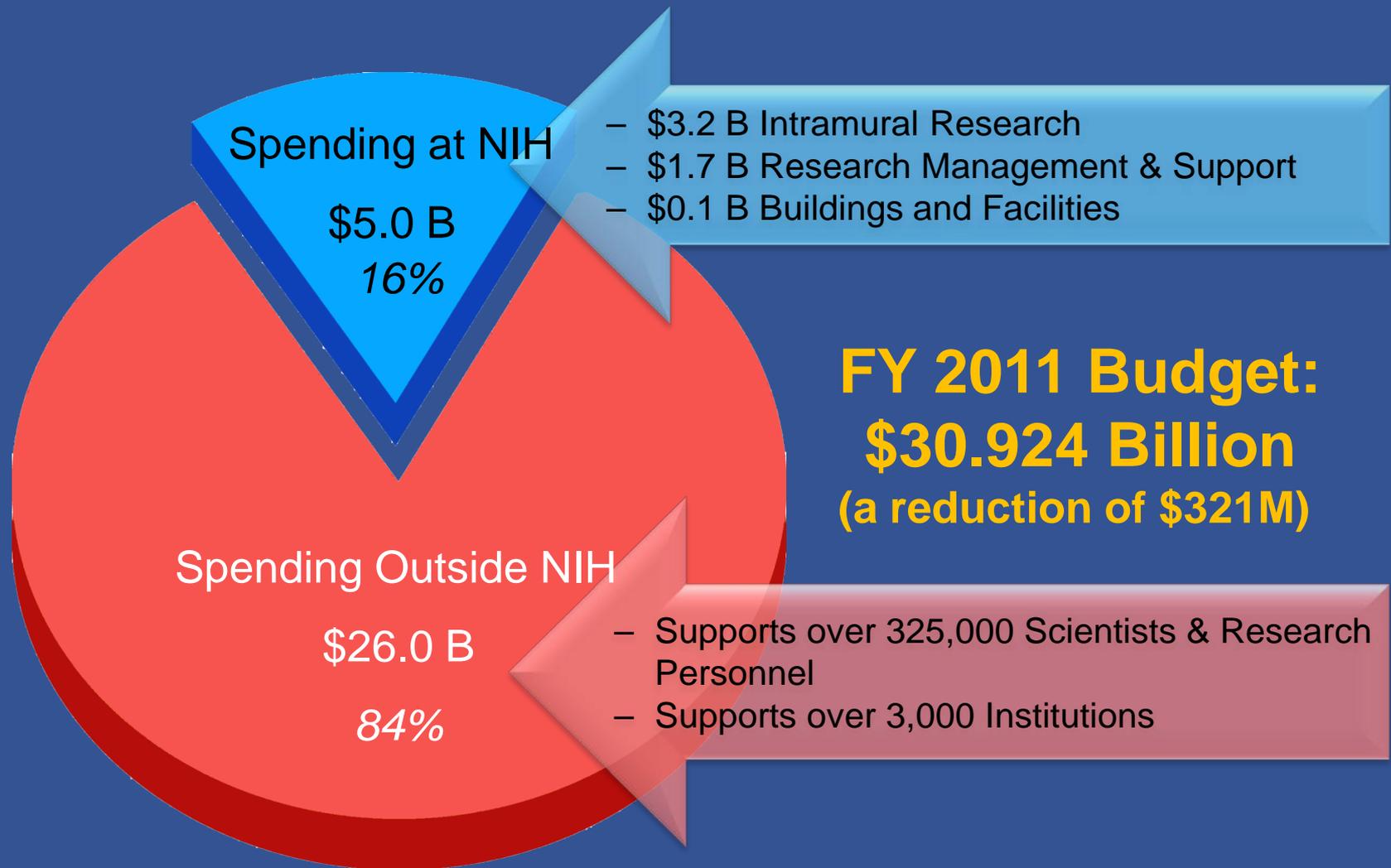


“Science in pursuit of **fundamental knowledge** about the nature and behavior of living systems ... and the **application of that knowledge** to extend healthy life and reduce the burdens of illness and disability.”

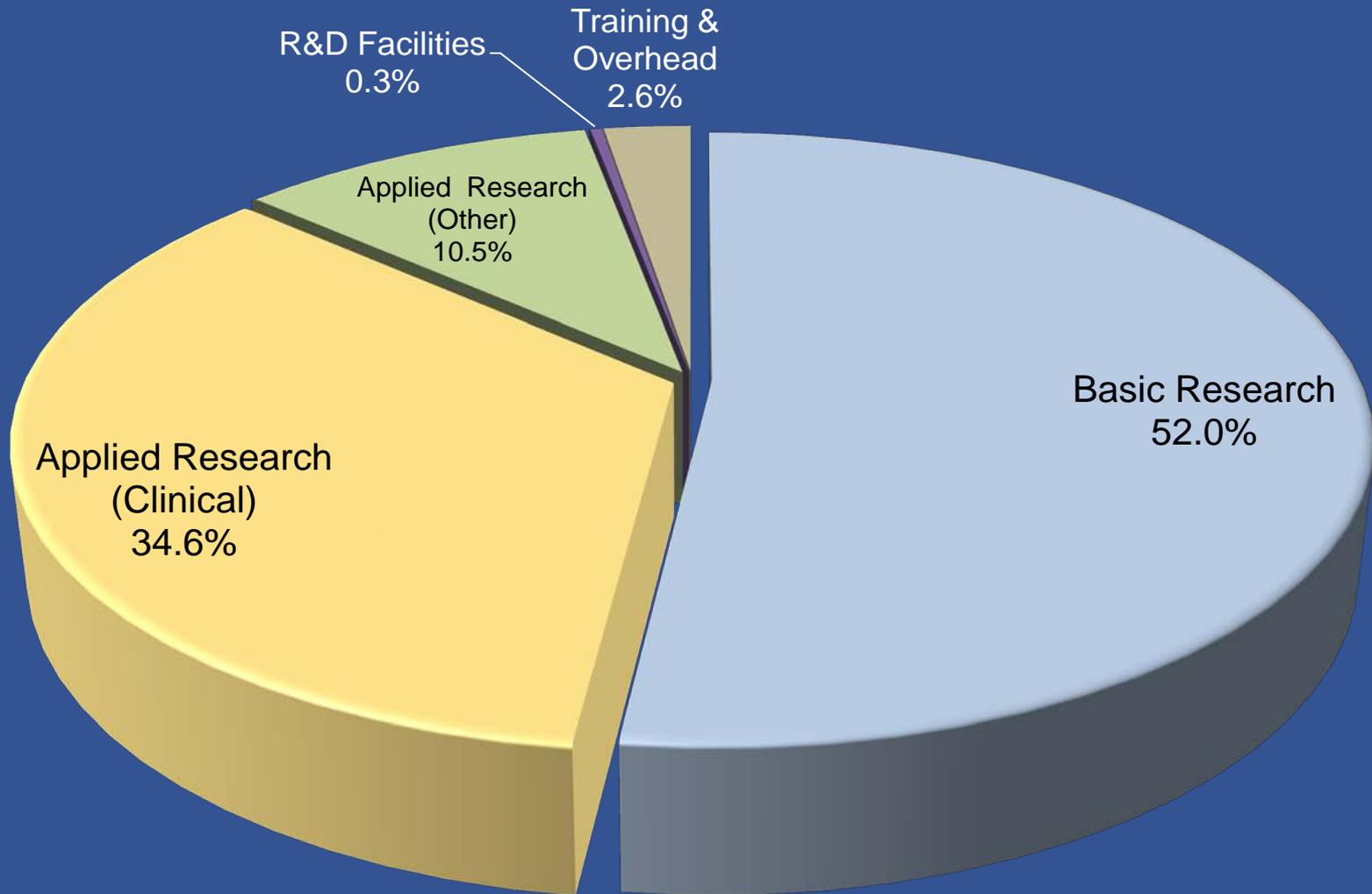


NIH Extramural & Intramural Funding

FY 2010 Budget: \$31.238 Billion



FY 2010 Percent Distribution of Basic and Clinical Research



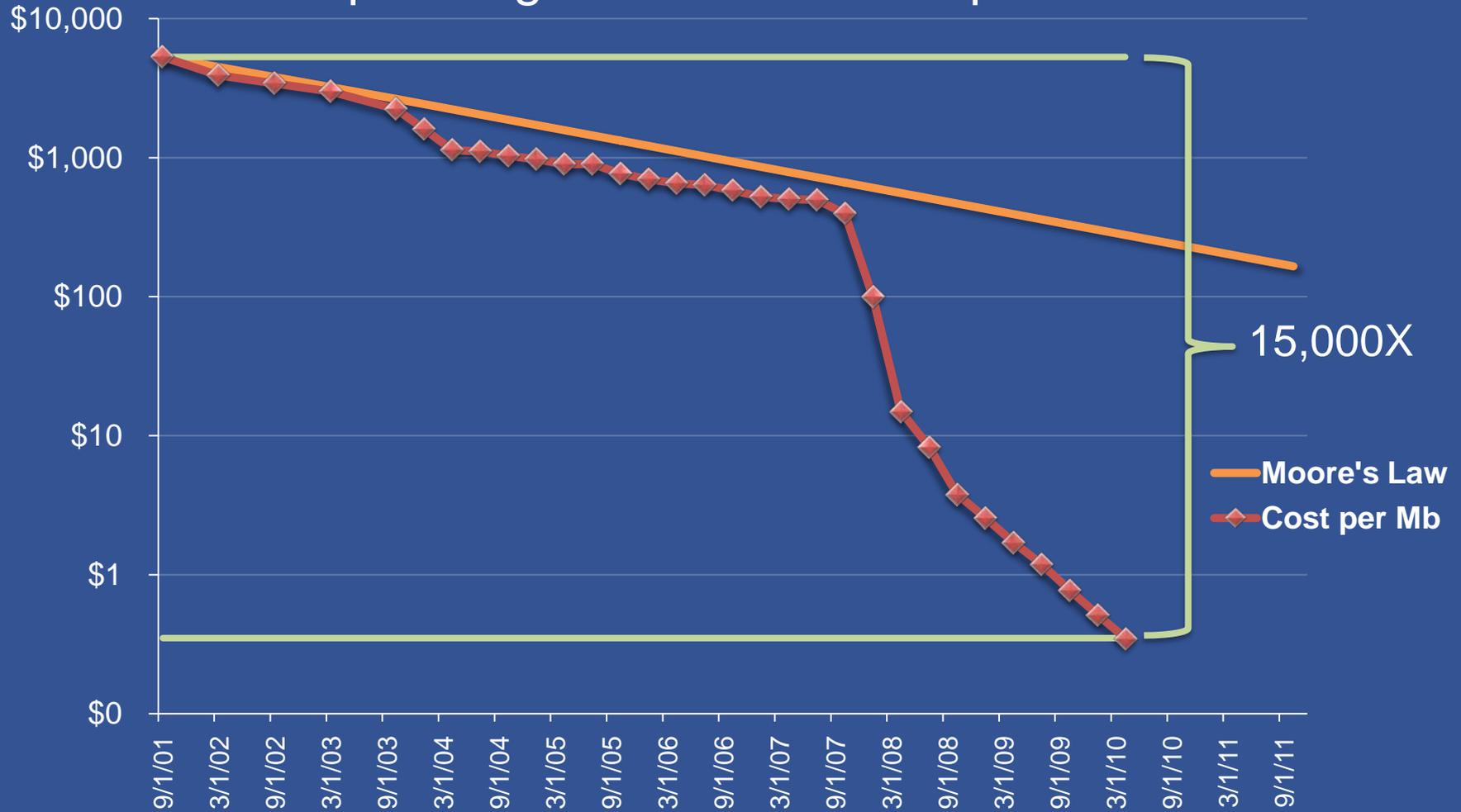
NIH Investments in Innovation

- Accelerating Discovery Through Technology
- Advancing Translational Sciences
- Encouraging New Investigators and New Ideas



Sequencing Costs Drop Faster than Moore's Law

Cost per Megabase of DNA Sequence



Clinical Applications of Genomic Analysis: Diagnosis and Treatment

- Patient: 6-year-old Nic
 - Severe inflammatory bowel disease from just before 2nd birthday
 - 100+ surgeries – little solid food – **no diagnosis**
- Whole exome sequencing
 - Found mutation in *XIAP* gene
 - Gene previously linked to blood disorder; curable by bone marrow transplantation
- Diagnosis allows treatment
 - July 2010: Nic receives stem cell transplant from healthy donor
 - Today: doing well; recovery continues

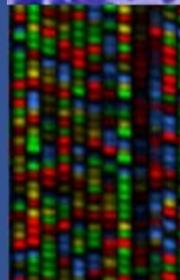
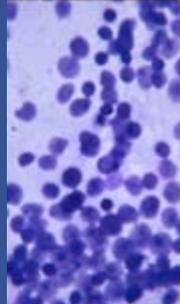
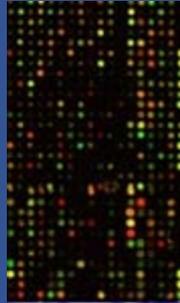


Credit: Gary Porter, Milwaukee Journal Sentinel



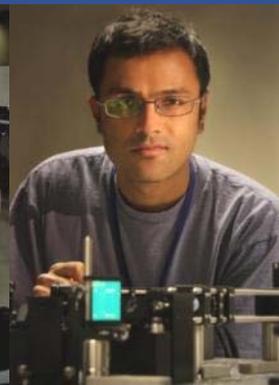
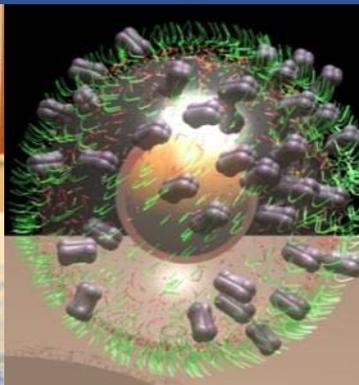
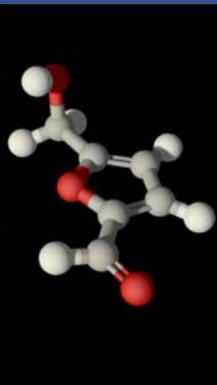
The Cancer Genome Atlas (TCGA)

- A comprehensive, collaborative effort led by NIH
 - To map genomic changes in major types, subtypes of cancer ...
 - To help chart a new course in cancer research
- Pilot project
 - Established scientific infrastructure; demonstrated “proof of concept”
 - Focused on 3 types of cancer: glioblastoma multiforme; ovarian; lung
- Current goal: to identify recurrent genomic and epigenomic drivers for at least 20 cancers over next 3 years

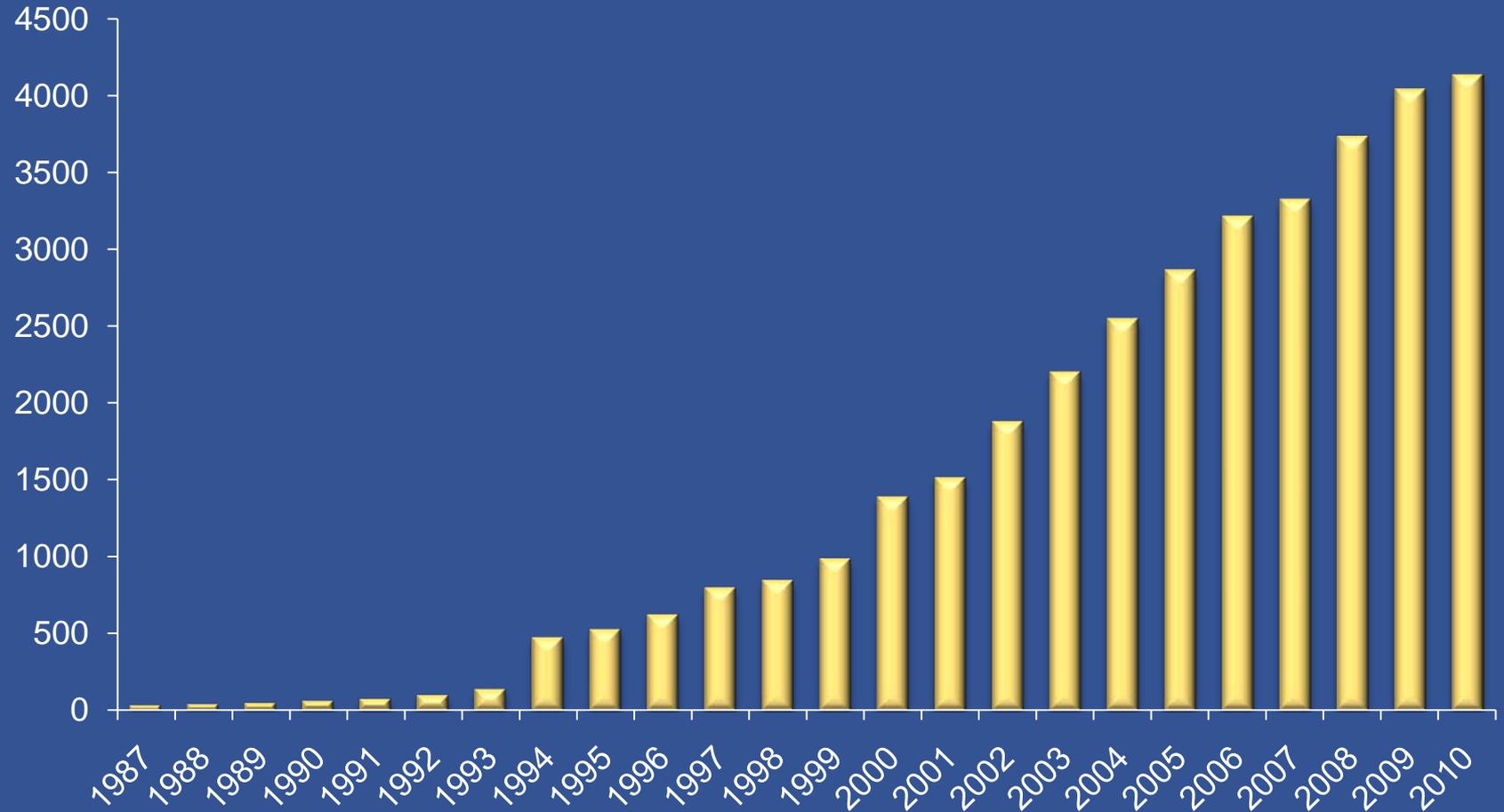


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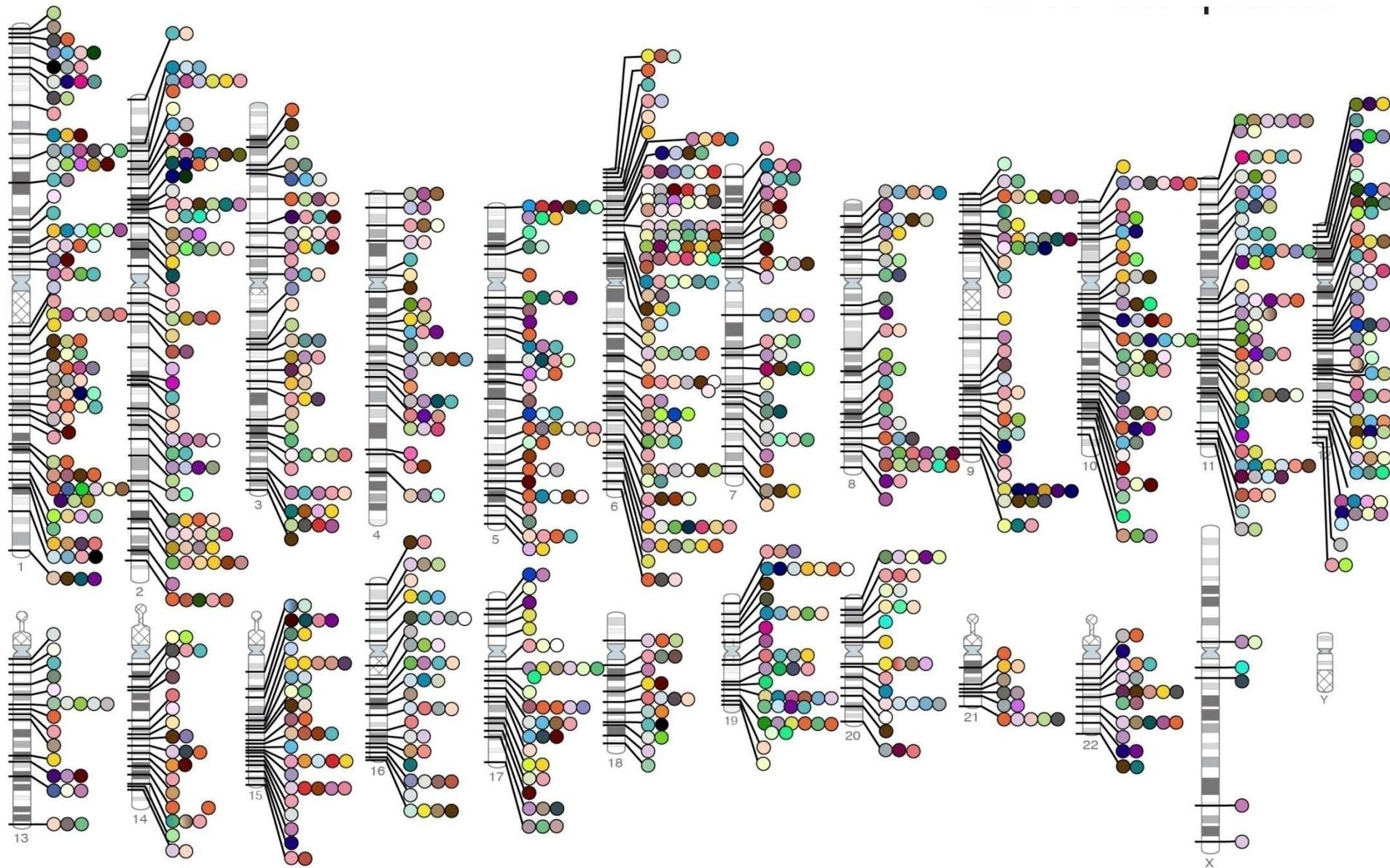


Disorders with Known Molecular Basis



Source: *Online Mendelian Inheritance in Man*

GWAS hits for common disease

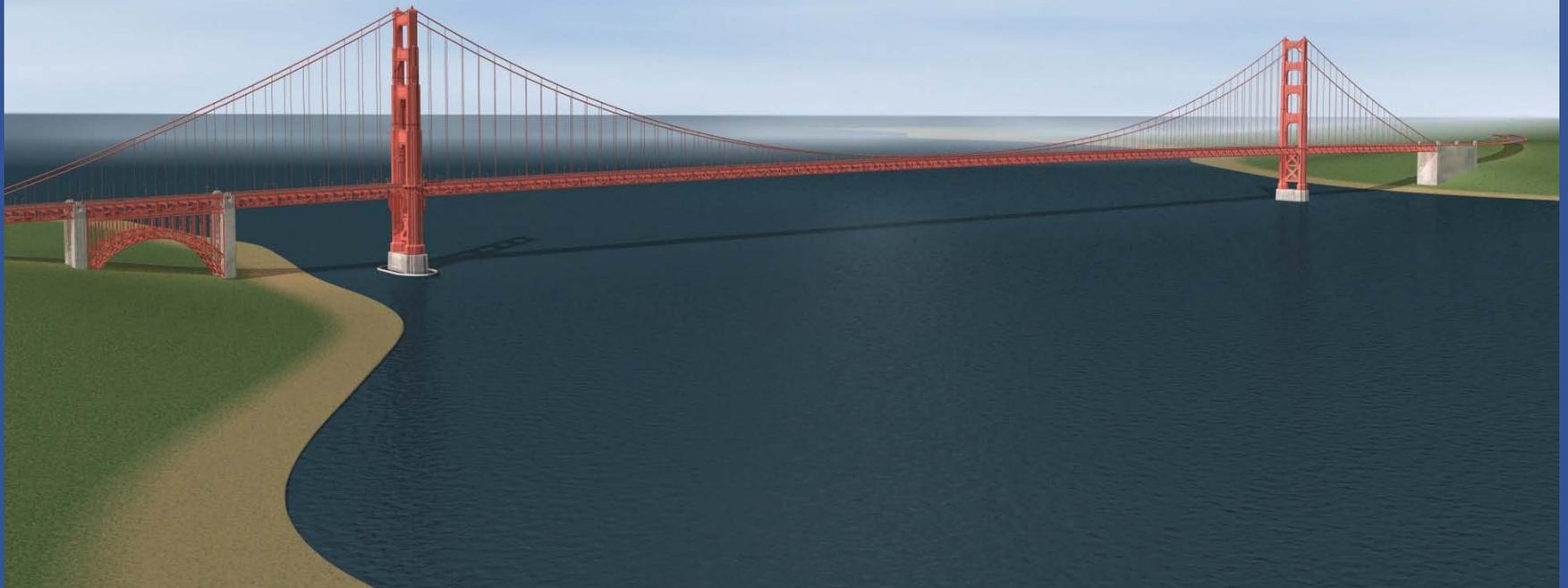


Fundamental Knowledge

Application of Fundamental Knowledge

**Fundamental
Knowledge**

**Application of
Fundamental
Knowledge**



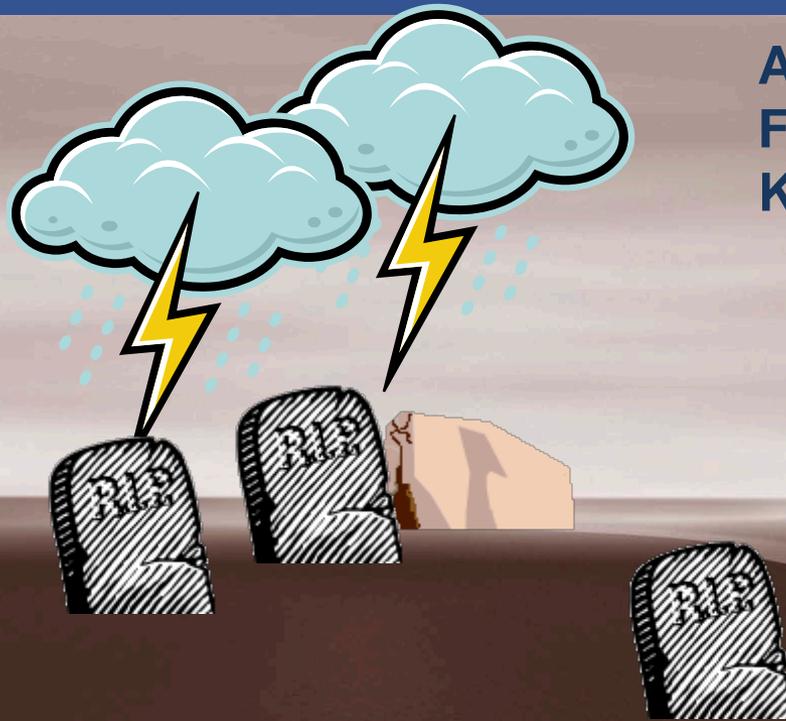
Fundamental Knowledge

Application of Fundamental Knowledge Cont'd

Fundamental Knowledge



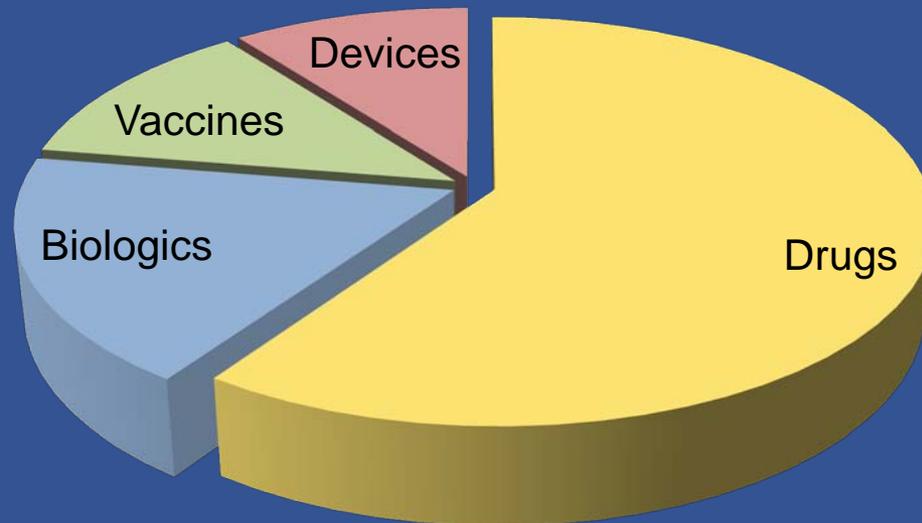
Application of Fundamental Knowledge



Therapeutics Development at NIH

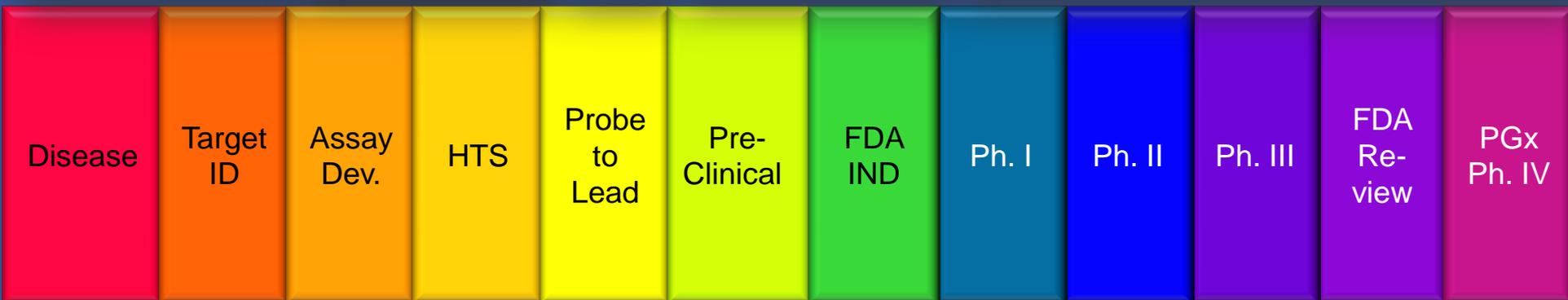
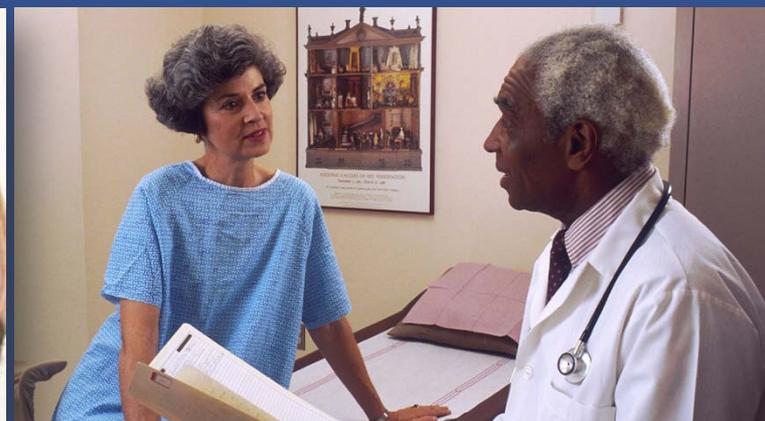
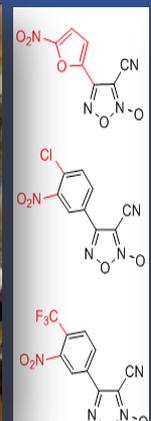
A 2010 trans-NIH inventory of activities relevant to therapeutics development found:

- Substantial investments in therapeutics development research
- Approximately 65% preclinical research; 35% clinical research
- 550 activities reported of varying sizes and areas of emphasis



Distribution of Investment

New NIH FDA Partnerships



New NIH-FDA Partnerships

NIH-FDA Collaborations



- NIH-FDA Regulatory Science Initiative: cooperative research grant awards to advance translational and regulatory science
- NIH-FDA Joint Leadership Council (est. 2010)
 - Goal: advance translational sciences by ensuring that:
 - Regulatory considerations are integral to biomedical research planning
 - The latest science informs the regulatory review process
 - Six working groups currently reviewing proposals for collaboration:
 - To better define regulatory pathways for coordinated approval of co-developed diagnostics and therapeutics
 - To develop risk-based approaches for best review of diagnostics



New Paradigms: Rescuing and Repurposing



NIH – INDUSTRY ROUNDTABLE
April 21-22, 2011

**Exploring New Uses for
Abandoned and Approved
Therapeutics**

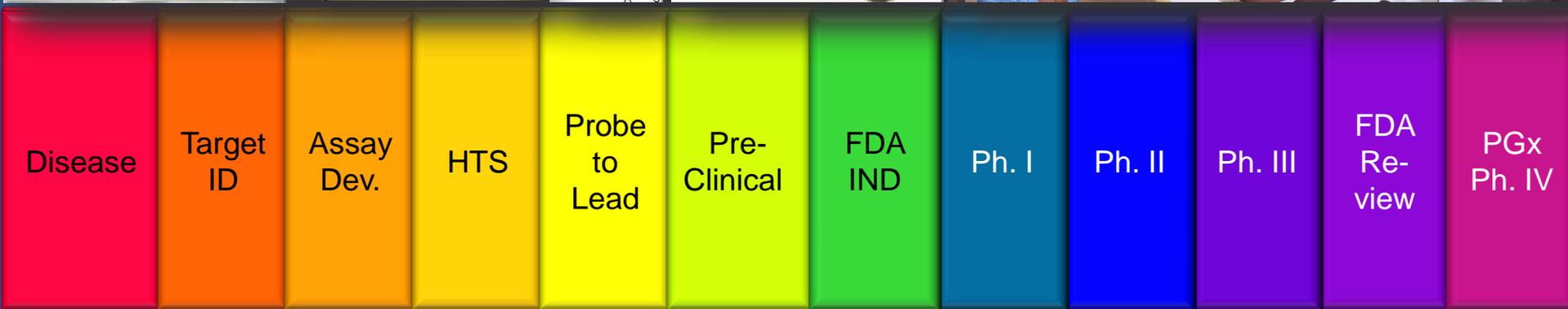
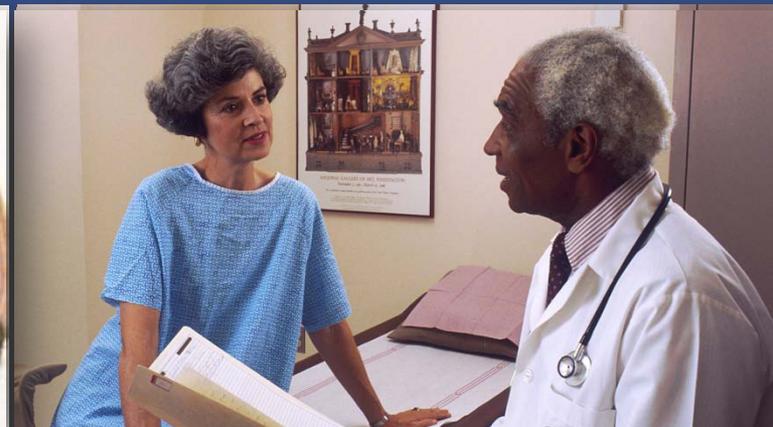
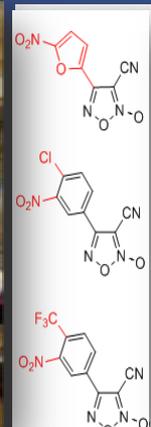
A Definitive List of Approved Drugs

- NIH Chemical Genomics Center (NCGC): national resource for translating genomic information into biological insights and new therapeutics
- NCGC Pharmaceutical Collection
 - Definitive list of all small-molecule drugs approved for human or veterinary use (U.S. and worldwide)
 - All data publically available
- Purpose: facilitate understanding of drug mechanisms; *drug repurposing* – especially for rare and neglected diseases



A composite image showing a perspective article on the left and a screenshot of a chemical database interface on the right. The article, titled 'PERSPECTIVE PHARMACOLOGY The NCGC Pharmaceutical Collection: A Comprehensive List of Approved Drugs', is by Ruili Huang, Noel Souto, and Ajit Jadhav. The database interface shows a search for '5-hydroxytryptamine receptor 1B' with a chemical structure and various identifiers like PubChem CID (5111) and CAS (1300617-0).

New NIH FDA Partnerships

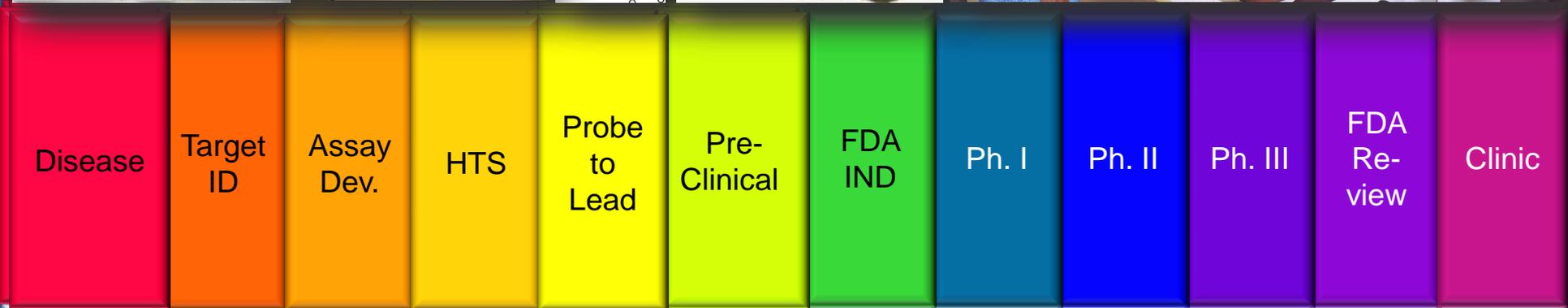
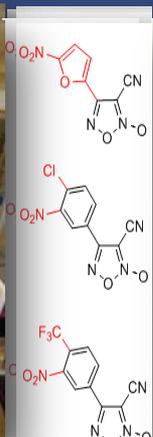


Cures Acceleration Network (CAN)

- CAN will:
 - Advance development of “high need cures”
 - Reduce barriers to translation in areas the private sector is unlikely to pursue actively
- Funding mechanisms:
 - Grant Awards – with or without partnership:
 - Up to \$15 million per award per fiscal year
 - Flexible Research Awards:
 - DARPA-like authority
 - Not to exceed 20% of total appropriated funds /fiscal year



National Center for Advancing Translational Sciences



NIH Supported Basic Research

NIH Molecular Libraries Initiative

TRND
RAID

NIH Clinical Center, Clinical and Translational Science Awards

New NIH-FDA Partnerships

Cures Acceleration Network

Creation of the National Center for Advancing Translational Sciences (NCATS)

To catalyze the generation of innovative methods and technologies that will enhance the development, testing, and implementation of diagnostics and therapeutics across a wide range of human diseases and conditions.

Updated 6.3.11



NCATS: **Functions**

Improve the processes of diagnostics and therapeutics development, testing, and implementation by:

- Experimenting with innovative approaches in an open-access model
- Choosing therapeutic projects to evaluate these innovative approaches
- Promoting interactions to advance the field of regulatory science

Catalyze the development and implementation of new diagnostics and therapeutics by:

- Encouraging collaborations across all sectors
- Providing resources to enable diagnostics and therapeutic development and implementation
- Enhancing training in relevant disciplines

NCATS will:

- Facilitate – not duplicate – the translational research activities supported and conducted by the ICs
- Complement – not compete with – the private sector
- Reinforce – not reduce – NIH's commitment to basic science research



Comparative Effectiveness Research at NIH

THE NEW ENGLAND JOURNAL OF MEDICINE

COMMENTARY JAMA, June 2, 2010—Vol 303, No. 21

Using Science to Improve the Nation's Health System NIH's Commitment to Comparative Effectiveness Research

Michael S. Lauer, MD

Francis S. Collins, MD, PhD

SINCE BARACK OBAMA BECAME THE 44TH PRESIDENT OF the United States in January 2009, nearly all sectors of society have engaged in intense discussions about the best ways to stimulate the nation's economy and reform the US health care system. The National Institutes of Health (NIH) has been—and will continue to be—in the middle of such conversations, emphasizing the power of biomedical research to show what health interventions yield the greatest benefits.

Health reform and economic concerns may have moved comparative effectiveness research (CER) from relative obscurity into the public policy spotlight. However, CER is not a new concept to NIH, which has long recognized and supported the value of CER for providing evidence-based, well-validated approaches to medical care.

For instance, nearly 2 decades ago, NIH-supported researchers published results of the Cardiac Arrhythmia Suppression

gressional Budget Office cited NIH's comparative effectiveness studies as prime examples of government-sponsored research that could directly inform clinical practice and public policy.³

Today, the biomedical research community has an unprecedented opportunity to build on this foundation. The United States urgently needs the evidence to design a system that offers health interventions that are both beneficial and cost-effective. The American Recovery and Reinvestment Act (ARRA) of 2009 appropriated \$1.1 billion for CER, with \$400 million of that funding allocated to NIH and the remainder to AHRQ and the Office of the Secretary of the Department of Health and Human Services.

While the ARRA-mandated report of the Federal Coordinating Council acknowledged that NIH historically has been the largest source of federal support for CER,⁴ NIH has important partners in other government agencies, particularly AHRQ. NIH generally contributes to CER by supporting primary research, including both observational studies and randomized control trials. AHRQ's strength is in conducting secondary comprehensive meta-analyses of multiple studies, seeking to identify overarching conclusions and

to Prevent Heart Attack Trial (ALLHAT)



Diabetes Prevention Program (DPP) Trial

- Adults with “pre-diabetes”
- Exercised 30 minutes a day, lost 7% body weight, were aided by a coach
- **Reduced diabetes risk 58%!**
- Many partners now taking this program to 13 communities in 10 states; CMS exploring ways to extend to Medicare and Medicaid



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Opportunities for Tomorrow: NIH Investing in New, Transformative Ideas

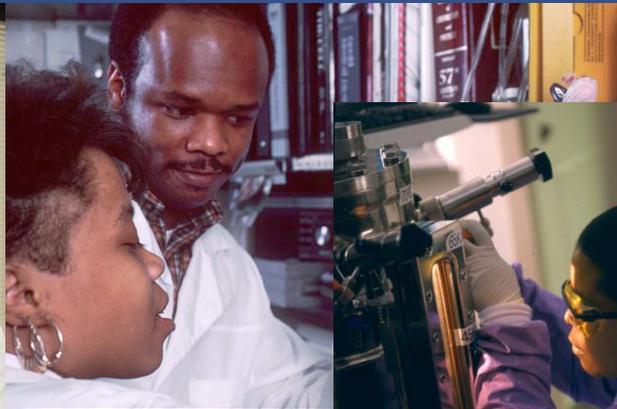
- Transformative R01
 - Supports both individuals and collaborative investigative teams
 - No budget limit per proposal up to budget cap for program as a whole (\$25M total costs/yr, 5 yr)
- NIH Director's Pioneer Award
 - Supports exceptionally creative individual scientists
 - Total funding ~ \$5M, 5 yr
- New Innovator Award
 - Supports small number of exceptionally creative new investigators
 - Provides up to \$300K in direct costs
- NIH Director's Early Independence Awards
 - Program provides mechanism to “skip the post-doc”



Desperate Need for More Diversity in Science and Medicine in the U.S.

African Americans, Hispanics, and Native Americans:

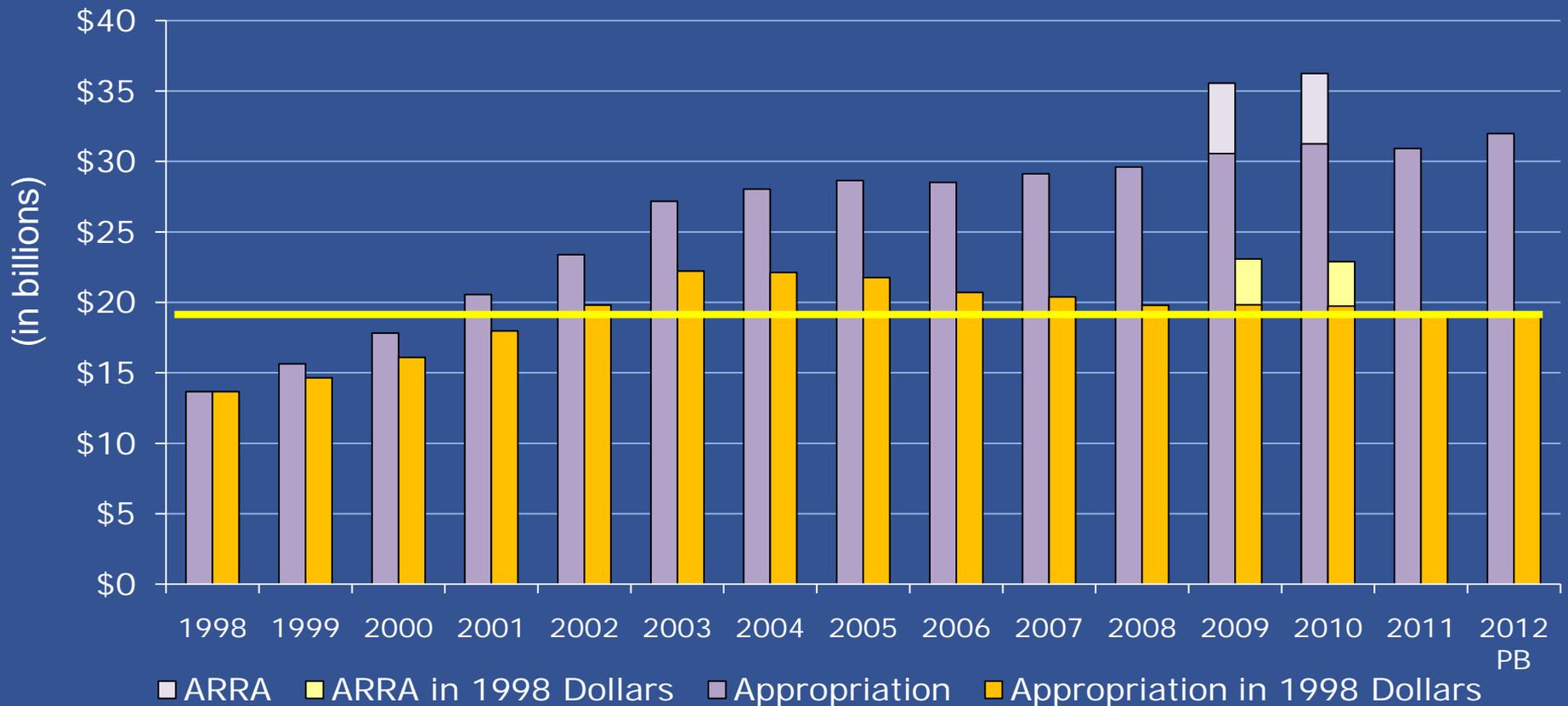
- Represent 31% of U.S. college age population but only account for 14% of undergraduates in life sciences
- And even fewer in later stages



Challenges to Biomedical Research

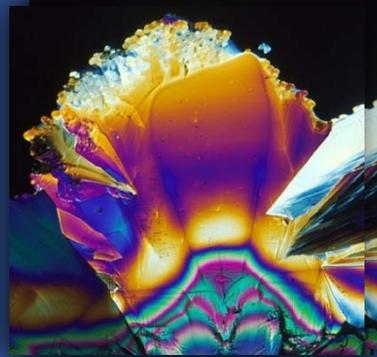
Appropriation History vs. Actual Purchasing Power

FY 1998 appropriation – FY 2012 Presidential Budget (\$ in billions)



One Voice ...





NIH

*Turning discovery
into health*

