The Surgeon Scientist
University of California, San Diego
Surgery Research Day
May 3, 2017

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David C. Sabiston, Jr. Professor and Chairman
Department of Surgery, Duke University School of Medicine
Surgeon-in-Chief, Duke University Health System
Durham, North Carolina
THE GENUINE WORKS OF HIPPOCRATES
TRANSLATED FROM THE GREEK
WITH A PRELIMINARY DISCOURSE AND ANNOTATIONS
BY FRANCIS ADAMS, LL.D.

IN TWO VOLUMES
VOL. I.

LONDON
PRINTED FOR THE SYDENHAM SOCIETY
1840.
Throughout history, the common defining trait of a great surgeon has been a *personal* understanding of health, disease and healing achieved through direct, tactile experience.
What is the current research landscape?
Trends in R&D by Agency
in billions of constant FY 2012 dollars

Source: AAAS Report: Research & Development series. FY 2012 and FY 2013 figures are latest estimates. 1976-1994 figures are NSF data on obligations in the Federal Funds survey. © 2012 AAAS
FIGURE 1
NIH funding as a share of GDP, FY 1950–2019

Source: NIH funding figures through FY 2014 are based on total budget authority. Projected NIH funding figures for FY 2015 through FY 2019 are based on data from the Congressional Budget Office. GDP figures are based on data from the Office of Management and Budget Historical Tables, Table 1.2
NIH Grant Application Success Rates
FY 1978-2013

Source: NIH http://report.nih.gov/success_rates/
### NIAID Paylines

As of December 5, 2011, we have all FY 2012 interim paylines except T32. You can find FY 2011 paylines at [Archive of Final NIAID Paylines by Fiscal Year](#). For more financial information, go to Paylines and Funding.

### NIAID Interim Paylines for FY 2012

These paylines apply to applications reviewed for September 2011, February 2012, and May 2012 Council meetings.

<table>
<thead>
<tr>
<th>Grant Types</th>
<th>Interim Payline</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>R01 (non-new PIs)</td>
<td>9 percentile</td>
<td>Research Projects for established investigators</td>
</tr>
<tr>
<td>R01 (new PIs)</td>
<td>12 percentile</td>
<td>Research Projects for new and early-stage investigators</td>
</tr>
<tr>
<td>F31</td>
<td>24 overall impact score</td>
<td>NRSA Individual Predoctoral Fellowships to Promote Diversity in Health-Related Research</td>
</tr>
<tr>
<td>F32</td>
<td>22 overall impact score</td>
<td>NRSA Postdoctoral Fellowships</td>
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<tr>
<td>K (except K99)</td>
<td>20 overall impact score</td>
<td>Career Development Awards</td>
</tr>
<tr>
<td>R03</td>
<td>20 overall impact score</td>
<td>Small Grants</td>
</tr>
<tr>
<td>R15</td>
<td>20 overall impact score</td>
<td>Academic Research Enhancement Awards (AREA)</td>
</tr>
<tr>
<td>R21</td>
<td>20 overall impact score</td>
<td>Exploratory/Developmental Grants</td>
</tr>
<tr>
<td>R41, R42</td>
<td>25 overall impact score</td>
<td>STTR Phase I and II—Small Business Technology Transfer</td>
</tr>
<tr>
<td>R43, R44</td>
<td>25 overall impact score</td>
<td>SBIR Phase I and II—Small Business Innovation Research</td>
</tr>
<tr>
<td>T32</td>
<td>TBA</td>
<td>Institutional NRSA Training Awards</td>
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</tbody>
</table>

### Highlights

- NIAID Funding Newsletter, December 7, 2011
- All About Grants
- Strategy for NIH Funding
- Samples and Examples
- Sample Applications
- Top Policy Changes
- Resources for Researchers

### Look It Up

- Academic Research Enhancement Award (AREA)
- advisory Council
- career development award (K)
- early-stage investigator
- exploratory/developmental research grant (R21)
- fellowship (F)
- fiscal year (FY)
- interim payline
- overall impact score
- payline
- percentile
- R01
- R56-Bridge award
- small business award
- training grant (T)

See the [Glossary](#) for more terms.
Percentage of NIH R01 Principal Investigators Age 36 and Younger and Age 66 and Older (Fiscal Years 1980 to 2010)
Hospital Medicare margins: inpatient, outpatient, and overall

Note: A margin is calculated as payments minus costs, divided by payments; margins are based on Medicare-allowable costs. Analysis excludes critical access and Maryland hospitals. Medicare inpatient margins include services covered by the acute inpatient prospective payment system. Overall Medicare margin includes acute inpatient, outpatient, hospital-based home health and skilled nursing facility (including swing bed), and inpatient psychiatric and rehabilitation services, plus graduate medical education.

Source: MedPAC analysis of Medicare Cost Report file from CMS.
Relationship Between Occurrence of Surgical Complications and Hospital Finances

Sunil Eappen, MD
Bennett H. Lane, MS
Barry Rosenberg, MD, MBA
Stuart A. Lipsitz, ScD
David Sadoff, MBA
Dave Matheson, JD, MBA
William R. Berry, MD, MPP, MPH
Mark Lester, MD, MBA
Atul A. Gawande, MD, MPH

![Graph showing contribution margin per patient for different insurance types.]

JAMA 2013; 309 1599-1606
There is less money.
There are more investigators.
How are surgeons competing?
<table>
<thead>
<tr>
<th>Rank</th>
<th>Department Name</th>
<th>Award</th>
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<tbody>
<tr>
<td>1</td>
<td>INTERNAL MEDICINE/MEDICINE</td>
<td>$2,964,274,308</td>
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<tr>
<td>2</td>
<td>PSYCHIATRY</td>
<td>$720,025,463</td>
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<td>3</td>
<td>PEDIATRICS</td>
<td>$641,351,772</td>
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<td>4</td>
<td>MICROBIOLOGY/IMMUN/VIROLOGY</td>
<td>$590,964,253</td>
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<td>5</td>
<td>PATHOLOGY</td>
<td>$553,368,578</td>
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<td>6</td>
<td>BIOCHEMISTRY</td>
<td>$528,527,165</td>
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<td>7</td>
<td>NEUROLOGY</td>
<td>$455,886,715</td>
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<tr>
<td>8</td>
<td>PHARMACOLOGY</td>
<td>$455,841,831</td>
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<tr>
<td>9</td>
<td>NONE</td>
<td>$441,593,672</td>
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<td>GENETICS</td>
<td>$411,593,672</td>
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<td>11</td>
<td>PHYSIOLOGY</td>
<td>$397,438,025</td>
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<td>12</td>
<td>ANATOMY/CELL BIOLOGY</td>
<td>$395,298,073</td>
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<td>13</td>
<td>RADIATION-DIAGNOSTIC/ONCOLOGY</td>
<td>$318,860,295</td>
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<td>14</td>
<td>SURGERY</td>
<td>$277,078,059</td>
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<td>15</td>
<td>PUBLIC HEALTH &amp; PREV MEDICINE</td>
<td>$275,762,981</td>
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<td>16</td>
<td>NEUROSCIENCES</td>
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<td>17</td>
<td>OPHTHALMOLOGY</td>
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<td>18</td>
<td>OTHER BASIC SCIENCES</td>
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<td>19</td>
<td>OBSTETRICS &amp; GYNECOLOGY</td>
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<td>20</td>
<td>BIOLOGY</td>
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<td>21</td>
<td>ANESTHESIOLOGY</td>
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<td>22</td>
<td>OTOLOGY/OTOLARYNGOLOGY</td>
<td>$82,419,481</td>
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<td>23</td>
<td>NEUROSURGERY</td>
<td>$88,959,668</td>
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<td>24</td>
<td>FAMILY MEDICINE</td>
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<td>25</td>
<td>DERMATOLOGY</td>
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<td>26</td>
<td>UROLOGY</td>
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<td>27</td>
<td>ORTHOPEDICS</td>
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<td>28</td>
<td>BIOSTATISTICS &amp; OTHER MATH SCI</td>
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<td>29</td>
<td>BIOMEDICAL ENGINEERING</td>
<td>$42,564,812</td>
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<td>30</td>
<td>EMERGENCY MEDICINE</td>
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<td>VETERINARY SCIENCES</td>
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<td>OTHER HEALTH PROFESSIONS</td>
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<td>33</td>
<td>MISCELLANEOUS</td>
<td>$30,458,088</td>
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<td>34</td>
<td>PHYSICAL MEDICINE &amp; REHAB</td>
<td>$24,725,251</td>
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<td>35</td>
<td>OTHER CLINICAL SCIENCES</td>
<td>$21,293,585</td>
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<tr>
<td>36</td>
<td>BIOPHYSICS</td>
<td>$10,085,092</td>
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<tr>
<td>37</td>
<td>PSYCHOLOGY</td>
<td>$9,400,240</td>
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<tr>
<td>38</td>
<td>ADMINISTRATION</td>
<td>$8,273,083</td>
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<tr>
<td>39</td>
<td>ENGINEERING (ALL TYPES)</td>
<td>$7,904,757</td>
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<tr>
<td>40</td>
<td>SOCIAL SCIENCES</td>
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<tr>
<td>41</td>
<td>PHYSICS</td>
<td>$4,562,638</td>
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<tr>
<td>42</td>
<td>NUTRITION</td>
<td>$3,506,892</td>
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<tr>
<td>43</td>
<td>CHEMISTRY</td>
<td>$2,020,651</td>
</tr>
<tr>
<td>44</td>
<td>DENTISTRY</td>
<td>$325,628</td>
</tr>
</tbody>
</table>

| GRAND TOTAL | $11,129,679,405 |
| MEAN        | $252,947,259   |
The Future of Basic Science in Academic Surgery

Identifying Barriers to Success for Surgeon-scientists

Sundeep G. Keswani, MD,* Chad M. Moles, BSPH,* Michael Morowitz, MD,† Herbert Zeh, MD,‡
John S. Kuo, MD, PhD,§ Matthew H. Levine, MD, PhD,¶ Lily S. Cheng, MD,||
David J. Hackam, MD, PhD,†† Nita Ahuja, MD,†† and Allan M. Goldstein, MD,**

Basic Science Committee of the Society of University Surgeons
“Do you believe it is realistic to expect surgeons to be successful basic scientists in today’s hospital environment?”

Recent trends in the funding and utilization of NIH career development awards by surgical faculty

Shawn J. Rangel, MD, and R. Lawrence Moss, MD, Stanford, Calif, and New Haven, Conn

“Surgeons are less likely to apply for career development awards, and those who do are less likely to be successful compared to their non-surgical peers.”
Funding and Persistence

D  BASIC SCIENCE
SUBMITTED  FUNDED

E  CLINICAL RESEARCH
SUBMITTED  FUNDED

Why are surgeons performing poorly?

• They are stupid.
• They are lazy.
• They are not creative.
• They are disinterested.
• There are not any interesting or important questions.
No profession has a more intimate link between the basic laboratory and the clinic than surgery.
The Spectrum of Surgical Research

Discovery
- Study disease mechanisms
- Pursue new therapeutic targets

Translation
- Develop and screen new candidate therapeutics

Clinical Application
- Bring new treatment approaches to patients

Rigorously test and refine new approaches in pre-clinical models

Policy
Why are surgeons performing poorly?

• They are stupid.
• They are lazy.
• They are not creative.
• They are disinterested.
• There are not any interesting or important questions.
• Research is too hard.
Is research easy? No.

Was research ever easy? No!
Banting and Best

-from “Glory enough for all”
Why are surgeons performing poorly?

- They are stupid.
- They are lazy.
- They are not creative.
- They are disinterested.
- There are not any interesting or important questions.
- Research is too hard
- They are distracted.
Improving the Surgeon's Participation in Research: Is It a Problem of Training or Priority?
Clifford Y. Ko, M.D., Edward E. Whang, M.D., William P. Longmire Jr., M.D., David W. McFadden, M.D.
Presented at the Annual Meeting of the Association for Academic Surgery, Philadelphia, Pennsylvania, November 18–20, 1999

A 25-item survey was sent to 850 senior-level members of academic societies, including the Association of Academic Surgeons, Society of University Surgeons, and American Surgical Association. 44% response rate. 99% performed research at the beginning of their faculty appointment.

- 38% stopped performing basic research by age 39
- 17% stopped performing basic research between ages 40 and 49
- 23% stopped performing basic research between ages 50 and 59
- The primary reason given was clinical load

Conclusions:

(1) the majority consensus is that research training is integral to the development of academic surgeons;
(2) such research training opportunities appear adequate; however,
(3) faculty performing research, particularly at the junior level, need to be better protected from other academic duties, such as clinical practice and administration.
Stressors for surgeons doing research

Major stressors for academic surgeons

Of 373 surgeons graduating from ASTS approved fellowships from 1998-2008, only 6 (1.8%) received career development (K-series) awards, and 5 received R awards.
Average Salary of Full-Time Professors at the Top Five Highest-paying Schools

University of Chicago: $184,100
Stanford University: $181,400
Columbia University: $188,600
Harvard University: $191,200
Princeton University: $181,000

Average income of professors, 2010
Average income of professors, 2011

American Association of University Professors
Research Takes Time
Time is money.
The reward for doing research is that you get to do research.
In surgery, the gap between the fiscal rewards of research and clinical practice is the widest. As such, surgeon-scientists must, more than any other professionals, understand the inherent rewards of being able to do research, and perform research that has real value.
How do we create those surgeons?
Needs for a Research Career

• Talent
• Time
• Teachers
• Training
• Teams

Tips for Success in Research

• Become a voracious reader.
• Learn to write well.
• Master the English language.
• Associate yourself with a dedicated and well-funded mentor.
• Abandon all sense of entitlement.
• Really...abandon all sense of entitlement.
• Go “all in”, and most importantly, be honest with yourself as to whether you enjoy research.
More Tips for Success in Research

• If you enjoy reductionist biology, find a way to associate it with clinical reality.
• If you like clinical applicability, understand the reductionist biology.
• Find a niche where being a surgeon is an advantage, not a hindrance.
• Expect failure, and embrace it as a way to improve... again, abandon any sense of entitlement.
Mentorship

• Faculty members wishing to do research should develop a mentoring team
• Environment where research is a team sport
• Grantsmanship support
• Time management
• In the end there is a 12% payline, and faculty members have to write competitive grants.
Research is hard, and there is no “affirmative action” for surgeons.
More surgeons must start doing basic science

They say they don’t have the time or incentives to do research — and that’s dangerous for translational medicine.

21 April 2017

Surgeon Zbigniew Religa next to his patient after a 23-hour heart transplant in Poland in 1987.
Races are won in the Mountains
Races are won in the Mountains
Good Luck!