

# Research Career Pathways for Physicians

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# Who is The Physician-Scientist?

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# The cultural chasm

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**Clinicians** are motivated by the need for **immediate** action (sometimes to even save a life), whereas **scientists** are conditioned to **avoid rushing** to judgment;

**Clinicians** are taught to **adhere to standards and guidelines** of practice, whereas **scientists** are encouraged to **challenge** existing paradigms;

**Clinicians** traditionally **respect hierarchy** and expert authority, whereas **scientists** tend to **critique and challenge** accepted wisdom;

# The cultural chasm

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**For clinicians, errors are potentially mortal threats, whereas for scientists, errors are inevitable manifestations of the creative process;**

**Clinicians focus on the unique, whereas scientists look for generalizable principles.**

Andrew I. Schafer, MD  
Chair of the Department of Medicine  
Professor of Medicine at Weill Cornell Medical College  
and physician-in-chief at New York-Presbyterian Hospital/Weill Cornell Medical Center.

# My Personal Cultural Chasm

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"When I see and treat my first patient I won't just be seeing that particular human being but also I'll be seeing an enormously complicated mechanism that brought the patient to me.

That will better inform my research and possibly might inspire some other lines of investigation."



Figure 3.3. Individual NIH Research Project Grant Awardees, PhD, MD, and MD/PhD Degree (FY1995-2012)

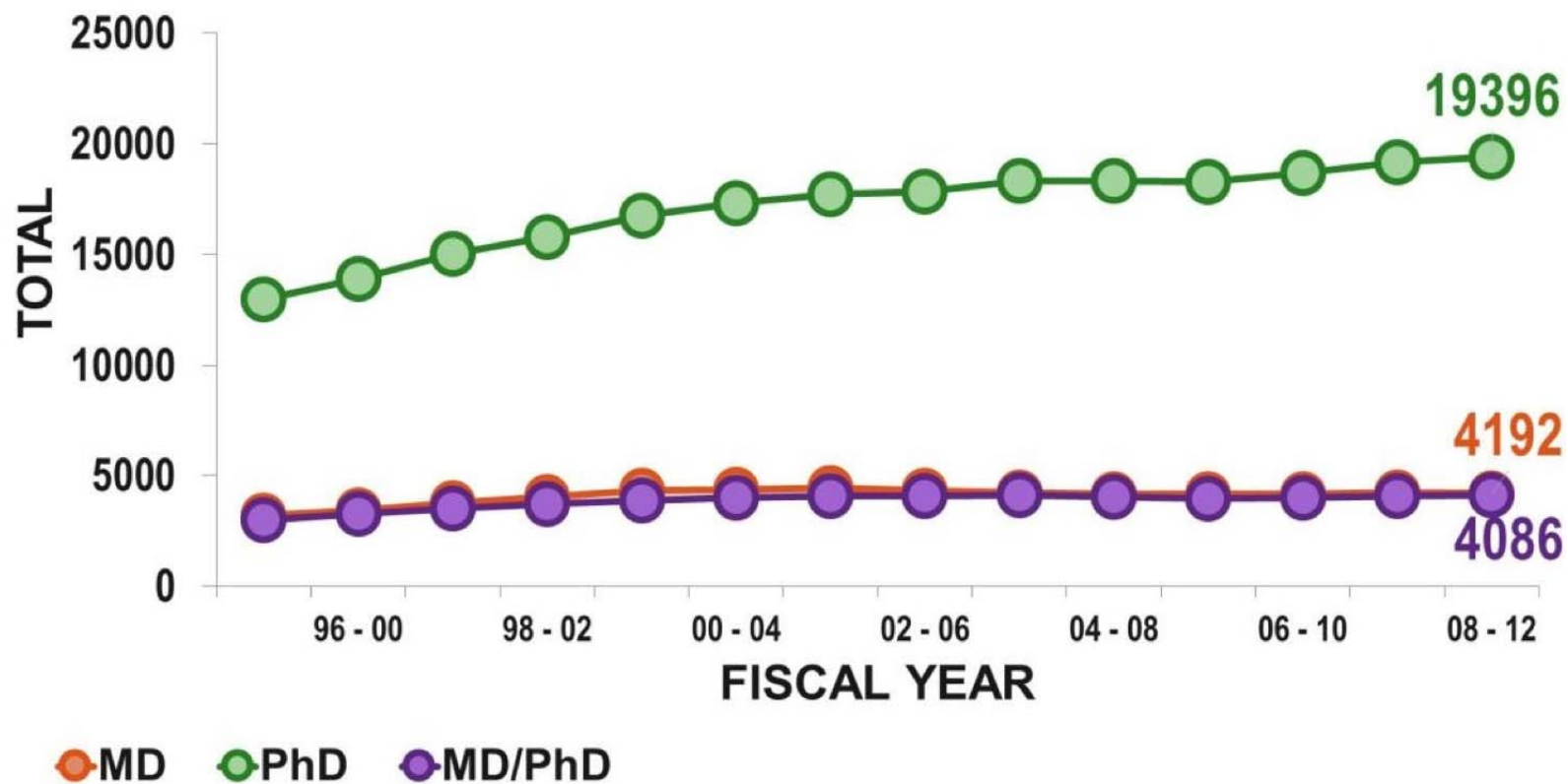
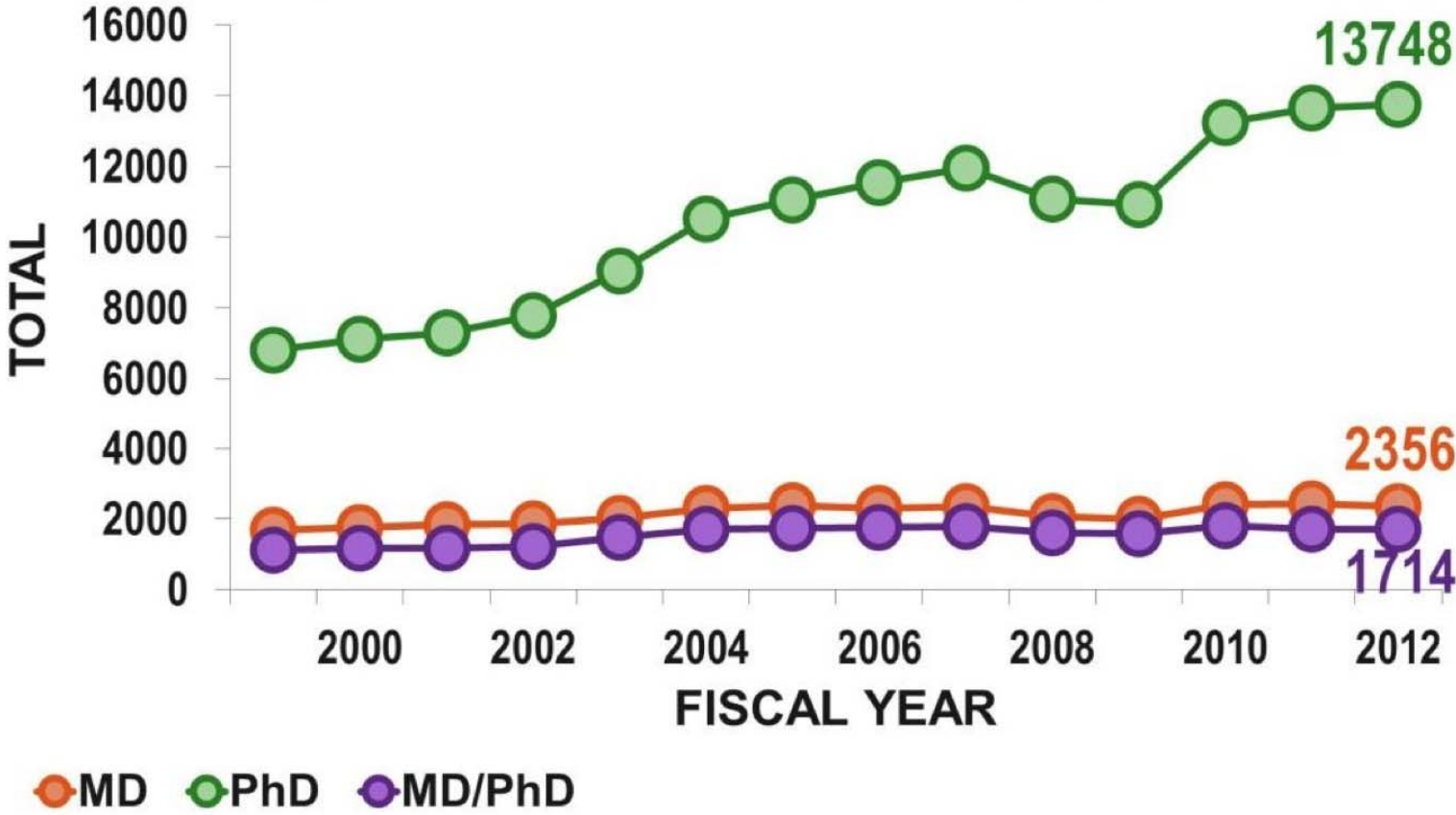


Figure 3.6. Individual First-time NIH Research Project Grant Applicants, PhD, MD, and MD/PhD Degree (FY1999-2012)



## Average Age of PIs with MD, MD-PhD, or PhD is dramatically increasing.

Figure 3.10. Average Age of NIH Research Project Grant Awardees, PhD, MD, and MD/PhD Degree (FY1999-2012)

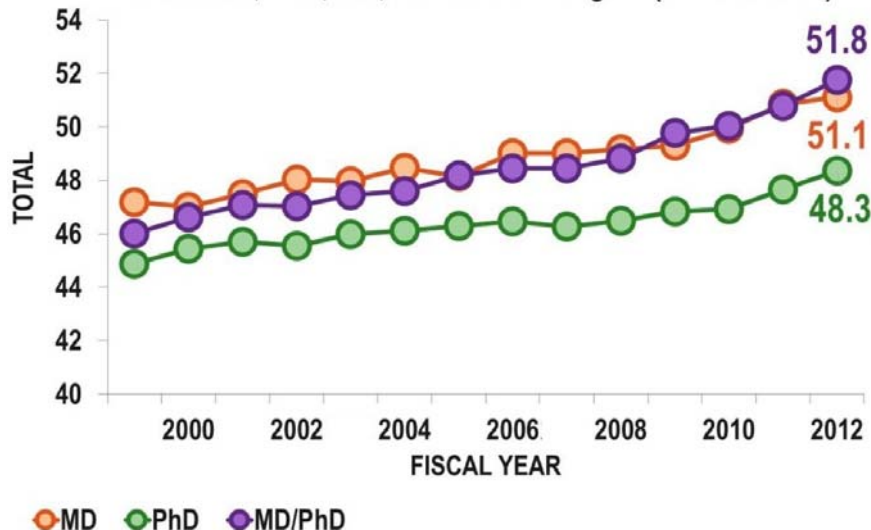


Figure 3.11. Average Age of First-time NIH Research Project Grant Awardees, PhD, MD, and MD/PhD Degree (FY1999-2012)

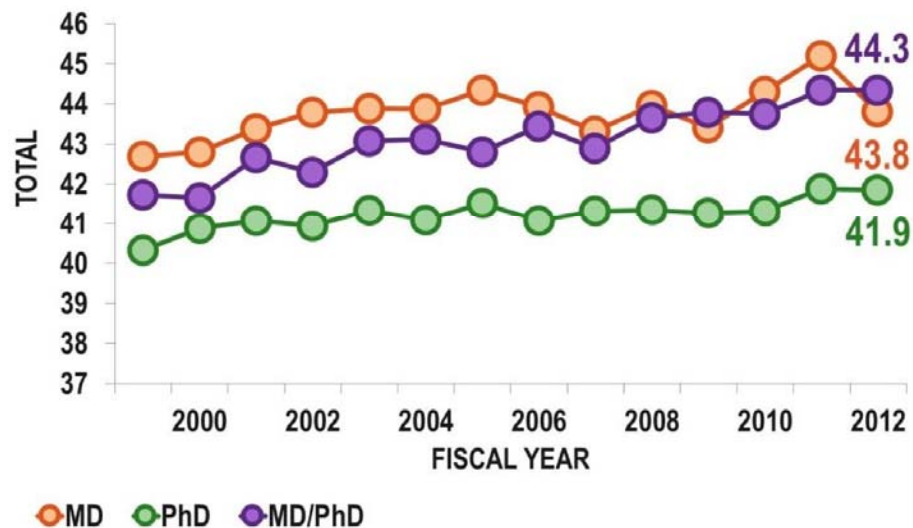
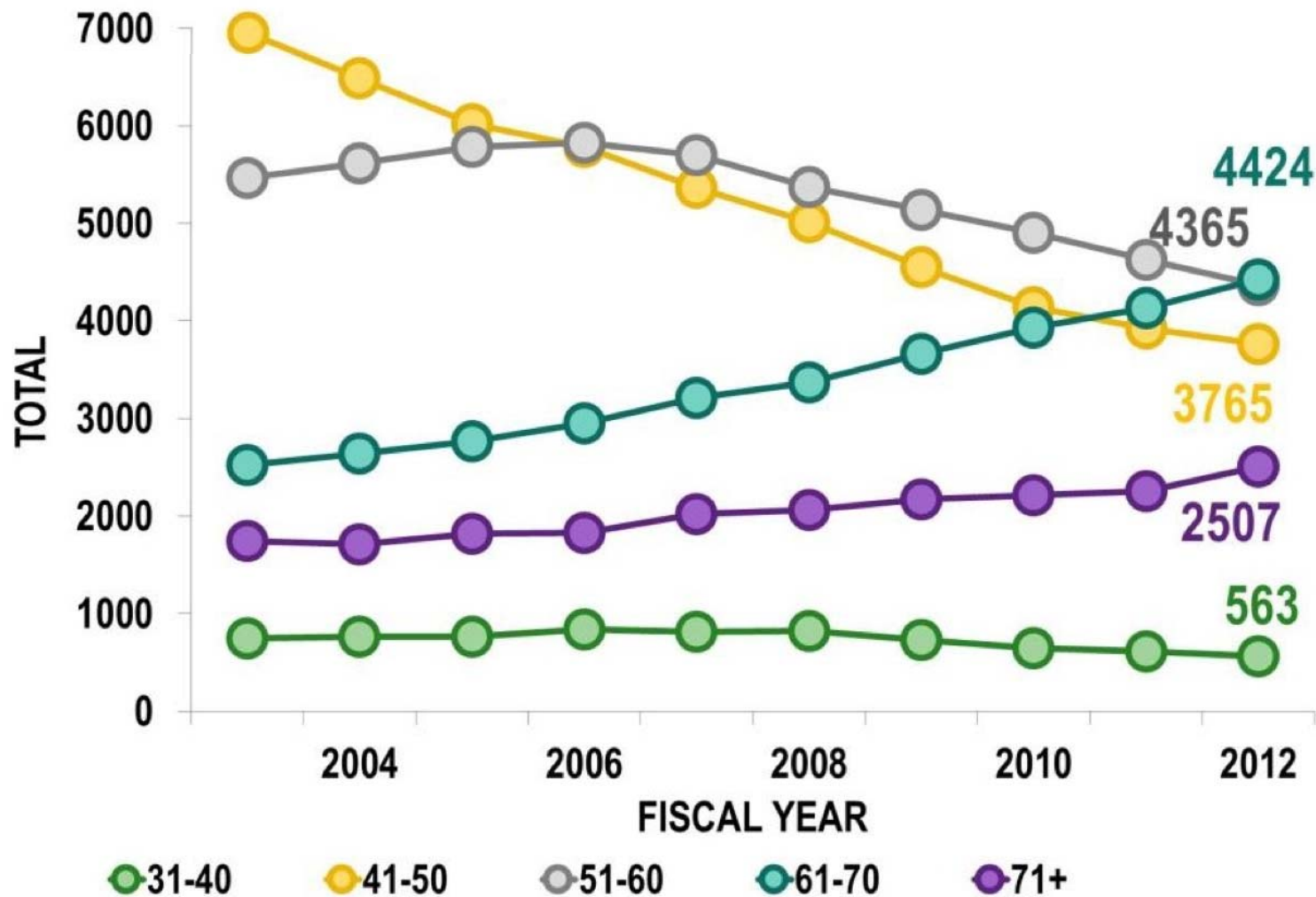




Figure 3.7. Physicians in Medical Research by Age Cohort (2003-2012)



# Age Distribution of NIH Principal Investigators and Medical School Faculty

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Age Distribution – AAMC Medical School  
Faculty and NIH R01 Principal Investigators

Walter Schaffer  
February 2012

OER, NIH, February 13 2012.

# PSW-WG Report Recommendations

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NIH should sustain strong support for the training of MD/PhDs

NIH should shift the balance in National Research Service Award (NRSA) postdoctoral training for physicians so that a greater proportion are supported through individual fellowships, rather than institutional training grants

NIH should continue to address the gap in RPG award rates between new and established investigators

NIH should establish a new physician-scientist-specific granting mechanism to facilitate the transition from training to independence

NIH should expand Loan Repayment Programs and the amount of loans forgiven should be increased to more realistically reflect the debt burden of current trainees

NIH should leverage the existing resources of the Clinical and Translational Science Awards (CTSA) program to obtain maximum benefit for training and career development of early-career physician-scientists

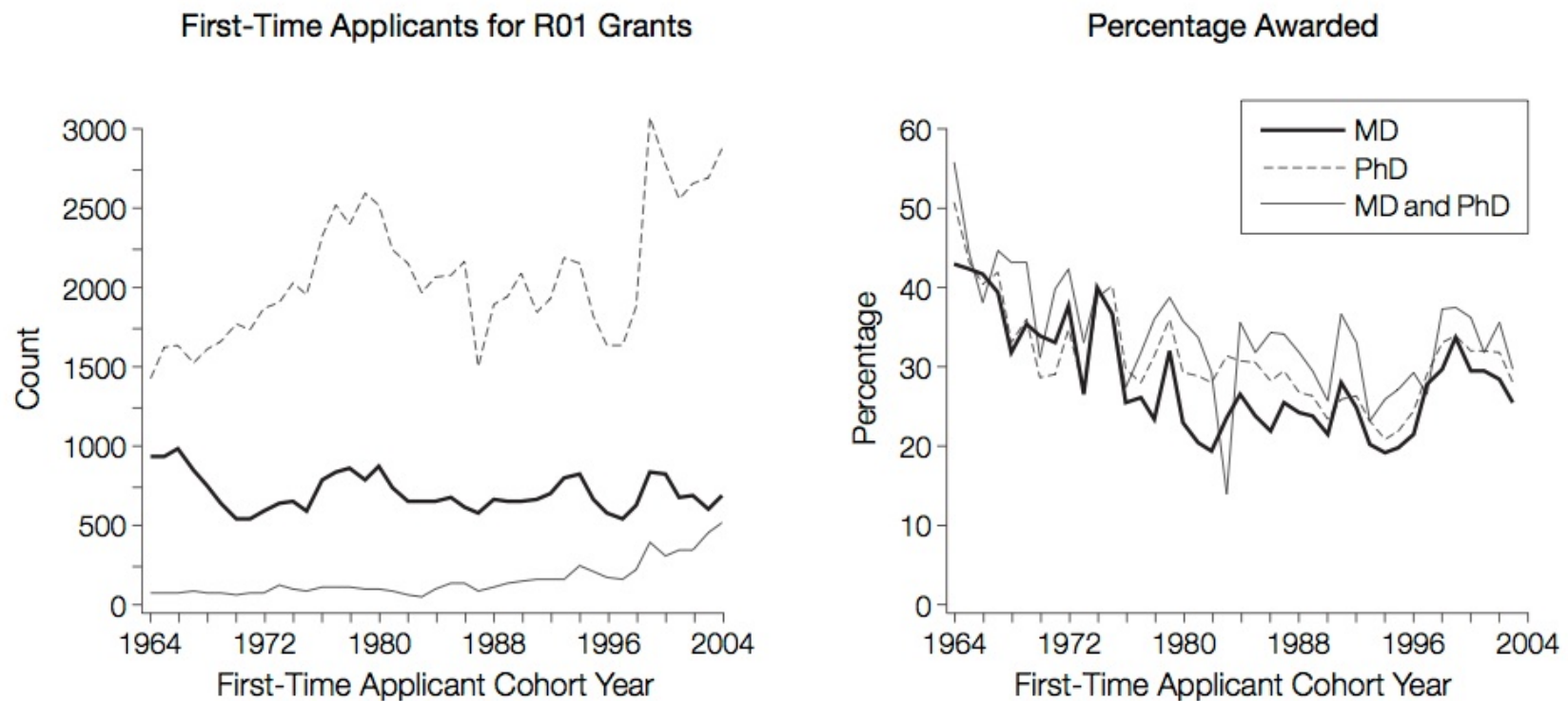
# The importance of MD physician-scientists

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- Over the last 25 years, 37 percent of Nobel Laureates in Physiology or Medicine had an MD degree.
- Over the Lasker Awards' last 30 years, 41 percent of the Basic Awards and 65 percent of the Clinical Awards have gone to MDs.
- 69 percent of NIH Institute Directors have an MD degree.
- 60 percent of the National Academy of Sciences Class IV (Biomedical Sciences) members have an MD degree.
- 70 percent of the chief scientific officers at the top 10 pharmaceutical companies have an MD degree.

# You Don't Need a Ph.D. Degree

**Figure 1.** First-Time Applicants for R01 Grants by Degree (1964-2004) and Percentage Awarded (1964-2003)



For percentage awarded,  $P = .03$  for MD vs PhD;  $P < .001$  for MD vs MD and PhD;  $P = .002$  for PhD vs MD and PhD.

# Physician-scientists versus clinician-educators

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	Physician-scientists	Clinician-educators
Career	Spend the majority of their time in research and less in clinical work	Spend part of their time in clinical practice and part in teaching
Description	Investigate clinical questions that arise in practice to improve understanding and develop better treatments and practices	Implement new knowledge into practice and share it with students

# Physician-scientists versus clinician-educators

	Physician-scientists	Clinician-educators
Focus	<p>Disease-oriented basic science research</p> <p>Application of basic science findings to patients</p> <p>Dissemination of research results</p> <p>Clinical investigation of patients</p> <p>Population and public health research</p> <p>Health services and systems research</p>	<p>Patient care</p> <p>Educational, evidence-based practice, dissemination methodologies</p>
Place of practice	Academic medical centers	Academic medical centers
Education	<p>Clinical training</p> <p>Additional research training</p> <p>Usually a Master's or a PhD</p> <p>Two–three years post-doctoral research fellowship</p>	<p>Clinical training</p> <p>Possibly a Master's</p> <p>May include specialization in educational theory/practice</p>

# Types of Research

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Type	Description
Basic science	<ul style="list-style-type: none"><li>● Increases knowledge and understanding of underlying disease processes</li><li>● Does not involve human subjects</li><li>● Examines molecular and cellular mechanisms of pathogenesis</li><li>● Conducted in the laboratory</li></ul>
Translational	<ul style="list-style-type: none"><li>● Translates scientific discoveries into practical, human applications</li><li>● Requires mastery of basic sciences, technology, and laboratory techniques</li></ul>



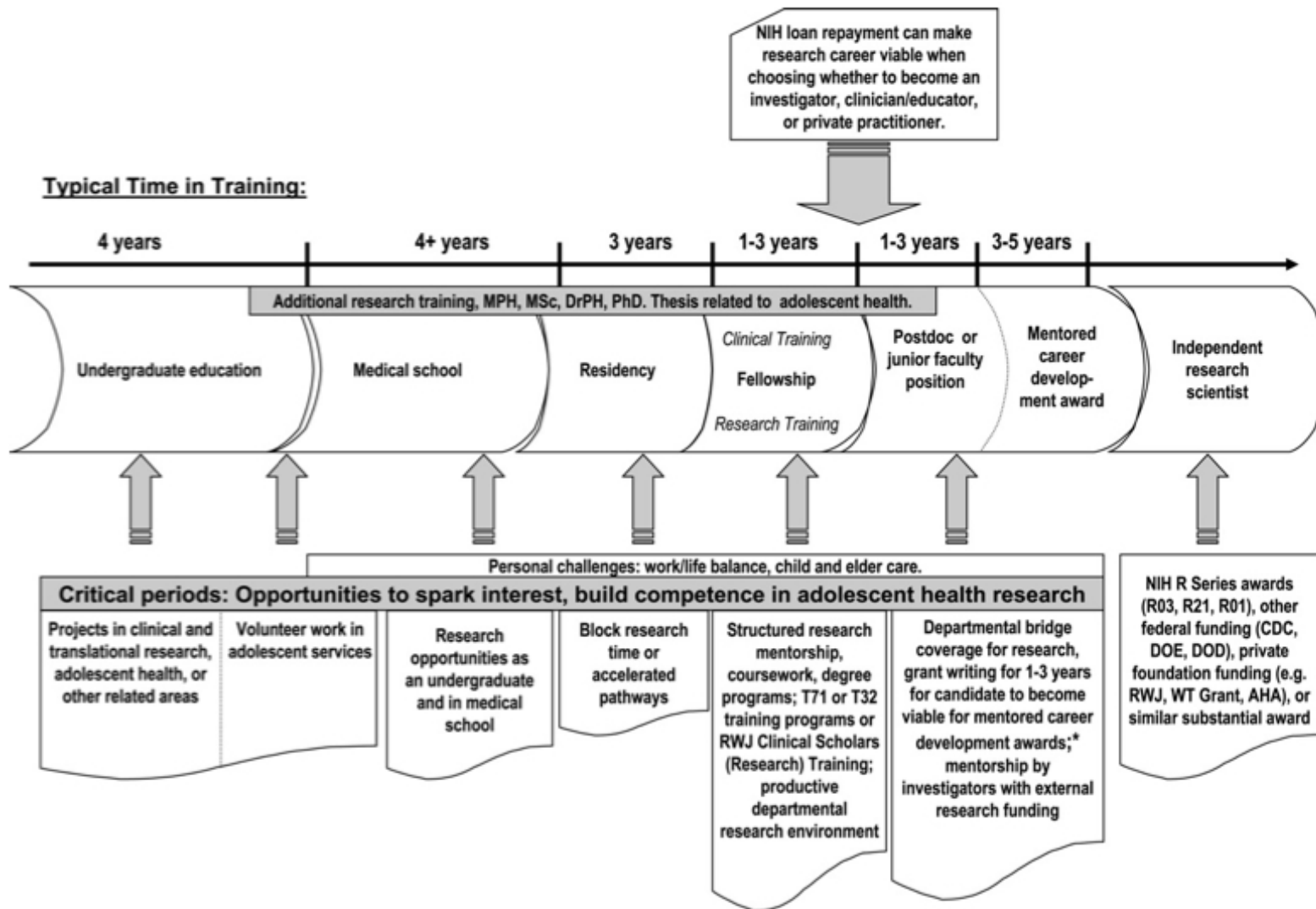
# Types of Research

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Type	Description
Knowledge translation	<ul style="list-style-type: none"><li>● Ensures that new treatments and research knowledge reach intended patients or populations and are implemented correctly</li><li>● Implements strategies for improving the use of or adherence to treatment</li><li>● Requires mastery of clinical epidemiology, evidence synthesis, communication theory, public policy, &amp; mixed methods/qualitative research</li></ul>
Clinical	<ul style="list-style-type: none"><li>● Applies basic science and translational research in patients</li><li>● Tests new knowledge, treatments, devices, etc. in patients</li><li>● Direct application to patient care</li><li>● May lead back to the laboratory to refine treatments for human usage</li><li>● Observational or interventional</li></ul>
Population	<ul style="list-style-type: none"><li>● Studies human subjects to improve the health of populations</li><li>● Identifies population-based risk factors and interventions to prevent onset of, interrupt the progression of, or improve population-based disease</li></ul>

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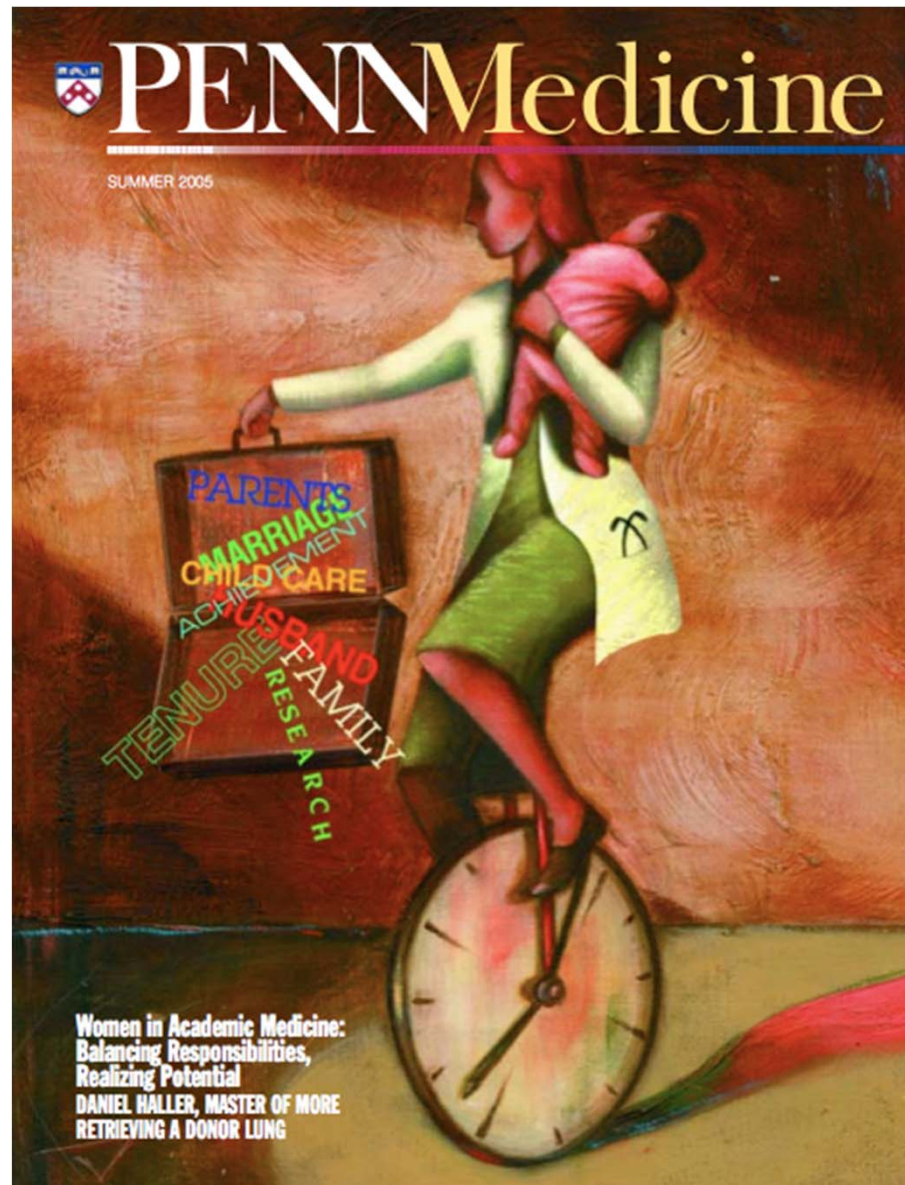
# How Long Does it Take to Become One?



\*Examples: NIH K-series awards and K99/R00 awards; RWJ and WT Grant career development awards, career development awards from professional organizations such as American Heart Association and American Diabetes Association

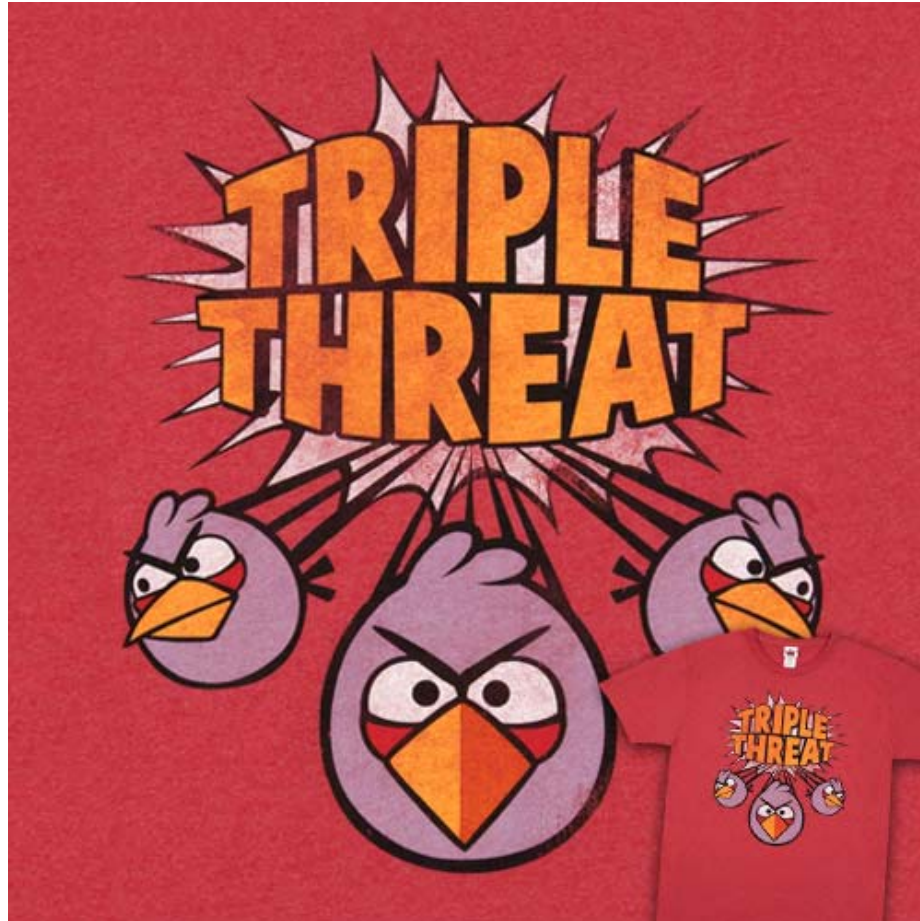
# What Does a Physician-Scientist Do?

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# What Does a Physician-Scientist Do?

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1. Patient Care
2. Teaching
3. Research

# What Does a Physician-Scientist Do?

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## 3. Research

### 1. Laboratory

Projects  
Personnel  
Training  
Grant Writing  
Paper Writing  
Budget

### 2. Ph.D. Thesis Comm.

### 3. Journal Reviews

### 4. Grant Reviews

### 5. Seminars

# The 1982 Revised Criteria for Classification of Systemic Lupus Erythematosus

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1 Malar Rash

2 Discoid Rash

3 Photosensitivity

4 Oral Ulcers

5 Arthritis

6 Serositis

7 Renal Disorder

8 Neurologic Disorder

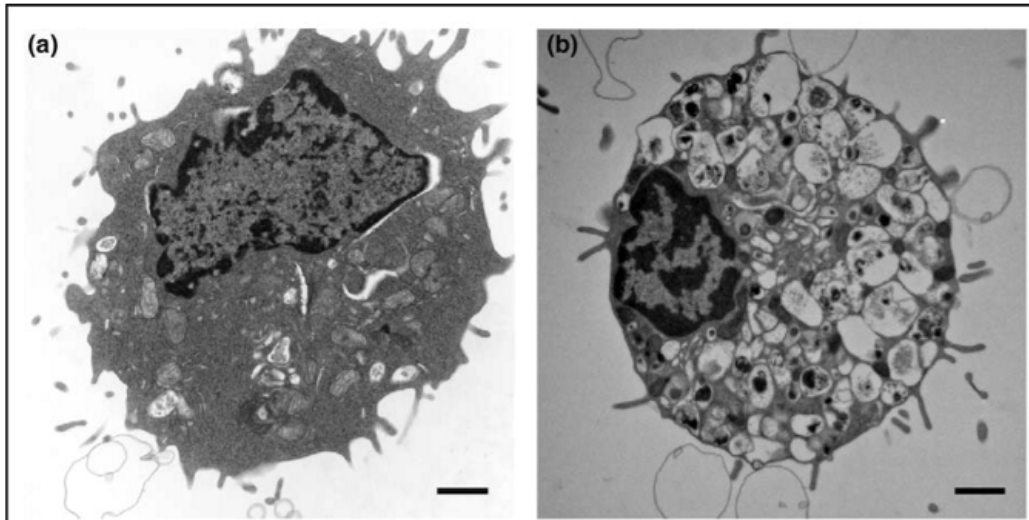
9 Hematologic Disorder

10 Immunologic Disorder  
(revised in 1997)

11 Antinuclear Antibody

# The Projects in The Laboratory

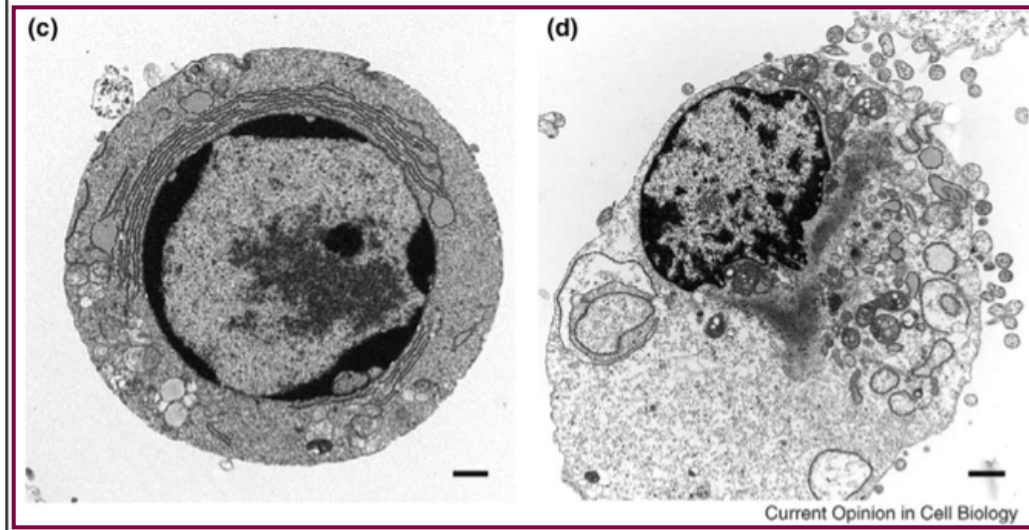
Normal



Autophagy

Apoptosis

Source of  
autoAgs  
in SLE



Necrosis

Mechanism of  
End-Organ Damage  
in Lupus Nephritis

# A Physician-Scientist's Project

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Late 90'-Early 00': Necrosis becomes a pathological mechanism in which molecular steps have to take place.

2004: SLE Glomerulonephritis (GN) is reclassified: Necrosis now becomes an important marker of severity

2006-7: First grant application successfully funded on the role of PARP-1 in SLE GN.

2009: First manuscript accepted for publication. Journal of Immunology. Second grant application successfully funded.

2012: Second manuscript submitted; Awarded an NIH R01 application; submission of a Grant on Necrosis, SLE and Sexual Hormones to the LRI; Initiated human studies on the relevance of necrotic cell death in GN.

2016: 7 Manuscripts published, including human relevant study. Several Grants funded. Further interest in cell death but also infections in SLE. Career expansion into Lupus clinical trials (Phase I and III).



# Who is The Physician-Scientist?

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# To Be or Not to Be?

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*The first step to getting the things you want out of life is this:  
decide what you want.*

–Ben Stein

# Successful Physician-Scientist

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Passion

Perseverance

Mentorship

Network

Taste

Luck

# Acknowledgements

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## RoC's Lab

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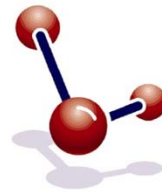
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Karen Gould



Alliance for Lupus Research  
PREVENT. TREAT. CURE.



## Temple

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## UPENN

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Avinash Bandhoola

Bob Eisenberg

Terri Laufer

Nina Lunig-Prak

Craig Thompson

## Yale

Joe Craft

## MCG

Michael Madaio

# The Dream of a Physician-Scientist

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*“Your grandma and I have decided to live together.”*

