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Why is it important for physicians to participate in medical research?
Why is it important for physicians to engage in medical research?

- Physicians and other health care professionals are at the interface of the delivery of clinical care and clinical outcomes
  - Understand and utilize scientific tools to tackle health care problems
Celebrating the Physician-Scientist
Chi V. Dang The Johns Hopkins University School of Medicine, Baltimore, Maryland, USA

“The role of the physician-scientist is ever so important that we all have the unique responsibility of making sure that the best and brightest are encouraged, mentored, and supported so that they can make significant investigative contributions to our healing art, the art of medicine.”

“The art of medicine to this day still has more questions than there are answers. On daily ward rounds, there are still vast numbers of questions that are amenable to careful studies with new tools. ...The tools for biomedical sciences have developed tremendous capabilities to answer complex questions that will need the insight of healers.
“Young investigative clinicians with great clinical phenotyping capabilities and patient materials are now challenging our system on the mechanism by which they can identify polymorphic genetic markers that may be associated with certain clinical phenotypes. The major challenge for investigative medicine, in particular with regard to the genetic basis of diseases, is to create mechanisms to encourage physicians to identify connections between phenotypes and the genetic makeup of patient populations.”
“Technologies that emerged over the last decade, such as high throughput gene expression profiling, high speed genotyping, and large scale proteomics, should not be available to just a few; rather, these tools should be made generally available to investigative physicians.”
Why do physicians choose to participate in medical research?
Why do physicians choose a research career?

- Curious
- Love to Learn
- Passion to Cure/Solve Problems
- Exciting & Challenging
- Enjoy Change
- Enjoy Arguing
- Enjoy Competition
Why do physicians choose a research career?

- Not Afraid of Hard Worker
- Persistent/Perseverance
- Exposure to a great mentor
- The Potential to Affect a Large Number of Patients
- Thrive in an Academic Environment
  - Inquiry/Research
  - Teaching
  - Cutting Edge Clinical Care
  - Process Improvement
PHYSICIAN RESEARCHER PROFILES

HHMI INVESTIGATORS…

WHAT IT TAKES TO BE A SCIENTIST
Why do physicians choose a research career?

- http://www.hhmi.org/coolscience/
- http://www.hhmi.org/scientists/
- Christine E. Seidman, M.D.
- "You're going to make mistakes," says Christine E. Seidman, whose research team studies the genetics of heart disease. "To be a good scientist is to see that stop sign — to turn around and go back in another direction — with the same enthusiasm and belief that you'll be successful again on the next try." Scientists have diverse personalities, Seidman adds, and they work as a team: "Sometimes you're fighting; sometimes you're disagreeing. But you're also going to play and have a good time, too."
Why do physicians choose a research career?

- http://www.hhmi.org/coolscience/
- http://www.hhmi.org/scientists/
- Bert Vogelstein, M.D.

The key thing about being a scientist, "is not being satisfied with the status quo," says Vogelstein, who is interested in identifying and characterizing genes that cause cancer. Even in prestigious journals, "evidence may be true and valid, but the interpretation of that evidence in that paper may not be correct." Along with the need for skepticism, Vogelstein says, experimental scientists need to like working with their hands and doing "aesthetically pleasing" experiments. But he keeps coming back to the bottom line. The first step in getting new knowledge, is "questioning current knowledge and the status quo."
Why do physicians choose a research career?

- [http://www.hhmi.org/coolscience/](http://www.hhmi.org/coolscience/)
- [http://www.hhmi.org/scientists/](http://www.hhmi.org/scientists/)
- Huda Y. Zoghbi, M.D.

"Be very observant, motivated, and accepting that to really succeed at something it is OK to fail a few times." These traits define a good scientist, says Huda Zoghbi, a neuroscientist at Baylor College of Medicine where she and her team focus on rare and enigmatic disorders, like Rett syndrome. Zoghbi would add a healthy dose of diligence and a little bit of intuition. There is more than one way to approach a problem and willingness to learn, to be open and exchange ideas, and collaborate with others are key characteristics to being a good scientist.
Why do physicians choose a research career?

- [http://www.hhmi.org/coolscience/](http://www.hhmi.org/coolscience/)
- [http://www.hhmi.org/scientists/](http://www.hhmi.org/scientists/)
- David C. Page, M.D.

David Page studies the human sex chromosomes and genes that play critical roles in the making of sperm and eggs. He thinks a scientist has to be intensely curious and intensely skeptical. First and foremost, a good scientist has to be a student, ready to learn. "An additional quality is that you have to be absolutely dogged and determined, because most of the time, your experiments are not going to work." Science is not for the faint of heart but one has the unique opportunity to fixate on a new understanding or overturning the old.
What does it take to be a scientist?

- Sean B. Carroll, Ph.D.
- [http://www.hhmi.org/becoming/](http://www.hhmi.org/becoming/)

Sean Carroll thinks the ingredients to being a good scientist are part intellectual and part emotional. On the emotional side, one has to be patient because much of what scientists do doesn't work. "You need more the mentality of a marathoner than a sprinter here, you have to have the endurance." Intellectually, a scientist needs a constant curiosity, not looking for the easy answers but being prepared for the unexpected—flexibility combined with a long steady effort. A leader in the field of evolutionary developmental biology, or evo-devo, Carroll exemplifies the traits that will help one make it to the finish line.
What does it take to be a scientist?

- Barbara J. Meyer, Ph.D.
- [http://www.hhmi.org/coolscience/](http://www.hhmi.org/coolscience/)
- [http://www.hhmi.org/scientists/](http://www.hhmi.org/scientists/)

Instant gratification? According to Barbara Meyer, that may not be what you find as a scientist. "Science is fun, but it's also hard," says Meyer, who studies sex determination and developmental biology in the tiny *C. elegans* roundworm. Experiments fail, and the answers you expect are often not the answers you get. A scientist, she says, must persevere. With *curiosity, creativity, discipline*--and a big *imagination*--experiments work and discoveries happen. And that, says Meyer, can be addictive. "You just always want to be able to discover something new."
Dr. Fauci was appointed Director of NIAID in 1984. He oversees an extensive research portfolio of basic and applied research to prevent, diagnose, and treat infectious diseases such as HIV/AIDS and other sexually transmitted infections, influenza, tuberculosis, malaria and illness from potential agents of bioterrorism.

NIAID also supports research on transplantation and immune-related illnesses, including autoimmune disorders, asthma and allergies. The NIAID budget for fiscal year 2012 is approximately $4.5 billion.

Dr. Fauci serves as one of the key advisors to the White House and Department of Health and Human Services on global AIDS issues, and on initiatives to bolster medical and public health preparedness against emerging infectious disease threats such as pandemic influenza.
Dr. Fauci developed effective therapies for formerly fatal inflammatory and immune-mediated diseases such as polyarteritis nodosa, Wegener's granulomatosis, and lymphomatoid granulomatosis. A 1985 Stanford University Arthritis Center Survey of the American Rheumatism Association membership ranked the work of Dr. Fauci on the treatment of polyarteritis nodosa and Wegener's granulomatosis as one of the most important advances in patient management in rheumatology over the previous 20 years.

- Scientist and Rock Stars = http://youtu.be/qCS89r9rbUk
Are physicians successful in research?
Nobel Prize in Physiology or Medicine

- **Blumberg, Baruch S** MD, For studies on the origin and spread of infectious diseases.

- **Brown, Michael S.** For discovery of cell receptors relating to cholesterol metabolism. Shared with Joseph L. Goldstein.

- **Goldstein, Joseph L** MD, For discovery of cell receptors relating to cholesterol metabolism. Shared with Michael S. Brown.

- **Kornberg, Arthur** MD, For work on the production of artificial nucleic acids.

- **Marshall, Barry J** MD, for the discovery of the bacterium Helicobacter pylori and its role in gastritis and peptic ulcer disease
Are physicians successful in research? 
Nobel Prize in Physiology or Medicine

- **Murad, Ferid** MD PhD, For discoveries concerning nitric oxide as a signalling molecule in the cardiovascular system.
- **Prusiner, Stanley B.** MD, For discovery of infectious particles called prions.
- **Robbins, Frederick C** MD, For work on the cultivation of the poliomyelitis virus in tissue culture systems.
- **Thomas, E Donnall** MD, For discoveries concerning the transplantation of organs and cells for the treatment of human diseases.
- **Yalow, Rosalyn** For the development of radioimmunoassays of peptide hormones.
PHYSICIAN RESEARCHER
PROFILES at OSUWMC
Physicians are Leaders in Research

- Carlo M. Croce M.D.
- Professor and Chair – OSU COM, Department of Molecular Virology, Immunology and Medical Genetics

http://youtu.be/NLdJUYUEUus

A member of the National Academy of Sciences, studies the molecular changes in genes that lead to cancer. He is interested in the early cellular changes of malignancy and how they might serve as targets for new treatment and preventive agents.

He has also discovered a number of cancer-related genes “oncogenes” and “tumor suppressor genes”, including BCL2, ALL1, TCL1, FHIT and LZTS1..

A new class of genes microRNAs mir15 and mir16
RNA genes of only tens or hundreds of nucleotides have been called the biological equivalent of dark matter—"all around us but almost escaping detection." These genes are found in that portion of DNA that doesn’t code for proteins and so was commonly known as "junk DNA," which explains why they received so little research attention until the late 1990s. Nowadays, however, research into these so-called microRNAs (miRNAs) and their role in cellular function and dysfunction—notably, in the latter case, cancer—has blossomed into one of the hottest fields of biology and medicine.

“We will have drugs based on microRNA, and a lot of novel diagnostic and prognostic markers will be developed,”

- Carlo M. Croce MD
Find Out More about Physician Led Research at the OSUWMC

- Dr. Michael Caligiuri – Professor of Hematology
  - http://youtu.be/-KooU7AEc-U

- Dr. Gary Smith - Professor of Pediatrics

- Dr. Christopher Breuer – Professor of Surgery
  - http://youtu.be/UMefjlahSSw
Questions & Commentary
What types of research do physicians pursue?
What type of research do physicians pursue?

- Basic Science
- Translational Science
- Clinical Science
- Population Science
- Implementation Science
- Health Policy Research
- Educational Research
About Sickle Cell Disease

Sickle cell disease is both a national and global health concern. Many of the more than 70,000 people living with sickle cell disease in the United States face a lifetime of painful, debilitating and expensive health problems, with a much-shortened life expectancy. Sickle cell disease takes an even heavier toll abroad, where an estimated 230,000 children are born with the disease each year in sub-Saharan Africa alone.

Symptoms originate, through mechanisms that are not entirely understood, from the circulation of abnormally shaped sickle red blood cells throughout the body. Sickle-shaped red blood cells clump in blood vessels thereby obstructing normal blood flow to vital organs, including the brain and lungs—resulting in strokes and a high susceptibility to respiratory and other types of infections. Obstructed blood supply to tissues also results in episodes of extreme pain.
Disease-Oriented Research
Doris Duke Charitable Foundation call for applications on Sickle Cell Disease

- The mission of the Doris Duke Charitable Foundation is to improve the quality of people’s lives through grants supporting medical research. Since 1998, the foundation’s Medical Research Program has sought to advance the prevention, prediction, diagnosis and treatment of human disease by strengthening and supporting clinical research.

- About the Innovations in Clinical Research Award (ICRA). ICRA, a competitive grant program that began in 2000, provides seed funding for early-stage, multi-disciplinary clinical research projects. Through ICRA, the Medical Research Program has funded 56 projects, ranging from HIV diagnostic development to cardiovascular disease research, with a total commitment of approximately $16 million.

- For the 2011 ICRA competition, the Medical Research Program received 85 applications from investigators at 60 research institutions, which were reviewed by a panel of 12 experts in blood disorders.
2012 Doris Duke Foundation Innovative Clinical Research Awards (ICRA)

- **Targeted Derepression of Fetal Hemoglobin in Sickle Cell Disease**
  James E. Bradner, M.D.
  Dana-Farber Cancer Institute

- **Genomic and Functional Analyses of Erythrocyte Hydration Pathways as Modifiers in Sickle Cell Disease**
  Patrick G. Gallagher, M.D., and Vincent P. Schulz, Ph.D.
  Yale University

- **Translating Genetic Discoveries to Improve Sickle Cell Disease Prognosis and Treatment**
  Joel N. Hirschhorn, M.D., Ph.D., and Guillaume Lettre, Ph.D.
  Broad Institute and Université de Montréal, Montreal Heart Institute

- See more at: http://www.ddcf.org/Programs/Medical-Research/Goals-and-Strategies/Expand-Clinical-Research-Frontiers/Innovations-in-Clinical-Research-Award/2012-ICRA-Grantees/#sthash.5G6kBII5.dpuf
Questions & Commentary
PHYSICIAN RESEARCH TRAINING PATHS
When do physicians decide if they want to pursue a research career?

- Variable along an academic career path:
  - High School
  - Undergraduate
    - Physician-Scientist MD PhD Pathway
      - Medical School
      - Residency
        - Fellowship
        - Faculty
How do physicians-in-training pursue a research career?

- **One step at a time**
- Full time Summer research in Medical School
- Part-time research during the Academic Year
- Full time research for 1-2 years (leave of absence)
- Pursue masters degree
- Pursue specialized training at a workshop/course
- Convert from MD to dual degree MD PhD pathway
- Continue research in residency/fellowship
- Apply for an academic position as a junior faculty
How do physicians balance a clinical and research career?

- Some have 100% research career
- Most have some combination of research and clinical practice
- Pursue research relevant to their clinical practice/expertise
- Work with other investigators/teams
- “Protected Time” for research in academic centers
- Success in funding is key to build your team
How do physicians obtain funding to do research?

- Build your research CV to be competitive for career development award & research grant opportunities
- Search for medical student research funding opportunities in your “field”
- Learn about grant opportunities specifically designated for MDs
- Learn about NIH centers, institutes and processes
- Access mentors and others to help you
How do medical students try out research?

- Know your resources
- Do some background work on research opportunities
- Seek a mentor who can provide you with research experience in a clinical field of interest
Questions & Commentary
Sources of Funding for Medical Student Research
Prestigious Medical Student Research Funding Opportunities

- Medical Student Research Fellowships
  - HHMI
  - NIH
  - AOA
  - Sarnoff Cardiovascular Foundation
  - Doris Duke Clinical Research Fellowship
  - Fogarty International Clinical Research Scholars Program
  - Foundations (AHA, ADA, AAS, …)
NIH Medical Research Scholars Program for Pre-Professional Students

NIH Announces New Research Scholars Program-

The Medical Research Scholars Program (MRSP) is a comprehensive, year-long research enrichment program designed to attract the most creative, research-oriented medical, dental, and veterinary students to the intramural campus of the NIH in Bethesda, MD. Student scholars engage in a mentored basic, clinical, or translational research project on the main NIH campus in Bethesda, or at close by NIH facilities, that matches their professional interests and career goals. The MRSP is designed to prepare clinician-scientists for leadership roles in biomedical research and will offer research experiences in basic science laboratories and in clinical and translational research conducted at the NIH Clinical Center. The MRSP application cycle for 2013-2014 will open on October 1, 2013.

http://www.cc.nih.gov/training/mrsp/index.html
Physicians-in-Training

- T32 (CCTS TL1) training grants for pre-professional students
- Specialty Specific Foundation grants for medical students
- HHMI, Sarnoff, Fogarty, NIH Research Scholars

FACULTY

- K08-basic science
- K23-clinical science

T32 training grants for clinician scientists
F32 postdoctoral award
Specialty Specific Foundation Awards
Questions & Commentary
RESEARCH RESIDENCY
The Surgical Neurology Branch of the National Institutes of Neurological Disorders and Stroke (NINDS) at the National Institutes of Health (NIH) offers an innovative 7-year, ACGME-accredited Neurological Surgery Residency-Training Program under the sponsorship of the NIH Clinical Center in collaboration with the University of Virginia. **Clinical training** is provided at the NIH Clinical Center and the University of Virginia. At the NIH, clinical training takes place under the mentorship of 5 full-time neurosurgical faculty. Because of the intense research-focus of the clinical service, nearly every case is complex, and residents are exposed to the latest technologies, including intraoperative magnetic resonance imaging and convection-enhanced delivery. At the University of Virginia [disclaimer], trainees will perform their junior residency and chief residency, under the direction of 11 full-time faculty. There, they will gain early and extensive experience in the treatment of diverse neurosurgical pathologies. **Research Training** Research training will take place at the NIH. Residents can work either within the Surgical Neurology Branch, or can call upon the significant resources of the NIH intramural research program, to identify a research project. Specific emphasis will be placed on preclinical research as well as the design of a prospective clinical research protocol, to be completed during the training period. The curriculum is designed for trainees to become future clinician-scientists and leaders in this dynamic field.
Yale Pediatric Scientist Development Program (PSDP)
Training the Next Generation of Pediatric Scientists

This program is designed to provide research training relevant to specialty areas of pediatrics and to prepare entry-level faculty for research careers in academic pediatrics. Physicians presently in pediatric training programs who wish to train in basic, translational, or clinical research with an established investigator/mentor are encouraged to apply, as are candidates who seek training in epidemiology/statistics, informatics, health services, or health policy. A commitment to an investigative academic career is essential. Candidates completing the Pediatric Scientist Development Program (PSDP) are eligible for sub-specialty boards, since PSDP training typically takes place after completion of the clinical fellowship year(s).
Questions & Commentary
ARE THERE PROFESSIONAL ORGANIZATIONS FOR PHYSICIANS WITH RESEARCH CAREERS?
Are there professional organizations for physicians with research careers?

- The ASCI is an honor society of physician-scientists, those who translate findings in the laboratory to the advancement of clinical practice.

- **APSA: American Physician Scientist Association**

  - The American Physician Scientists Association (APSA) is a national organization dedicated to addressing the needs of future physician scientists with respect to their training and career development.

  - [http://www.the-asci.org/](http://www.the-asci.org/)
Are OSU medical students involved with professional organizations for physicians with research careers?

- **APSA: American Physician Scientist Association**

  Executive Council 2013-2014:

  - **Kate Hartmann:** Annual Meeting Committee, Chair

  *Kate Hartmann* is an MD/PhD candidate at The Ohio State University Medical Scientist Training Program. She received a BS in Biology from Cornell University in 2010. At Ohio State, Ms. Hartmann currently serves as Co-Chair of the OSUWMC Research Day, Treasurer of the OSU Medical Scientist Student Organization, and Journal Club Co-Chair on the SUCCESS Planning Committee. Within APSA, Ms. Hartmann has served on the Annual Meeting Committee and is currently its Chair.

- [http://www.physicianscientists.org](http://www.physicianscientists.org)
Mr. Christopher Alvarez-Breckenridge is an MD-PhD candidate at The Ohio State University Medical Scientist Training Program. He received a BA in Biology and a BS in classics from The Ohio State University in 2005. As an undergraduate, he was named a Barry M. Goldwater Scholar as a sophomore and a Thomas J. Bardos Scholar as a Junior. Mr. Alvarez-Breckenridge has continued to be an active member of his community and school. His leadership positions have included his appointment to The Ohio State University Board of Trustees by Governor Bob Taft (2006-2008), and his appointment to the American Medical Association Foundation Board of Directors (2008-2009). Mr. Alvarez-Breckenridge has served as Vice-President of APSA (2008-2009) and President-elect of APSA in 2009-2010. Mr. Alvarez-Breckenridge joined the APSA Board of Directors in July of 2009.
Current Institution: The Ohio State University
Year in Program: G3
PhD Department/Training: Biochemistry
Research Interests: Enzymology, Protein Biochemistry, Neurology, Neuropathology
Main Goals for APSA: Goals for 2008-2009 include increasing our collaborative partnerships and interactions with other organizations while also focusing on the growth, longevity, and procedural aspects of our own.
American Society of Clinical Investigation
ASCI

About the Society

The ASCI is an honor society of physician-scientists, those who translate findings in the laboratory to the advancement of clinical practice. Founded in 1908, the Society is home to more than 3,000 members who are in the upper ranks of academic medicine and industry.

http://www.the-asci.org/
APSA
Membership Categories & Dues

- Full Member
  - MD/PhD or DO/PhD trainee, residents, fellows:
  - $20 annually, or $100 for the duration of the training program

- MD or DO students, residents, fellows involved in qualified research training experiences*, based on Membership Committee approval:
  - $20 annually, or $60 for 5 years

- Associate Member
  - MD or DO students, residents, fellows not yet engaged in research, premedical undergraduate students, individuals not yet enrolled in medical school, or anyone who does fit the requirements of Full Membership or Emeritus Membership:
  - $20 annually, $10 for premedical undergraduate students.

http://www.physicianscientists.org/
Introduction to Academic Radiology (ITAR) program

How to apply for the RSNA Introduction to Academic Radiology (ITAR) program.

We would like to invite you to apply for the RSNA Introduction to Academic Radiology (ITAR) program. As part of a new collaboration between RSNA and APSA, two medical students will be selected to travel to the RSNA Annual Meeting in Chicago for this special 4-day seminar to be held from November 25-29, 2012. A $1000 stipend will be awarded by RSNA to the selected students to offset travel and lodging costs.

To be considered, candidates must be current trainees in an accredited MD or MD/PhD program and must demonstrate academic radiology interest. Chosen candidates must have significant research experience of one (1) year or more. Applications will also be considered from candidates interested in pursuing careers in radiology-related specialties (i.e. radiation oncology and nuclear medicine).

http://www.rsna.org/
Annual AMA Research Symposium

When & Where: Nov. 15–16, 2013, Gaylord National Resort and Convention Center
National Harbor, MD

Qualifications:

- All medical student (includes medical students enrolled in joint degree programs, e.g., MD/PhD, MD/MPH, etc.), resident, fellow and international medical graduate (ECFMG-certified candidates who are awaiting residency) members of the AMA are invited to submit abstracts of their scientific research.

- Co-authors are not required to be AMA members, but please note that only one first author who submits will be allowed to present and therefore be eligible to win a prize.

- You must be present to discuss your research during the scheduled judging period on Friday, Nov. 15, 2013.

Deadlines: Abstracts for the 2013 AMA Research Symposium will be accepted beginning in June 2013 and **Medical Students Due August 15** Residents Due August 19 International Medical Graduates Due August 19

Questions & Commentary
HOW DO I GET STARTED???
How do I get started?

- Visit the Medical Student Research Trainees website [http://medicine.osu.edu/go/mdsr](http://medicine.osu.edu/go/mdsr)
- Attend MDSR Informational Sessions
- Become involved with Landacre Research Interest Group and/or Landacre Honor Society
- Talk to OSU medical students who have done research
  - [http://go.osu.edu/MDSRevents](http://go.osu.edu/MDSRevents)
  - [http://go.osu.edu/LANDACRE](http://go.osu.edu/LANDACRE)
MDSR Program

- Medical Student Research Program Office
  - 1068 Graves Hall, 292-2683
  - research.education@osumc.edu

- Medical Student Research Program Website
  - http://medicine.osu.edu/go/mdsr

- MDSR Newsletter
  - http://go.osu.edu/MDSRnews
Barbara Reichert - Estrogen and Retinoic Acid Interactions in the Regulation of Adipose Triglyceride Lipase

Timothy Voorhees - The clinical significance of unreported Cytomegalovirus Polymerase Chain Reaction values

Joel Palko - The biomechanics of the cornea and sclera in relation to ocular diseases such as glaucoma and keratoconus

http://go.osu.edu/MDSRnews
The Office of Research Education’s Medical Student Research Program aims to connect interested Medical Students to basic, clinical, and translational research, mentors, and funding opportunities.

- Resources for Medical Students
- Resources for Research Mentors
- Resources for Prospective Medical Students

http://medicine.osu.edu/go/mdsr
Next Session
Oct. 2nd, 2013
11:30-1 pm
Room 115 Biomedical Research Tower
460 W. 12th Ave.
*lunch provided

Learn about…..

- current and future research opportunities for physicians in training
- goals, expectations and context for your research experience
- how research training prepares you for critical thinking in clinical medicine and career success
- hear from other medical students, residents at OSUWMC engaged in research
Questions