

2017 American Society for Clinical Investigation Presidential Address

Vitalizing physician-scientists: it's time to overcome our imagination fatigue

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I know it's a little late in the day for it, but I want to start with breakfast. It was a Sunday in May 1990, final exam week of my first year in medical school. I was thoroughly tired of exams. Filling out another answer sheet with a number 2 pencil was the last thing I wanted to do. So I was thrilled to see the flyer on my desk for a breakfast seminar. Free breakfast and a lecture by Dr. Robert Mahley.

I went for the breakfast, but was nourished more by Dr. Mahley's project, a population study of lipid metabolism in Turkey. Afterwards, I don't know what possessed me, but I walked up to him and told him that in college I had studied lipid metabolism in elephant seals with Dr. Donald Puppione. Could I join his team and go to Turkey to take part in this research?

I remember the look on his face: who is this? But instead of laughing at my naiveté or doubting my ability, he took me on. That breakfast was the first step in my journey as a physician-scientist. Along the way, Dr. Mahley sent me to UT Southwestern, where I met Dr. Helen Hobbs. Since then, the two of them have supported every step of my career, including some challenging times, such as when I suddenly lost my husband, to discoveries that were exciting but very much counter to prevailing ideas. No matter how trivial or how difficult a problem, they were there to listen and advise. Through doubts, fears, and excitement, they were there. I am certain that without them, I would not be standing here today.

In those days, they knew, as I did not, that I was a future physician-scientist at risk. I might have become discouraged, or distracted, and quit research. But today, as a Council member, and this year, as President of the ASCI, I have spent considerable time thinking about the existential risks of physician-scientists.

Like many physicians working in academic centers, I was startled to learn how few of us there are: we make up less than 2% of US medical doctors (1). This number is based on a rather liberal definition of physicians doing research, in which research is not necessarily a major component of one's effort. An increasing number of medical schools have abbreviated the basic science courses in their curricula. Perhaps more important, physician-scientists have virtually disappeared from the teaching arena of direct patient care. Today, practical nuances, such as documentation and charge capture, have displaced curiosity and understanding of patient presentations and disease pathophysiology. In response, many physician-scientists have retreated to the comfort zones of our laboratories; few of us have proactively stepped up to interact with students and residents in clinical settings.

With decreasing emphasis on basic science and having so few role models, how can we expect young people to want to become physician-scientists? Often, the brightest students most interested in science are those who are admitted to medical school. However, on the long path from medical school through residency, they often do not have any meaningful contact with role models, so even the most brilliant students cannot sustain that interest. In this climate, how can we expect physicians to play a key role in finding the root cause of disease? Who will bring the next infectious outbreak to the bench? Opportunities to develop treatments for nearly 5,000 diseases with known genetic causes will be deferred or lost. Even if we can provide accessible health care to everyone in our country, patients will still suffer from dementia, ALS, and many diseases of which we have little understanding. We cannot deemphasize research.

Of course, this is not a new problem. The term "endangered species" was used by Dr. James Wyngaarden to describe physician-scientists in the late 1970s (2). Since then, Drs. David Ginsburg, Robert Lefkowitz, Stuart Orkin, Leon Rosenberg, Andrew Schafer, and many others have discussed the declining number of physicians in research.

But what is new is our imagination fatigue. As I talk to colleagues, junior and senior, about physician-scientists, I have a growing sense that we are accepting the status quo rather than striving to promote the phenomenal science that we should bring to our patients. Often I hear that "the days of the triple threat are over" or that "today, one can no longer take care of patients and do research." Many even say that it is not possible for an individual researcher to make major contributions, but rather that only teams can bring substantive advances.

I am not diminishing the importance of collaborations. Of course major discoveries are the culmination of many advances. But is it true that medicine and science have gotten so much harder?

I don't think so. Instead, I suspect that we have simply accepted that it is much harder, only because we have been hearing that pessimistic refrain for so long. What we need to do is to imagine what is possible.

It is not that medicine or science has gotten harder, but rather the bureaucracy has gotten in the way, and the value system has changed. We accept the mounting administrative burden and rewards for medical procedures, rather than academic contributions. Others including Dr. Holly Smith have pointed out the unusual and complex arrangement in which medical education and research take place alongside the health care system. Research, education, and patient care have different goals. To evaluate their success with the same criteria can lead to the sense that individuals cannot participate in all three missions. Nevertheless, our Society has maintained an illustrious roster of physi-

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cian-scientists for over 100 years; it is our responsibility to ensure its vitality. Let's remember what we saw in our mentors who inspired us to become physician-scientists.

We cannot sit and accept the stacks of reports on declining funding and the decreasing numbers of young physicians going into research. Instead, we have to fix them. The time is now. I think we all know what this "ideal situation" should look like. We do not need another study or report. We need to find practical and actionable solutions.

Today is the eve of the March for Science taking place in Washington, DC, and in cities around the world, including Chicago. We can take steps in our own march for science, starting right here. Let me share some steps, large and small, that I hope we can take together.

First, let me start with the boldest one: What if we have an independent fund to support young physician-scientists, especially at the transition from training to independence? Dr. Holly Smith referred to this period as "neonatal care." He said, "In the biogenesis of a physician-scientist, one of the most neglected stages is that of the precarious transition into independence. This phase shift from training, which implies dependence, to independence as a scientist requires careful consideration and support" (3). So, let's imagine a fund aimed to address this period of vulnerability. It will be coupled with mentoring, including strong commitment from advisors to help their trainees transition to independence. Sustained support should encourage our trainees to take on riskier and more challenging problems. The funding will be generous, but the bar will also be held high. This is a dream that several colleagues and I share; we are still discussing details. In the audience, if you are sitting on \$1 billion, please talk to me. And for the rest, stay tuned and be a voice for funds for young investigators. We will need all of your support for this major step forward in our march.

Second, deans, department chairs, and division chiefs: fellows and young faculty have put their careers and therefore the future of biomedicine in your hands. The beginning of a career is the most difficult. Your encouragement of faculty can turn their worries into productive action. The intellectually stimulating culture and research support that you provide prompt

a willingness to take on difficult clinical cases and challenging research questions. Research is accompanied by failures; your departments' supportive environment can reassure our younger colleagues that each failed experiment is one step closer to a key finding. Most important, faculty pay close attention to how you judge them — whether it is by the amount of grant dollars, the number of clinical procedures, or the time spent to solve difficult cases and understand basic mechanisms. How you reward and/or compensate your faculty goes far beyond those individuals; it sets the value system for our community.

Even though we do not know exactly what fosters breakthroughs, we do know from academic pedigrees that excellence, curiosity, and creativity are contagious. Environments that demand critical thinking and true progress rather than incremental advances are important. Today, there is much uncertainty in funding for research and health care. In these times, an instinct may be to retreat to safer problems and use more conservative approaches, but these have long-term negative effects on science and medicine. Your leadership is critical at this juncture. Perhaps we can leverage this challenging time to encourage transformative changes on longstanding issues such as length of training, salary and compensation, as well as board and recertification requirements. Adversity does not have to hinder progress; we look to you for guidance and plans that invest in our futures.

Third, what can we do as the ASCI? We need to lead by examining the meaning of "honor" and "excellence" in selecting new members. It is easy for us to reward individuals by looking at discernible results, such as impact factors and grant dollars, rather than evaluating the process or the bravery in taking on difficult problems or spending time to understand a fundamental process that has no clear trajectory to disease treatments. We can either encourage a whole generation of physician-scientists who are good at scoring As or reward those who are committed to groundbreaking discoveries. The criteria we use in what Dr. Goldstein referred to as "mid-career checkups" (4) influence the composition of this room and the atmosphere of academic medicine. The Joint Meeting should be where everyone wants to come to hear

the latest discoveries and meet the newest inductees — and not just a rite of passage. So let's lead by carefully defining the meaning of "honor" in this honor society.

I just listed some big cultural changes that we have to make; there are also smaller steps that each of us can take, starting today.

Notice the students and fellows in this room, talk to them, show interest in their research and career plans, tell them to stay in touch, and check in with them from time to time. We like to say we offer a wonderful network. Demonstrate that by reaching out to our colleagues and young trainees.

Make sure our fellows and junior faculty have protected time and support for research. And if we notice they don't, intervene for them, and don't accept the less-than-ideal situation; help them to imagine and achieve the best.

Give to funds such as the Seldin-Smith Award or the Medical Fellows Fund that allow the ASCI to support young investigators. We need your financial support. We will be a good steward of your contributions. There is a table outside with information on ASCI programs that need your support; I hope you will stop by and make a contribution.

Come to the annual meeting regularly and encourage your colleagues to do the same — it's a great time to catch up with friends, meet with mentors, and mentor the next generation. We cannot be a single voice for physician-scientists unless we act together. Consider the annual meeting a step in your march for science. A single march is not enough, nor is coming to the meeting only in the year of your induction.

Thank our hard-working staff and our Council members for their service. Every march needs good organizers. I, personally, have valued receiving their advice and expertise during my presidential year.

Fellows and students: your steps are the most difficult. Your responsibility is to work hard and excel. Like many others, I am going to tell you to follow your passion and remain curious. A question or a finding may be very cool at first sight, but for it to take root requires time and hard work. So start by finding an interesting topic, and then learn everything about it by reading, doing experiments, and talking to experts; in Dr. Michael Brown's words, "be totally consumed by it" (5). Your strongest voice is showing excellence in what you do. Pick

a reasonable set of things to do, and give it your all. Don't be afraid to pursue hard problems, and don't settle for anything less than excellence. This persistence will enable you to make discoveries that improve patients' lives. You will find that these pursuits are intellectually gratifying and outright enjoyable.

I hope everyone in this room will refuse to accept the status quo, commit to doing something, and support each other's efforts. We have to rekindle the same level of excitement that was present for those who started the ASCI in 1908. Fundamental research by ASCI members led to the development of drugs to treat heart diseases, stomach ulcers, and immune deficiencies. Later today, you will hear from three colleagues whose basic studies led to drugs for diabetes that benefited many millions of patients. It's just the most recent evidence that our work is essential to America and the world.

Finally, let us be the generation that reverses the decline in the number of physician-scientists. We have to shed our imagination fatigue and take concerted

actions together. I am confident that we can achieve this most important goal. Let's march together; I count on each and every one of you to take bold steps to support physician-scientists.

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I dedicate this address to the memory of my husband, Richard S. Spielman, who taught me to "always be on the lookout for the presence of wonder" (6).

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