An Interview with Nancy Andrews

Nancy Andrews was drawn into the study of iron biology in the mid-1990s, just as the field was emerging from the doldrums. For decades, researchers had been frustrated by the lack of a molecular understanding of how proper iron concentrations are maintained in the body, but in 1996 a team of scientists discovered a defective gene in patients with iron overload, or hemochromatosis. As researchers raced to find out how the mutant gene caused the disease, Andrews set off on a different quest—to understand how iron enters and leaves cells in the first place. In 1997, she and colleagues identified the molecule responsible for transporting iron into cells. Over the following years, she would help crack the mystery of hemochromatosis and other issues in iron homeostasis, helping to usher in a golden age of iron biology. During that time she would assume a series of high-level administrative posts, earning a reputation as a passionate advocate for medical education and for women in medicine. In 2007, Andrews moved from Harvard Medical School, where she studied and worked for nearly 30 years, to become Dean of Duke Medical School. She is the only woman to be at the helm of a top 10 medical school, which earned her widespread media attention. She spoke to me first from her lab and then her office.

You were surprised by the attention your appointment at Duke received. Why?
I don’t think I knew personally any women deans of medical schools but it seemed amazing that, in 2007, after women had been in academic medicine for some time, none of the top-ranking schools had a woman dean.

You’ve said that part of the problem is the pipeline—many deans are former department chairs, in particular of internal medicine, and there are just not that many women in those positions.
I think that is a big problem.

You’ve identified several reasons why women have not pursued careers in academic medicine—they don’t think that it’s possible to combine a successful career and family. They feel they have to be better than men just to be considered equal. And they lack encouragement and compelling role models. From what I can tell, few of these have applied to you in your career.

You’ve said that for much of your career, you hadn’t given the issue of women in science much thought. But you are now a passionate advocate for women in science. What was the turning point?
If I had to point to one thing, it would have been March 1999 when the MIT report about women in science was made public. Before then, I definitely felt that there were my daughter, who is now applying to medical school and considered doing an MD–PhD program decided not to because she was told it would be difficult to have a normal work–family balance. I was shocked that all of people she would believe that. But that message is still being delivered to undergraduates in spite of many examples of people who do find ways to make everything work. It’s also true that women still have to supercompete to be seen as equal. I feel that sometimes even now in what I do. And I see it over and over again. If you look objectively at the qualifications and accomplishments of women and men side by side, the women usually have to have accomplished more to be considered in the same way.
times that I was disadvantaged because I was a woman, but seeing that the experiences were so stereotyped in women across different kinds of scientific careers and institutions really drove that home to me. I was lucky when I was young that I was naive and just accepted the status quo. I was lucky in the sense that I didn’t worry that I would have trouble doing what I wanted to do. In another sense, I suppose I was probably too complacent because I would not have considered, for example, a career in surgery because women didn’t become surgeons.

You were not the first woman in your family to make a mark in a male-dominated world. Your great grandmother, Mary Raymond Shipman Andrews, was a famous and prolific writer of boys’ adventure tales. She was born in 1860 and died in 1936 so you obviously never met her but there must have been family stories.

Yes, there were definitely family stories about her and I read a number of her books when I was young. I grew up with a lot of family examples of women who succeeded. My mother’s mother had been superintendent of schools when she was very young. She died of multiple sclerosis at age 31. I had a great aunt who started a home for unwed mothers in Syracuse. Even going back to the 1600s or 1700s there were strong women. I think that probably empowered me in some ways.

Your great grandfather William Shankland Andrews was a judge on the New York court of appeals and your great, great grandfather Charles Andrews was mayor of Syracuse, New York. In fact, they all lived in Syracuse, where you were born. What was it like growing up in a place with so much family history?
It gave me a lot of confidence.

You’ve been interested in science since you were a child. What captivated you?
My grandparents traveled a lot. My grandfather was in education so in the summer they would go all around the world leading educational trips and they would bring things back from all sorts of places. I remember thinking, “I’m never going to visit Africa or South America.” Science was for me a way to open up the world without traveling, to explore within the limits of what I thought I would know. Of course, scientists travel but I didn’t realize it then.

Was it unusual for a girl to be so interested in science?
I think so. I was a funny mix of accepting limits but at the same time being oblivious to the fact that some of the things I liked to do women didn’t seem to be doing. But I had a chemistry teacher in high school who was a woman and who pushed me pretty hard. I was a strong student and, for whatever reasons, she took a strong interest. She had me apply for a scholarship to go to work on a marine biology project on Cape Cod in the summer. There were several other things she nominated me for. I had a lot of positive reinforcement from her and from those different awards.

Was there something about the way your mind worked that attracted you to science and made you good at it?
Curiosity is a lot of it—just wanting to know how things work. My best subjects in high school were math and foreign languages. Math, in particular, was a place where my teachers let me go at my own pace. I could get way ahead of the class. I think that part of the reason I liked chemistry so much was I could use mathematical constructs to solve problems.

Were either of your parents scientifically oriented?
Not at all. My father was and still is—though not very often, he’s 88 now—a lawyer and my mother a social worker. My father had come from a line of lawyers and probably didn’t consider anything else. I think as he got older and I went into science, he realized that he probably would’ve been very interested in it.
What about your siblings?
I have three brothers. One of them is an economics professor and the other two are lawyers.

When you were a kid, you saw a film called “Hemo the Magnificent.” It made blood come alive, literally. You would later become intimately involved with red blood cells. Did the movie influence you—did it help you fall in love with red blood cells?

It made a huge difference. We watched it over and over again. I was just fascinated by it and was really curious about how things worked in the body.

In fact, you went on to do hematology experiments in high school.
During my summer on Cape Cod, we were working with a lot of different animals. I heard from someone that serum from horseshoe crab was very sensitive and would clot if it came in contact with endotoxin. I was curious about what in the serum would make it clot. My father was a lawyer for a biology professor at Syracuse University and she very nicely offered for me to come work on horseshoe crabs in her lab. I went with a bunch of friends to Cape Cod to collect my specimens. At one point, I had 31 horseshoe crabs in my bedroom in saltwater tanks. I also brought back a blue claw crab. One day, it disappeared from its tank. Months later we found it in my father’s closet.

I’m assuming it was dead!
Correct. Again I was kind of oblivious. It never occurred to me that this would seem strange. I wanted to do it so I just did it.

Did you have other interests—literature, art, music?
I was pretty serious about music when I was young. I played a bunch of different instruments. I was probably strongest on cello but also had piano lessons for some time, and played clarinet, bass clarinet, and saxophone—even string bass, though that was my weakest. But I wasn’t very good about practicing, which was a problem. I got interested in writing music so my parents arranged for me to have a tutor in composition at Syracuse University. He taught me music theory and always critiqued my compositions. When I was thirteen I entered a composition contest and won. Something I had written was performed at the local museum. I could spend hours thinking about music, making up melodies, putting them into arrangements with multiple instruments. I loved doing that. Actually, my great uncle was a composer named Roger Sessions.

I’ve heard of him.
I would send him things that I had written and he would send me his comments. Usually I was too embarrassed to send him music—I only did that a couple of times. But we just had a wonderful correspondence. But after I won the composition contest I thought I was too old—the great composers had already done much more by that age—and that I’d have to find a different career.

Mathematical genius often blossoms at a young age. Was there any connection between your facility with math and your musical ability?
They may have been connected. In a way I can’t articulate, I think the brain works similarly sometimes for music and for math. I had always liked math.

It’s not surprising that you got into Yale—you went there in 1976. You knew you wanted to study science. Did you know which field?
I was interested in chemistry and thought I might do that, but someone told me that the only jobs were in industry. That didn’t seem as exciting as working in the university. Of course, I could’ve been a chemist at the university, but I didn’t realize that. So I moved more towards biochemistry.

You began working with a young professor, Joan Steitz, who was at the forefront of the emerging field of molecular biology. It sounds like it was a rich and rewarding relationship.
It was tremendous. I ended up being there during the time that she had the insight that snRNPs—small nuclear ribonucleoproteins—were involved in mRNA splicing. It was a brilliant insight on her part. It was a lot of fun being there. I had great mentorship from her and from students and postdocs in the lab.

You weren’t planning to go to medical school. What happened to change your mind?

I met a lot of MD–PhD students. They made it sound very exciting. I always felt a strong urge to do something that would help people. The idea of being able to mix the science with more direct service was appealing. I decided to apply to medical school late in my junior year. I was fortunate because I missed the premed meetings and all of the hype. I’d done chemistry and everything so it made college a lot easier.

I read that one interviewer at an MD–PhD program told you that you were an excellent candidate but that you liked people too much to be in the lab.

He was a surgeon and he said, “You know, I can see through you. Molecules aren’t sexy enough, you’re going to want to work with people instead.” I just thought—how can you say that about me when you only met me in an interview? I withdrew my application.

You landed in a great place—the MD–PhD program at Harvard. You did a year and a half of medical school, then went to MIT for three and a half years, where you worked in the lab of David Baltimore. You’ve said that the lab—and the whole MIT biology department—was a remarkable incubator for scientific talent.

The people who came through MIT around that time—it’s kind of like a Who’s Who of American science now. Almost everyone went on to make a huge contribution in science. It was an incredible environment.

What did you work on?

Poliovirus replication, specifically host factors. A graduate student before me had identified that there was a host factor involved in poliovirus replication.

Baltimore was busy setting up the Whitehead Institute. You’ve said that would later inspire your own foray into administration. What did you see that inspired you?

The idea of handpicking scientists and designing what an ideal scientific building should look like, putting together something where there wasn’t anything before, looked like tremendous fun. I’m sure there were parts of it that weren’t as much fun that I didn’t get to see, but it just looked like a great thing to do.

You chose pediatrics for your residency. Some people expected you to go the clinical route but you wanted to do research. You liked the idea that you could be your own intellectual boss. What aspect of science felt most creative?

It’s coming up with the original idea. That’s most fun because I can put things together that nobody has put together before. I love digging around in the literature or a microarray data set. I can spend hours doing that, trying to see connections relevant to our work that haven’t been made before. I’ll look at papers from very different fields because I have a hunch that there might be something there that relates to our work. Most of the time there’s not, but when there is, I feel like I’ve found a treasure. Another thing that’s been a lot of fun is not being stuck in one system, not just staying in the blood. And not just looking at things with one or a small number of technical approaches. Bringing new approaches
into the lab and venturing out into the heart, and the intestines, the liver and, more recently, even neurons—it’s fun because I learn new things and I can bring a new perspective. It’s less fun when I put in grants because sometimes people say, "You can’t work in the heart," as happened recently, "because you’re not a cardiologist." We ended up getting that grant anyway.

You began your postdoc in 1989. You got back to blood—you worked in Stuart Orkin’s lab on the hematopoietic specific transcription factor, NF-E2. How did that come about?
I learned a lot from my graduate work—how to purify proteins, how to think about science—but I wasn’t particularly excited about the project. When Stu offered me a list of possible projects, I thought this time I’m going to take the one that sounds like it’ll be most exciting. It ended up being tough.

You had to purify thousands of liters of cultured blood cells to get enough material.
Yes, it was crazy.

Was there ever any question that you would ultimately get to where you wanted to be?
I wondered about it at times. In the beginning, I set up an assay and got it to work really well and then all of a sudden it stopped working. I figured out how to make it work consistently but it was a little nerve-racking along the way because I knew that there were a few other groups who were trying to do it. I kept hearing reports that they already got it and I knew I didn’t have it. But in the end it worked out.

How have you viewed competition?
Usually I ignore it. For me the real competition is with myself, trying to do better than I’ve done before. Sometimes it makes me anxious but mostly it just irritates me to know more about who else is competing.

You became a faculty member at Harvard Medical School in 1991. Meanwhile you’d already met your husband, Bernard [Mathey-Prevot].
He was a postdoc with David Baltimore.

When and how did you meet?
He moved to Boston in 1983.

He’s Swiss originally?
Yes. He had come to the US to do his PhD at Rockefeller and came to David’s lab as a postdoc in 1983. I’d only been there a year and a half but I thought of myself as a senior student. I’d had very little bench space when I first got to David’s lab and a postdoc was leaving. She had a larger bench that she was giving up. I thought it had been promised to me and my husband thought it had been promised to him. We first met debating who was going to get the bigger bench.

This sounds like the making of a Hollywood movie. I ended up getting it. We got to be friends.

You’d obviously met a lot of men, being in a male-oriented world. There must have been qualities about him that really appealed to you.
Yes, he was and is a very thoughtful, honest person and a fabulous scientist—one of the best thinkers about science I’ve ever met. And just down to earth, modest but very nice, and very straightforward. I think those were the things I liked.

Did you collaborate on any projects?
As a resident, I couldn’t stand being out of the lab so I started using some vacation time and weekends to work in his lab. I could just go in and help him get things set up. We actually published one or two papers from that time. It was really to satisfy my craving for being in the lab.

At home, do you talk shop or do domestic issues loom larger?
We used to talk about science but my daughter felt left out. When she got big enough to participate in conversations we stopped talking about science as much. I imagine when my son goes off to college we’ll start talking more about science again.

You deliberately waited to have children until after you landed your first faculty job. You were lucky—your daughter was born not long after.
As soon as I had the protein NF-E2 that I was trying to purify, I figured it was an okay time to have kids because I’d probably secured my job. The timing worked amazingly well. We had my son almost exactly three years later.

You’ve said that you and most successful women physician-scientists owe their success to enlightened partners. You’ve also talked about how there are lots of men who are willing to take on an equal share of responsibility in having and raising children. Is that still your opinion?
Yes, I think so. Quite a few young men have asked me questions about balancing work and their families. An awful lot of younger men really want to be an active part of their families and want to know how they can fit it into their careers.

In what ways have you made your husband’s career possible?
To be honest, he has made more concessions for mine than the other way around. That’s happened at every step.

You might have continued working on NF-E2 but you were lured into iron biology by a medical student, Mark Fleming.

Mark approached Stu Orkin about doing a literature project in iron because he had a relative with hemochromatosis. Stu is very focused and wasn’t particularly interested in taking on an area he didn’t know well. I didn’t know anything about iron either but Mark seemed like a very bright medical student. I mentored him for his literature project and started to get more interested. He came up with a great idea, which was to find genes important in iron metabolism by taking advantage of some spontaneous mouse mutants that had been characterized largely at the Jackson lab and to try to find the genes that caused their iron deficiency phenotypes. It was a wonderful idea—the only downside was that I hadn’t had any genetics or mouse experience. Mark’s experience was pretty limited too. We tossed it around for a while, strategized, and decided to move forward with it. And Bill Dieterich, who at that point was a postdoc in Eric Lander’s lab, was willing to collaborate with us. That was really tremendous and made it possible.

What captivated you about the project?
There was so little known about iron transport in mammals—it was wide open. I liked the connection between clinical work and lab work—I could see patients with iron-related disorders in the clinic and at the same time ask very relevant questions in the lab. The final thing was I became a Howard Hughes investigator very shortly after I opened my lab so I had resources to do something completely different.

It was also an exciting time in iron biology—a mutant gene had been found in hemochromatosis patients and scientists were racing to find out how it caused disease.
In August of 1996, the report of the hemochromatosis gene was published. A lot of groups had been trying to find it. We made a deliberate choice not to go after HFE [the hemochromatosis gene]. We didn’t think we’d be able to compete. We didn’t have the patient populations—patients are almost always adults and we were in a pediatric environment. We didn’t even try that angle. But we reasoned that to ultimately understand what was going on in hemochromatosis, we needed to know more about iron transport and that was why we went after the transporter instead. In 1997, we reported the identification of what we now call DMT [divalent metal transporter] as the transporter that brings iron into cells. As time went on, trying to figure out what was going on in hemochromatosis, I became convinced from reading some old studies that the problem wasn’t going to be iron getting into cells but [rather] a defect that caused iron to be excessively released from cells. I remember a colleague who worked on iron for many years saying, “No, it can’t be this easy. It’s going to be some complicated mechanism.” But it really was that easy.

All this was happening in the mid to late 1990s, right around the time you were beginning your foray into administration, first with the Harvard MD–PhD program and later as dean for Basic Sciences and Graduate Studies. What made you so good at it?
I really cared about the students—getting to know them and helping them solve problems, mentoring them, helping them make connections that would be useful for their science. That was my big asset. Another very important thing was that the faculty around me were committed to the idea of the program and helped me think about what we could do to make it better and to fix some long-standing problems. That got the attention of Joe Martin [then dean of Harvard Medical School] and gave him what had to be a pretty creative idea at the time of offering me the role of associate dean and later dean of Basic Sciences and Graduate Studies. He really took a big chance on me. What I liked about the job was being in a position to help people develop their careers. I loved being able to see a huge expanse of science well outside my own area and to hear about interesting and new things that I wouldn’t have if I’d stayed in my own world.

Yet it sounds like at some point you were growing too comfortable—you were looking for a new challenge.
I started to think about what was coming next and then when Joe announced that he was stepping down, I decided it would be a good time to move to something different. When I started in 1980, I never expected that I would stay there for almost three decades. And I started to realize that if I didn’t move, I was never going to move. It was a great opportunity to think about both having an experience in a different institution, a different environment, and also a different kind of job.

You had been approached to take on a number of senior administration jobs but you’ve said that none suited you until the offer from Duke. Why did you say yes?
The huge attraction was the kind of community we have here—the fact that the medical school is on the same campus as all the other schools, that we have many interactions with the other schools. There’s a lot of collaboration among our faculty members, less of a gulf between clinical and basic science departments than at many medical schools. And just the community
spirit and the nimbleness—that you could have an idea and make something of it much more easily here than often is the case at older schools.

Have you surprised yourself in the way you’ve taken on the challenges?
Because of the way the general economy and the NIH have been over the last five years, I’ve had to put a lot of attention into budgets and finance. I didn’t think that I would like finance but it’s actually turned out to be fun.

David Baltimore has commented on your equanimity. Yet you are passionate about what you do. That’s an interesting combination—passion and equanimity. Does that sound right?
I think I’m enthusiastic and energetic about things I’m interested in but when there’s a problem or crisis, I become very calm and logical and do things methodically to deal with it. Instead of becoming more agitated, I get this sense of calm and approach it in a nonpanicked way. Maybe that’s a part of it.

It seems you’ve had a blessed existence professionally and personally. Was there ever a dark period?
I’ve been incredibly lucky. I’ve been surrounded by people who’ve helped me do things I never dreamed I’d be able to do. One thing I could say would be a dark period is how terrible the situation is right now for American science. I worry hugely about what this means for young people thinking about science, for people who have invested tremendous amounts of time and energy in trying to be good scientists and are now having to deal with situations that would’ve been unimaginable 20 years ago.

You’re at the forefront of thinking about medical education and about the future direction of science, in general. You were part of a committee—Advancing Research in Science and Engineering (ARISE)
That’s right.

You and your colleagues issued a report calling upon American scientists to move from an interdisciplinary approach to a transdisciplinary one. One way to do this would be to pose Grand Challenges that would capture the imagination of the general public. Can you say more?
Somebody recently said to me something that rang true, which is that, for scientists, personal money is not the incentive. It’s feeling like they can do something and make a difference. Thinking about the huge problems that the world faces right now, [it seemed to us that] calling them “Grand Challenges” might bring people together from very diverse viewpoints and fields and would likely accelerate finding solutions to them. I think having Grand Challenges will also attract funding that isn’t coming into science right now from philanthropists, from industry perhaps, from governments around the world.

How much time do you spend in your lab?
I’m there on Tuesday and Friday mornings from 8 o’clock til noon and, occasionally, other times. I will often spend time on weekends thinking about science, having fun going through data sets and papers.

What time do you get to work?
I usually get up around 4:30, read my e-mails, read the news, exercise, shower, and leave for work between 6:15 and 6:30. So usually I get here between 6:30 and 6:45.

What time do you leave?
If I don’t have a dinner, I leave to be home at 6.

What do you do to unwind?
I like to cook—that’s why I try to get home by 6. We usually eat at 7 or 7:30. Usually I figure out what I’m going to do for dinner in the car on the way home and then I work fast to get it ready.

Do you have a favorite dish or style of cooking?
I like spicy food. I use a ton of garlic—probably too much garlic and too much salt. I usually throw things together in whatever way seems right that day. It’s a way to unwind and also a creative outlet for me.

Is music still a part of your life?
I like having music around but I’m not serious about it in the way that I once was. A few times a year, I’ll sit down at the piano.

In 2007, when you moved to Duke, you wrote that your then 15-year-old daughter was questioning whether she’d go into medicine. Now she’s premed—what happened?
I tried to get her interested in science by taking her into my lab on the weekends, kind of playing around. I showed her how to draw blood and we made each other’s DNA. We also drew blood from my husband. We did some PCR to try to prove that my husband and I were her parents. We proved pretty well that he’s her father but there’s some doubt about me.

Now that you’ve gotten your daughter interested in medicine and science, I’m wondering what’s left—what’s your own personal Grand Challenge going forward.
I’ve been totally bitten by the mom bug. At this point, to be honest, for me the most important thing is that my kids end up happy.
Some people have suggested that the world would be a better place if the majority of countries were led by women. I’m wondering about the state of medical education—how different would it be if the majority of medical schools were led by women? I think that if at least half of them were, it would be a big step forward. People waste so much time on politics and power struggles. I think that women might be more inclined just to get down to business and try to make things better.