Science AMA Series: How Do Doctors Learn Anatomy? I'm Chris Ruff, from Johns Hopkins, I've taught anatomy for 35 years, AMA!

HopkinsMedicine$_{A}MA^{1}andr/ScienceAMAs^{1}$

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Abstract

Hi Reddit, my name is Chris Ruff [https://www.hopkinsmedicine.org/profiles/results/directory/profile/0000031/christopher-ruff], and I'm an anatomist and biological anthropologist at the Johns Hopkins University School of Medicine. During my 35 years of teaching anatomy, I've seen many changes in how we introduce students to this subject. Anatomy forms the foundation for much of medicine, but can be difficult to learn, so finding the best ways to communicate that information is important. Dissection of cadavers has always been a key part of anatomical training, because of the realism and experience with the actual body that it involves. However, increasingly we also use computer software to reinforce or review anatomical structures or concepts. Recently, we have developed a new product that makes learning muscles and bones fun and interactive. It's designed for both medical professionals and anatomy neophytes. [https://www.hopkinsmedicine.org/news/articles/anatomy-app-offers-interactive-learning-from-johns-hopkins-expert] I'll be back at 1 pm ET today to answer your questions.

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What is the best memorisation technique in your opinion?

onetapsS

We usually tell our students not to simply memorize, but to understand how the structures function. That approach helps to put structures it into context. It's similar to learning a foreign language. It is easier to learn to hold a conversation if you learn the structure of the language rather than just vocabulary words.

We also say to learn things in groups. For example, if you're learning the lower limb you'll be studying about 200 features. However, if you group them, you'll have to learn about half of that because the groups share blood supplies, innervations, and functions.

I also recommend that my students take advantage of the dichotomies in the human body. If a structure has a descriptive word like "longus" (=long) in it, there will almost always be another similar structure with the opposite term (i.e., "brevis").

The app we developed can serve a quick & easy reference for studying muscular anatomy that's much more convenient than, let's say an atlas. It can help students build the context they need by giving them an in-depth view of the systems they are studying.
https://www.hopkinsmedicine.org/news/articles/anatomy-app-offers-interactive-learning-from-johns-hopkins-expert

How much of Da Vinci's work contributed to the study of anatomy?

BubbhaDunkh

That's a good question! We don't actually delve too much into the history of anatomy in our courses, but DaVinci was a very astute student of anatomy. He did most of the artistic drawings of human anatomy that we had for centuries.

Also Rembrandt did a painting called The Anatomy Lesson (https://en.wikipedia.org/wiki/The_Anatomy_Lesson_of_Dr._Nicolaes_Tulp)

The anatomy in it is actually very accurate, which has led people to ask how he had access to cadavers to study for the painting? For a long time it was actually illegal or highly restricted to have access to human bodies for dissection. It was not standard medical practice. Even now, people still have many qualms of dissection - but we believe it is still necessary to see the structures, to touch them & to give students a sense of what they are working with. It helps them to develop the language to be able to describe anatomical features to other experts, a skill you need to have no matter what your practice is in medicine.

Also, a lot of the images we use to study anatomy are idealized - healthy young people - but many of the patients our students will see are old and have pathologies. They're not "typical" so it is important for medical students to see the real thing. https://www.nytimes.com/2016/12/22/well/live/what-doctors-can-learn-from-looking-at-art.html

Dr. Ruff, thank you for taking the time to do this AMA.

I am a student about to finish his M.S. in Biology.

For someone, such as myself, wanting to teach anatomy at the high school or college level, what type of doctoral degrees do you recommend? I am having a hard time finding PhD programs in my area that are in Anatomy/Physiology. Also, do you find yourself having to periodically review any anatomy that you do teach (mechanisms of immunology, muscles in specific areas, etc.)?

Matty22Ice

It's sometimes said that anatomy doesn't change - that we knew anatomy 100s of years ago - but actually we are still learning new things about the human body.

For example, some researchers have found evidence that there are certain nerves in the pelvis that should be recategorized from X to Y, which will change the way we teach them. Knowing this is important to pelvic pathologies & surgery. However, according to my OBGYN colleagues here, this issue has not been completely resolved and there is still much debate on their proper categorization.

Physicians are constantly looking at nerve distributions and the branching patterns of nerves because it has implications in pain diagnoses. For example, if you have something wrong with your hip, you could actually have referred pain down to your knee because of it, depending on the particular nerve distribution.

To answer the second part of your question, I'd say a masters in biology if you have anatomy as part of your coursework is probably fine for teaching high school.

Anatomy as a discipline is spread out over many other disciplines, for example, surgery. There aren't really many departments any more dedicated solely to anatomy. There are departments of zoology which are probably the most common places where comparative anatomy is taught at the undergraduate level. Allied health fields (Physical Therapy, Occupational Therapy, Nursing) also have a large focus on anatomy. Depending on the institution, a doctorate may or may not be required for teaching. Those kinds of programs also have different focuses - the musculoskeletal system in

physical therapy, for example.

What is usually the most difficult area for students? What do you suggest to make it easier to memorize/grasp?

Dollopadaisy

Probably the single most difficult area to learn are the cranial nerves. We always save that for near the end of the course so our students are used to how to learn at that point. There are 12 pairs of cranial nerves. Most medical students, including myself, do start out with a simple mnemonic - ranging from G to R rated (which people probably remember the best!).

We also teach them how to arrange the nerves into functional groups. If you can understand the nerves that go to the eye and layer on the autonomic vs. somatic systems that can help to organize things.

Also, going over it again and again by learning the nerves in different contexts really helps. For example, looking at what nerves are involved in sight, eye movement, etc. helps students remember. It's not easy, but most students find it fascinating.

Slightly off topic, but you have to have some good stories of students being grossed out or fainting. Any of them ever fall into a corpse?

Bargeral

We've had people poke themselves & have to go to the ER - but only once every 5 years or so - it's usually very safe and the students are very attentive.

The emotional response is something different. However, for the most part students adapt very quickly to the anatomy lab. One thing that we do to help them with the initial experience is an exercise called "Meet Your Cadaver." Before beginning dissection, we gather students around their cadavers and talk about the experience - how they feel about the individual who donated their body, how they feel seeing the cadaver, and their thoughts about dissection.

Then, after the course, we do a "post mortem" & talk to the students about how they felt about the process, how they feel about their cadaver now and how their thoughts may have changed. The students also hold a ceremony after the class that is very nice. They play music, they give talks, recite poetry, and they may put together flower arrangements to show their gratitude to the person who donated the body and their families.

This is all an important part of the experience. We don't recommend that our students just "tough it out" and encourage them to step out of lab if they are feeling uncomfortable. But, for virtually 100% of my students, their scientific curiosity is so strong that I haven't seen a student who is not excited about the experience by the end. Going through the process is also a way to honor the person who donated their body. They wanted to become part of this vital step in helping students become medical professionals.

I hear some people have more muscles than others. Which muscles are actually in some people and not others?

logicallyzany

That's interesting! There are actually a few muscles that some people have & others do not. They're all

mostly small and not very functionally important. There's one in your forearm called the Palmaris longus that is missing in around 15-20 % of people depending on the population. It's thought to be vestigial and is almost completely absent in some populations. It seems to be a random genetic effect, but is important to surgeons because if you're doing surgery in the wrist you could get mixed up if you don't remember that this muscle may be missing.

https://en.wikipedia.org/wiki/Palmaris_longus_muscle

There's another calles Psoas minor that's a vestigial muscle in humans - in most people it's just a fibrous band - but some people actually have some muscle tissue in it. It's leftover from quadrupeds and helps them with walking.

Fun fact - the Psoas major, under the minor, is actually the filet mignon - and we do have one of those!

What are the common mistakes that the students make when starting out?

MestreDasAves

Trying to over-memorize without understanding, and then becoming overwhelmed. There is an urge to learn everything & know the vocab, but if you don't know how it fits, you are going to get lost.

On the flip side of that, don't be distressed if it all seems like too much. In our course here we learn thousands of structures in 7 weeks & it seems impossible but it's really not. Once you build the foundation, you can learn it really fast.

Another thing to keep in mind is to not worry if you do forget some of it. It's like learning a foreign language. You need repeated exposure to remember everything. We have students 3 years out who come back & tell us that everything came back to them while studying systems for another course.

I'd like to ask about a more interpersonal aspect of teaching anatomy. How long do you think it takes students to become comfortable with seeing the inside of a human body?

adenovato

Most students are able to relax within a few days because the fascination with learning and seeing anatomical structures tends to overwhelm any initial negative emotions. These students have been planning to be medical professionals for much of their lives and many of them see this as a critical step in that direction.

1 out of 10, how much Latin do you know?

Duckbilling

I never took Latin in school, although it would have certainly be useful in my future anatomy teaching! Almost all anatomy terminology is based on Latin. On the other hand, because English is in part based on a romance language, many terms will look familiar and there are some structures that have entered the common vocabulary, for example gluteus maximus.

Other than the app you mention, which books/websites give the best quality/approachable take on anatomy? I am taking an anatomy class and think the textbook is written poorly-I learn despite it. It chops up the topics and doesn't frame the material as more than collections of facts.

TempAccount8891

Primal pictures is another software source that could be really useful. (https://primalpictures.com/)

Look into medical libraries too! They may have software you can use or other text sources. Be careful about using generic programs out there - there are a lot of inaccuracies in those. That's the benefit of our app. It has been thoroughly vetted by members of the anatomy department here at JHM.