The Traditional Lecture Is Dead. I Would Know—I'm a Professor

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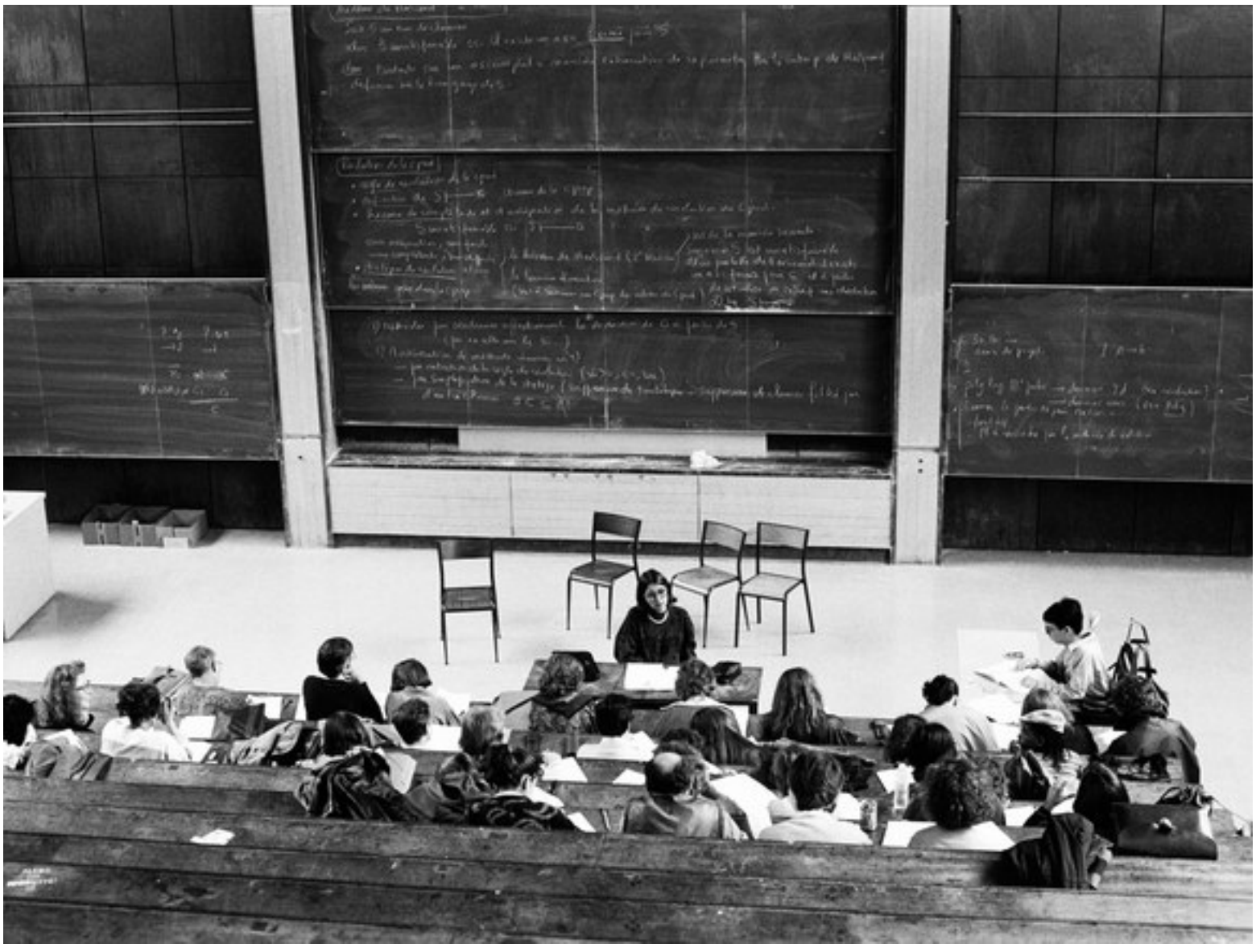

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When I was young, there was no such thing as the World Wide Web or video streaming. If you wanted to watch something, you had to wait until it appeared on television. Sometimes you might think, "Hey, I think I'll watch a show," and flip the channels until you found something interesting. This is how I discovered *The Mechanical Universe ... And Beyond*.

If you are not familiar with this wonderful television program from the mid-'80s, it was essentially a college-level introductory physics class presented by Cal Tech University. It included classroom lectures by Cal Tech

applied physicist David Goodstein, some excellent physics demonstrations, and cool stuff like historical reenactments. The thing I remember most about it is how it mathematically manipulated equations with weird animation. Now that I think about it, those animations probably reinforced the incorrect notion of "moving stuff to the other side of the equation," but still. They were cool.

Now that the internet exists, you can find *The Mechanical Universe* on YouTube, and you ought to check it out. Beyond being awesome, it shows why the traditional college lecture is dead.

What is the traditional lecture? It is a model of learning in which a teacher possesses the knowledge on a given topic and disseminates it to students. This model dates to the beginning of education, when it was the only way of sharing information. In fact, you occasionally still see the person presenting the lecture called a reader, because way back before the internet and even the printing press, a teacher would literally read from a book so students could copy it all down.

Now, don't get me wrong. The traditional lecture model worked wonderfully for eons. But it is an outdated idea, something that becomes obvious if you watch even a single episode of *The Mechanical Universe*. Close your eyes and imagine yourself in a college physics course with a professor giving a traditional lecture. Now open your eyes. (I'm speaking metaphorically; obviously, if you closed your eyes, how could you know that I just said to open them? Busted.) Did you envision The Best Physics Lecture EVAR? I doubt it. You probably pictured someone droning on and on in front of a chalkboard or PowerPoint presentation. No way that is more engaging or interesting than an episode of *The Mechanical Universe*, and if you're a teacher who uses traditional lectures, just stop and play the show instead. Everyone will be better off.

But wait! Perhaps you do something a video can't—you invite students to interact and ask questions. Great! But still, I say play *The Mechanical*

Universe. When someone wants to ask a question, pause the show and let them. That will still beat most lectures.

You may think by now that I think most physics professors are dolts. I promise that's not the case. But traditional lectures simply aren't effective. Research shows students don't learn by hearing or seeing, they learn by doing, a model often called active learning.

Physics faculty should start thinking about how they can go beyond just a traditional lecture. There are some easy things they can do (or students can ask them to do) to make learning more engaging. First, make students read the book outside of class, rather than in class. If your lecture merely covers the material in the textbook, why make students buy the textbook? Now, you may put a different spin on the material, but still. You're merely repeating what students can read on their own. Let them do that on their own time, and use the classroom for experiments and demonstrations and so forth. This is the idea behind a flipped class, something I've done more and more of in recent years. It makes learning more fun.

Another easy change? Start using a student response system. As you discuss a topic, present the class with a multiple choice question and let students discuss it and vote on the answer. If they answer correctly, great, move on. If not, explain why the answer is incorrect and let them try again. I find that the most productive lessons come when the class is split between two answers and everyone tries to convince the other side. For example, if you ask students what happens to the motion of an object under a constant force? Some students might say it will move at a constant speed, while others say it will change speed. Trying to convince their peers leads to great discussions. You might think that sounds like chaos, but in my experience it works terrifically.

Of all the things you can do to make learning more active, one of my favorites is plain old problem solving. Give students a problem—or heck, have them make up the problem and then let them solve it in groups. You would be

surprised at how much the students learn by working in groups and then sharing their answers with classmates. This is a go-to activity for me because it's easy to do, and students love that it helps them practice problems that might appear on a test.

These are just a few examples that I've used. You may have others. The point isn't to use any one example but to go beyond the traditional lecture by creating an environment in which students actively participate in class. You may experience some difficulty, even reluctance doing this. If so, take baby steps. Do one thing at a time. But so something, because professors who continue giving traditional lectures might just find themselves replaced by a video.