

The Laboratory Dilemma in Online Physics: A Solution that is a Durable Lesson

Martin Connors
Farook Al-Shamali
Christy Bredeson

Athabasca University, Alberta, Canada

Partnership to Integrate Computing into Undergraduate Physics
Virtual Conference 2020 / June 26 2020



The first Home Lab

Our usual approach to introductory physics labs gives the idea that physics is done in the lab: an ethereal, inaccessible subject

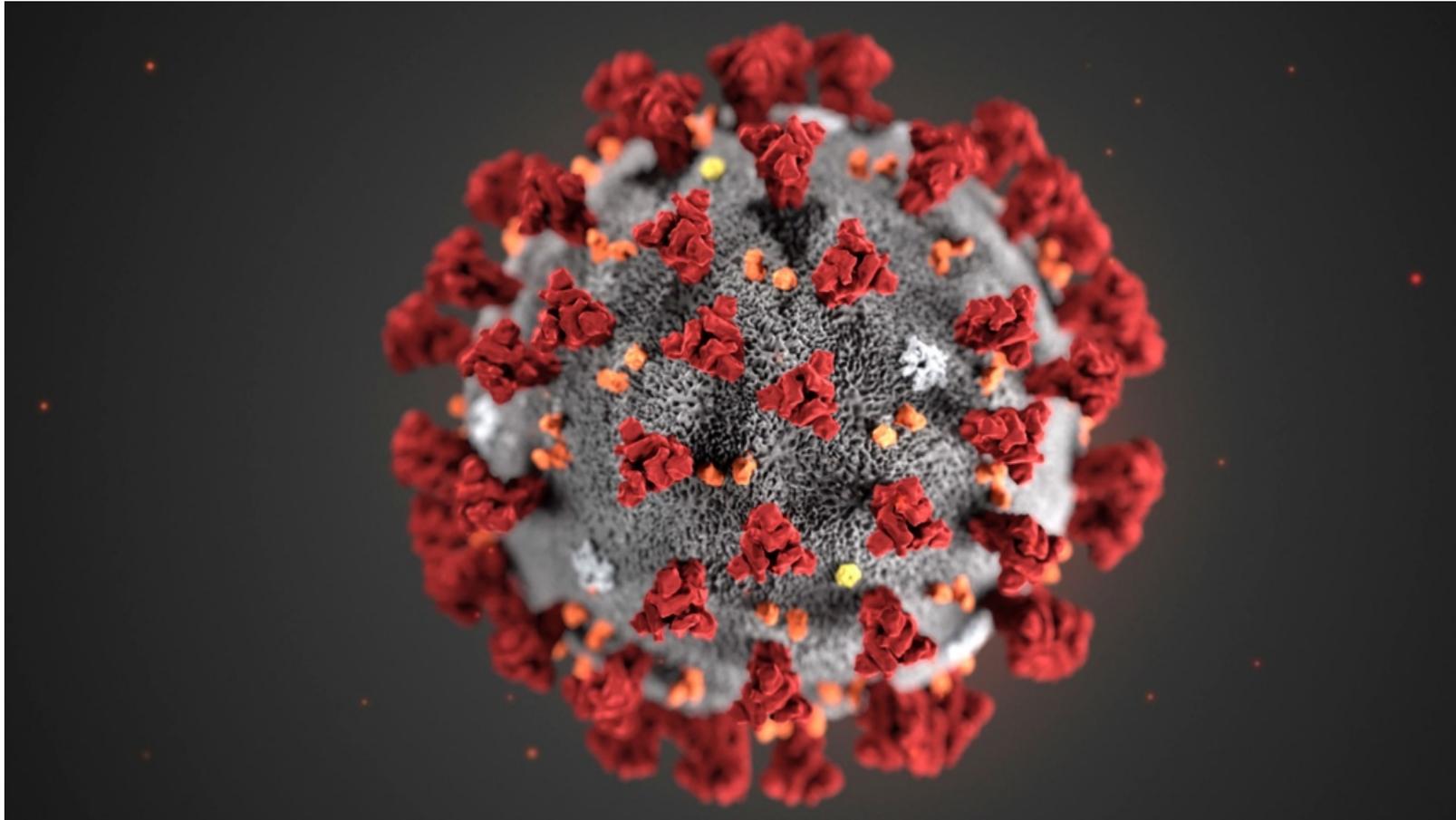
In fact, physics is all around us, and what better place to experience and study it than in the home...

... as Aristotle showed ca. 220 BCE



<http://archimedespalimpsest.org/images/kaltoon/4.php>

Now we are all in hot water...



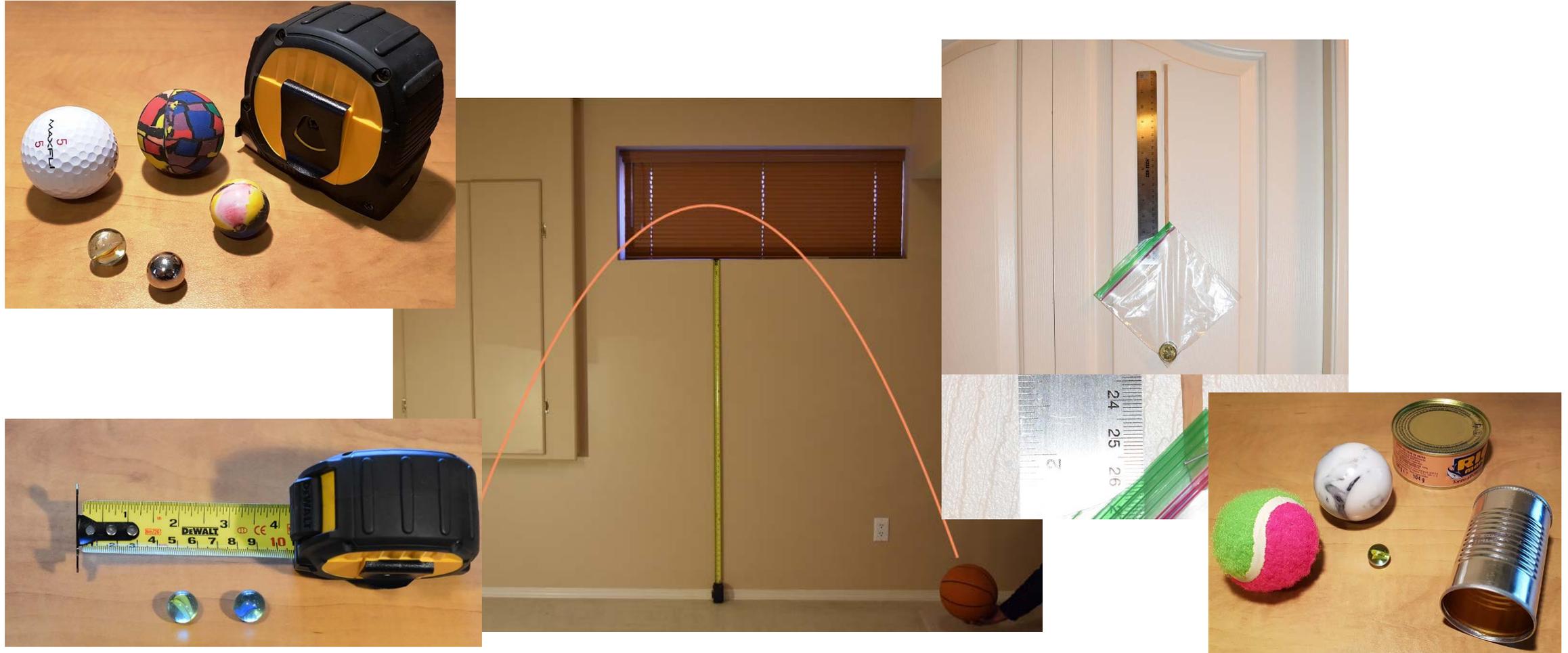
If experiments can't be done in the lab, and we are self-isolating, why not do labs at home....

....doing labs at home is something Athabasca University has been doing for distance education physics for about 25 years

What have we learned?

- Doing labs at home works really well
- Some investment in lab kits *may* be needed
- Logistics must be thought of, some similarities to library use
- Lab manuals must be written appropriate to materials used
- Safety must be addressed (no problems in 20 years!)
- Students are setting up labs themselves, *this is a good thing*
- Generally we have asked for a custom-written report

The present mechanics kits do not cost *anything*. We assume every Canadian has a smartphone (and a hockey puck)



Free tracker or Logger Pro (site license) software is used.

E&M/optics kits still need to be sent out, containing specialized (although inexpensive) materials.
NOT mailing kits removes a delay in starting our *asynchronous* courses: in synchronous (campus substitute) courses you may get students to buy things themselves



Calculus-based E&M kit is a variant. We also get them to build a simple motor. Some E&M functions like magnetic detection can be done with smartphones, electric measurement not easily.



The Durable Lesson: Home Labs have been very successful for us in distance education. *You* may continue to use DE, but even if not, Home Labs are a practical and valuable alternative to traditional labs.

Our institutions have had a big financial strain: home labs are likely to be cheaper in the long run and meet educational objectives.

Perhaps we need to flip homework: do a lab at home and a tutorial session on campus when that is again possible.

Students seem to *like* home labs. We even get them to photograph their setups and put the photo in their lab report. This is partly to discourage cheating, but they also seem *proud* to send in what they themselves did. These are not “cookbook” labs!

Final note: once we solved the distance education labs problem, other fields also adopted it. *Enrollments soared!*