ASTRO BEAT

June 2021

Figure 1: Earth as seen from Apollo 15 (Image source: NASA[1]). Apollo 15 astronaut James B. Irwin said: "As we got further and further away, it [the Earth] diminished in size. Finally it shrank to the size of a marble, the most beautiful you can imagine. That beautiful, warm, living object looked so fragile, so delicate, that if you touched it with a finger it would crumble and fall apart. Seeing this has to change a man."

Let's Talk About Climate Change in Astronomy

By Travis Rector
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Many years ago, one day in my solar system astronomy class, we were talking about the searing hellscape of Venus. A student asked me, "Is that what climate change is going to do to the Earth?" I assured her the answer was no- we weren't going to turn into Venus. But I soon realized I didn't really know how to answer her other questions. What was going to happen to the Earth? How worried should we be? And what can we do about it? That day, and future ones, made it clear that many people are deeply concerned about climate change, and they aren't getting the information they need from other places. And they need to hear it. Climate change is ravaging my home state of Alaska, in ways that are no longer deniable. It is a threat to our economy, our food, our ways of life. And, no matter where you live, climate change is a threat to yours as well.

But what does astronomy have to do with climate change? As it turns out, a lot. The science of climate change is woven into astronomy. For example, the geologic histories of Mars and Venus tell chilling stories of planets that were oh so close to being like Earth, but then weren't. They serve as a warning that planets don't necessarily stay habitable. Of course the climates of Venus and Mars have changed due to natural variations. The Earth's climate changes naturally too, but on the timescales of many thousands of years. Variations in the brightness of the Sun are often mistakenly blamed, but scientists now know for certain that the climate change we've experienced over the last 100 years or so can only be explained by human activity, primarily from the burning of fossil fuels.

Figure 2: Categories of climate solutions, from Project Drawdown at https://www.drawdown.org.

Sometimes people wonder, if things get really bad here on Earth, if we might be able to move to another planet. The frequent news stories about the discovery of new exoplanets, often in so-called "habitable zones," has led to a misconception that there is a wealth of worlds out there that we could possibly move to if needed. Pictures of Captain Kirk and Mr. Spock beaming down to an exotic, yet strangely familiar, planet may come to mind. Unfortunately the term "habitable zone" does not necessarily mean that a planet in this zone is habitable. It simply means that it could in principle have the right conditions for liquid water to be on its surface. It doesn't mean that there actually is water, or that there is life, or that we could actually live there. And even if we could, these exoplanets are so far away we couldn't possibly relocate to them. Mars at its closest is about four light minutes away from us. The nearest star is over four light years. Compare four minutes to four years and you'll get a sense of how much bigger that is. And we can't even yet get one human to Mars, much less all of humanity! It is clear that there truly is "no Planet B." And it's important that everyone knows that we have no choice but to keep Earth's climate habitable, not just for ourselves but for the plants and animals we rely upon. That is the astronomical message about climate change; and it is what compels many astronomers, including myself, to take action.

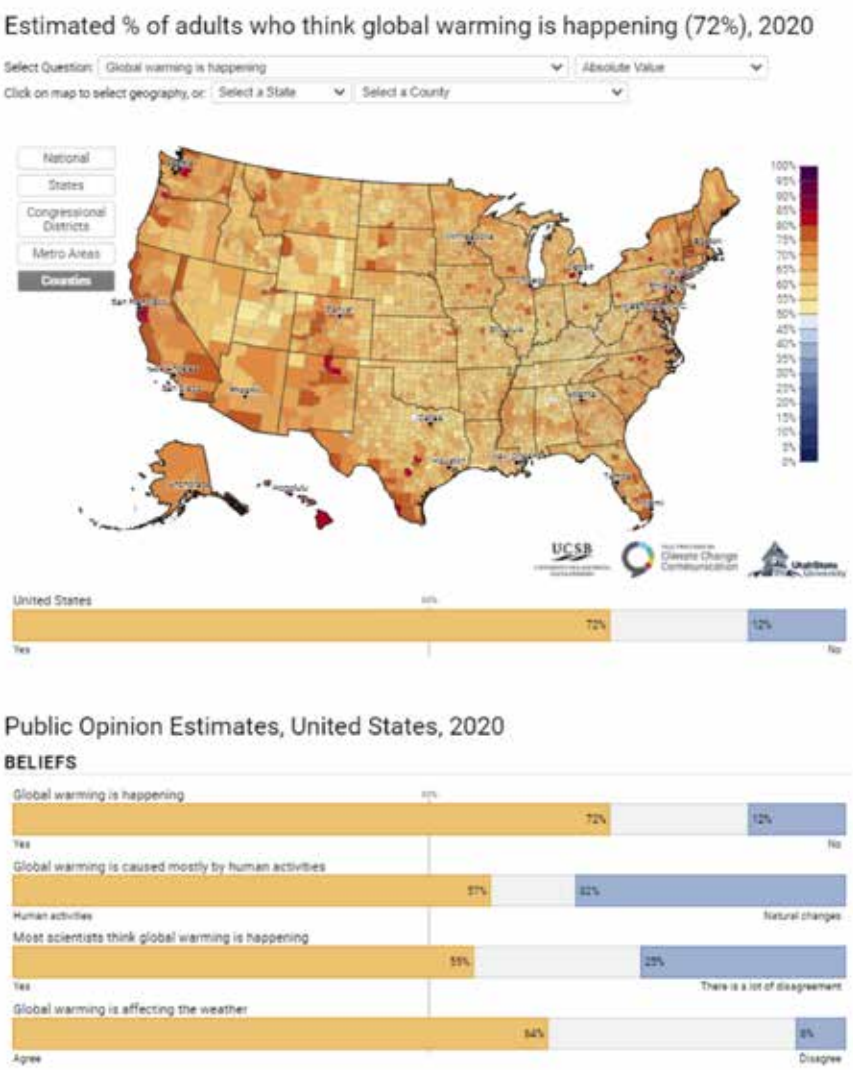

Figure 3: Example of public opinion data from the Yale Program on Climate Change Communication, from https://climatecommunication.yale.edu/visualizations-data/ycom-us/.

Climate change is a problem that we've talked about for decades, but we no longer have time to wait. To avoid the worst consequences we need to dramatically reduce our carbon emissions- cutting them in half over the next decade and getting to minimal carbon emissions by 2050. The good news is that we already have the solutions we need to achieve these goals. We don't need radical new technologies. Project Drawdown[2] does a wonderful job of describing the different solutions available to us (see Fig. 2). And what's exciting is that these solutions can also make our lives better.

So what can you do to help? Climate scientist Dr. Katherine Hayhoe has simple advice. Talk about it! Since climate change can be controversial, you may be afraid of "starting a fight" by bringing it up. You may also worry that others don't care about it, but that's not the case. According to surveys by the Yale Program on Climate Change Communication[3], the majority of Americans believe climate change is happening and is caused by human activity (see Fig. 3). They are also concerned about the risks of climate change. And they overwhelmingly support policies to address it.

At the same time, two-thirds of Americans say that they rarely or never talk about the problem. You don't have to be an expert on climate change to talk about it. Just by expressing your concern you're helping others to do the same. That can lead to conversations about what we, collectively and as individuals, can do to solve the problem. It helps to make the conversation personal. How is it going to affect you? Most people know climate change is a problem, but few know how it will impact them. The National Climate Assessment Report[4] breaks down the consequences of climate change by region, so it's a great resource for learning how your community is being affected (see Fig. 4).

Figure 4: Example figure from the National Climate Assessment Report (2018, https://nca2018.globalchange.gov), illustrating impacts in southwestern

You can also use your love of astronomy as an opportunity to talk about climate change. As I write this, Venus is visible in the western sky shortly after sunset. It's a great opportunity to talk about our sister planet, and the fact it is over 800˚F on its surface because its atmosphere is much thicker and made almost entirely of carbon dioxide. You may be surprised how easily that leads to a conversation about what we're doing to the Earth's climate. See a story about exoplanets? Use it as an opportunity to talk about what makes our planet special. Talking about space travel? There are many compelling quotes from astronauts about how seeing the Earth from space gave them perspective (see Fig. 1 and its caption, and Fig. 5).

The astronomers perspective is what inspired us to create the organization "Astronomers for Planet Earth[5]", a grass-roots organization of astronomy students, educators, and scientists around the world that shares our astronomical perspective about the Earth and climate change. In collaboration with the ASP, we are organizing a Summer Symposium[6] on July 23rd on how you, an astronomy enthusiast, educator, or professional, can help to address climate change. I hope you will join us!

Footnotes

1. (page 1): https://commons.wikimedia.org/wiki/File:Apollo_15_Earth1.jpg
2. (page 3): https://www.drawdown.org
3. (page 3): https://climatecommunication.yale.edu/visualizations-data/ycom-us/
4. (page 3): https://nca2018.globalchange.gov
5. (page 4): https://astronomersforplanet.earth
6. (page 4): https://astrosociety.org/get-involved/events/asp2021-summer-symposium/symposium-overview.html

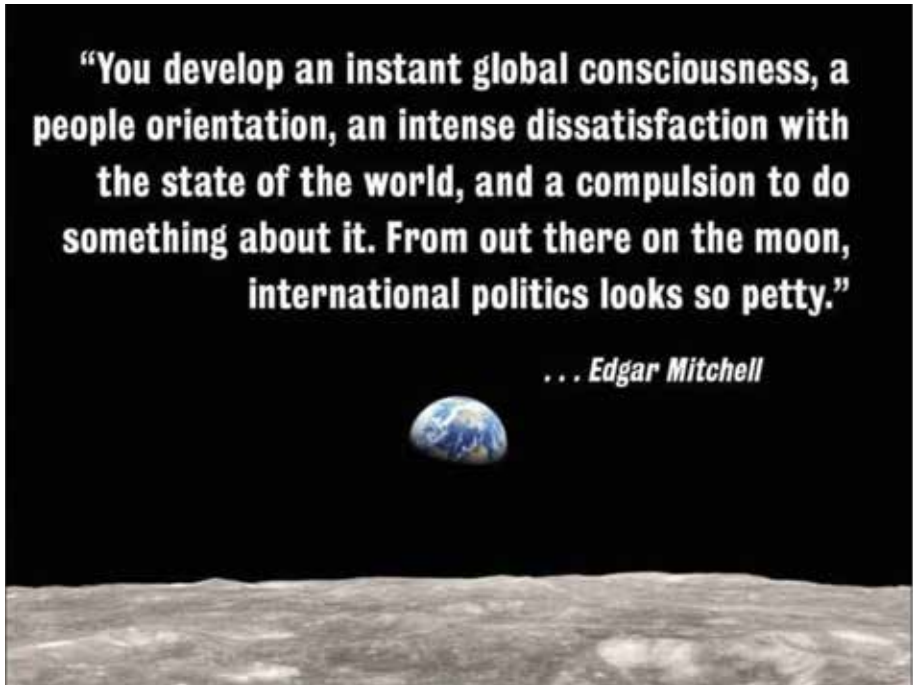

Figure 5: Another NASA image of the Earth, seen from the Moon, with a quote from Apollo astronaut Edgar Mitchell.

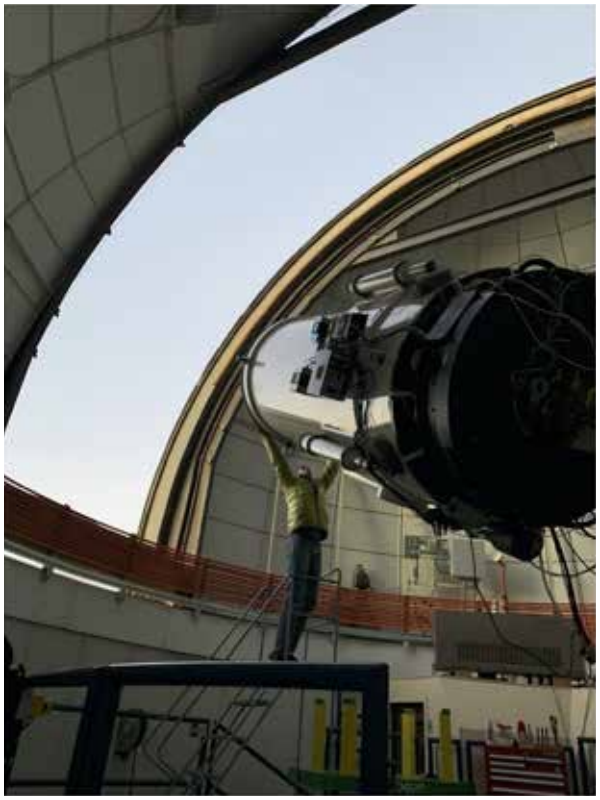

Figure 6: An action shot of the author taking the cover off of the Swope 1-meter telescope at Las Campanas Observatory.

About the Author

Dr. Travis Rector is a professor of physics and astronomy at the University of Alaska in Anchorage. He is one of the organizers of the organization Astronomers for Planet Earth. He is also the chair of the sustainability committee for the American Astronomical Society. In these roles he is working to help educate people on the causes and consequences of, and solutions to, climate change.

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