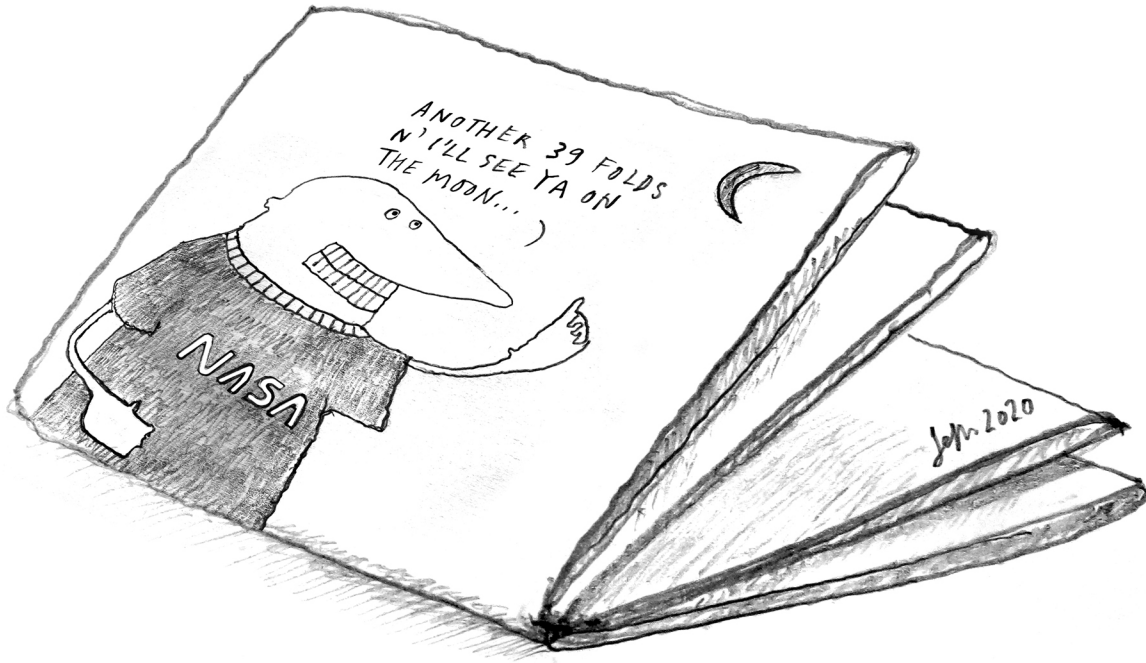


STICKY WICKET

Corona XX – to the edge of the universe

Mole

Original artwork by Pete Jeffs - www.peterjeffsart.com

Hi, I hope you're keeping busy! I know I am, what with Kazoom meetings (that I cannot avoid), papers and grants to write and review (and review again), people to see (virtually), and places to go (not). And although there are only so many hours in a day, I find that I am looking around for a bit more to do, you know, something *different*. Maybe I'll take up origami.

I'm pretty fascinated by origami, the art of paper folding. People make some pretty amazing things with a piece of paper. For myself, I don't seem to have the patience, or perhaps the dexterity, to make lots of complex folds, and my attempts at a parrot bring only hearty guffaws from my friend Professor Parrot, who is pretty good at this stuff.

But, just for fun, let's take a virtual voyage with a piece of paper. The average piece, such as the ones that are strewn about my work space (journal articles and reviews, trivia, instructions on how to fix my printer, that sort of stuff) have an average thickness of about 0.1 mm, or 10^{-4} meters. If we fold it in half, it is twice as thick. Fold it seven times and it is the thickness of a paperback book, like my copy of 'Cat's Cradle' (which we talked about last time). At twenty-seven folds, it is a kilometer thick. ("But Mole," you complain. I'm listening. "You can't fold a piece of paper twenty-seven times!") Of course you can, provided it is big enough! And hey, this is just virtual paper. Fold it some more. A mere forty-two folds to the moon, fifty-one folds to the sun (careful, it's flammable, let's not go there). At ninety folds, our paper is now thicker than the Virgo Supercluster (the cluster that contains our galaxy and Andromeda, about one hundred and ten million *light years* across). By one

hundred and three folds, our piece of paper is now the thickness of the known universe. Who says we can't go anywhere?

This virtual journey was inspired by the wonderful Spanish entertainer, Juan Tamariz, who presented something like it (stopping at the moon and back) on a radio program several years ago. (It was in Spanish, of course, but I read the translation. I am woefully deficient in languages that are foreign to me.) He is a deeply thoughtful philosopher, in his way, but appears to his public as a mad magician who does wonderful things with a pack of playing cards. But that isn't what I wanted to talk about. ("Really, Mole?")

Of course, our virtual journey was about the concept of exponential functions, and how quickly interesting things happen when they are applied. You may recall the story of the king who granted any favor to a helpful subject, who asked only for a grain of rice on one square of a chessboard, two on the next, four on the next, and onward to the last square. The king disparaged this simple request, but approved, only to find that there was not enough rice in the kingdom to fulfill this wish. He probably just had him killed, as such stories tend to go, but I don't remember.

You probably know why I'm bringing this up (of course you do, you're very smart). The number of people who upon exposure are infected by one person with a virus, say SARS-CoV2, is the R_0 . When R_0 is less than 1, the virus disappears from the population (although it has to stay at this number until it is gone, which can be a long time). When R_0 is greater than 1, the virus spreads, exponentially. If R_0 is 2, we have the situation of the rice on the

chessboard, or our virtual origami experiment. We do not know the precise R_0 for SARS-CoV2, but it appears to be between 2 and 7, based on early studies in China.

But the number we really want to know is the R_t , or the effective reproduction rate, which is influenced by safe practices such as mask wearing, hand washing, and social distancing. We have some good news here (but not as good as we'd like). In this country I live in, composed of states, half of our states are currently (as of this writing) reporting R_t values under 1. The bad news is that this means that the other twenty-five have R_t values greater than 1. The other not so good news is that 'under 1' is, in all cases, only *slightly* under 1. The best is currently at 0.8 (most are between 0.95 and 1). If we all managed to sustain this best R_t , that would be good, and even without a successful vaccine, we might see our numbers of new

cases dwindle. Someday, a long time from now. So of course, we need a vaccine. Fingers crossed.

At the worst, a few weeks ago, our R_t values here were all pretty close to 2. We could have been on a real trip to the end of the known universe at those numbers. Maybe we are starting to realize that we have the power to do something about this Terrible Pandemic, and it is as simple as taking sensible precautions. Of course, things are never that simple, and this isolation and distancing is taking a toll, both on our economies and on our mental health. But I have to think that it's better than riding a piece of paper to the moon, to the Virgo Supercluster and beyond.

By the way, did I mention that on the one hundred and *fourth* fold, you go to the edge of the known universe and back?

Welcome home.