[TROY]

Did you know that the Sun's magnetic field declines and actually reverses its polarity every 11 years? And did you know that geologists have discovered that our planet does the same thing? However, the Earth's magnetic poles reverse their geographic location every 300,000 years or so and the last time it happened was 780,000 years ago.

Now there have been hundreds of these magnetic reversals during the last 70 million years. The data from the last reversal indicates that it only takes about a thousand years or less for the field to completely vanish and then rebuild itself in the new polarity phase. The time between the Earth's magnetic cycle seems to be slowly increasing. Geologists think this is because the core of the Earth is actually cooling and the currents are flowing more sluggishly as Earth ages. Now the good news is that the magnetic poles reversal has no effect on the rotational pull of a star or a planet and there is no evidence in the fossil record of enhanced mutation or extinction tied with these reversals. The bad news is that dazzling aurora; the beautiful curtains of light we admire in the Arctic and Antarctic regions will disappear for a few centuries and probably be replaced with colorful but few shows of light spanning the night sky.

[Troy]

I'm Troy Cline and in today's podcast we will hear from Dr. Sten Odenwald, the chief author and editor of the Sun-Earth Day, Technology through Time series. In this episode Sten is going to share 4 amazing magnetic facts. So without any further delay here's Sten.

[Sten]

I had a lot of fun writing this essay because magnetism is the force everybody talks about but nobody does anything about it. (laughs) And it is amazing; it's the second force that we've known about really the longest, we've known about magnetism for thousands of years. It has only been in the last 200 years that we figured out how it works and can do some really neat things with it. It has a lot of strange properties that are very different from gravity. I tried to capture at least 5 or 6 of these peculiar things in the essay, sort of highlighting the top 5 or the top 10. One of strangest of course is that it has polarity, a north or a south pole to it. You never find north and south poles by themselves off in the universe. They always come in pairs. It is kinda fun, because when you look at the sun and try to map where the north and south poles are, sometimes you find a lot more south then you do north. That is because sometimes the

south is spread out so wide that you can't really detect it properly so you miss all of the matching poles, and that happens quite a bit. But, the physicist actually have been spending quite a bit of time looking for these things called mono poles, where you only have a north type pole. Some theories proposed them to be fundamental particles but modern theories of cosmology that involve inflation say that if these theories are correct you are only going to have one of those literally in the region space you can see out to the most distant galaxy, so it is unlikely that it is going to be anywhere near Earth. Theories are interesting, but when it really comes down to it magnetism is still one of the most common forces we haven't experienced yet. We find it in many different places, we find it in the Sun we find it in the Earth, we can manufacture very easily, we can make them pick up junk cars in junk yards or with the Large Hadron Collider in the Sun, which is just starting its operation, we can actually use them to steer fundamental particles to crash into each other, to look for new physics. So magnetism is really cool and I hope with this essay I captured at least some of the highlights and coolness of this force.

Another interesting thing about magnetic fields is that all magnetic fields are produced by moving charged particles. You might not be able to see where those particles are, but they're there. They can either be electrons spinning around inside of an atom which produce a magnetic field and added together produce a magnetic field like you use in a kitchen magnet or if you have a current flowing through a wire that current of charge particles produce a magnetic field too. The really interesting thing about it though is if you were moving with these charged particles the magnetic field would completely disappear. If you were exactly in step with the charged particles the magnetic field would completely disappear. So magnetic fields are malleable, they're not thick things that can be changed if you are moving or standing still. That is a second really curious thing about them.

[Troy]

I'd like to thank Dr. Odenwald for sharing his time with us today. And you can read more about this topic in the Technology through Time section on the Sun-Earth Day website. You can also share your questions, thoughts and comments with Sten on our Facebook and Twitter page or by sending an email to sunearthday@gmail.com

For all other details about the Sun-Earth Day program including information about our past SED themes be sure to visit our website at sunearthday.nasa.gov.

While there, don't forget to register in order to receive Sun-Earth Day updates!