

## Technology Through Time Highlights.

With the help of thousands of scientists and observers across the centuries, our knowledge of the sun and its connection of the earth has expanded our minds. As we look to the future we can only wonder what awaits us.

I'm Troy Cline, and in today's podcast I will be talking to Dr. Sten Odenwald, the chief author and editor of the Sun-Earth Day's Technology Through Time series. During our phone conversation Sten shares how he acquires the information for the essays and the importance of resource verification.

[The call]

Troy: Hey Sten!

Sten: Oh, Troy Hi!

Troy: How's it going?

Sten: Well good.

Troy: Now, do you have any favorite essays that really stick out in your mind?

Sten: Yeah, actually the one that comes to mind is Ancient Sunlight, essay 50.

Troy: Number 50, let me go to that right now, I'm on the website which of course is at [sunearthday.nasa.gov](http://sunearthday.nasa.gov) and I am in the Technology Through Time section and I essay number 50. Now as I look down through the article I'm looking towards the bottom at the diagram and it almost looks like a puzzle coming out of the sun. And the caption says, 'Light escapes the Sun's core through a series of random steps as it is absorbed and emitted by atoms along the way. You look at that and you see this random path that light would have to take from the core to get out to the surface and then suddenly it's straight shot.

Sten: In fact it spends most of its time near the core because the density of the gasses near the core of the sun is about equal to the density of lead. So there are many times more collisions in the core and each one of those collisions impedes the forward progress of the light to the surface. Once you get about half way to the surface then things go very quickly because the atmosphere is much less dense. But still, when you add up how long it takes to cross each of the shelves of matter of the Sun, you get something like on the order of tens of thousands of years.

Troy: And I'm noticing that on the very bottom of the page under references I see a reference to an activity on this particular essay called "how old is Sunlight". And that is a classroom activity that you can go to and download.

Sten: Yeah, believe it or not this is a classroom activity that you can actually do yourself. Part of it is understanding how random walks work. That is a very fun and basic physical process. All you need is a pair of dice, a piece of gridded coordinate paper, pencil and away you go.

Troy: Well one of the things I really want to bring out is the Gallery. You can just simply click on them. At the bottom of each article is where we've placed the gallery pictures. So if you see something interesting and you just click on that image, it will open the entire gallery with a list of amazing images that can make beautiful screen savers.

Sten: Astronomy is a very visual subject and we like to put our best foot forward. It's not all algebra, mathematics and scientific notation. We do generate some spectacular images, not only from actual

photographs, but also from manipulation of equations which generate their own images which is also striking.

Troy: There's one that I'm looking at right now which is really great. It's a close up of the Sun that looks like abstract modern art, but it's real! There's an image called "The close up of a sunspot" taken with the Swedish solar telescope in LaPama, and it is absolutely dazzling and you wouldn't know that was unless you had been trained.

Sten: It's so striking that you have to include it with any treatment of the Sun and sunspots. It's so startling that you look at this image and you're seeing the real detail in the sunspot. It's not an artist's rendition or anything or modern art. It's the real thing. You almost don't know what you're looking at because it's so surrealist and abstract, like you said. Then you start to focus in on details that are a thousand miles across moving at ten thousand miles an hour and you think to yourself, 'Oh wow, what is this? This is amazing'. Technology through time is a vast resource that we've created and I'm just curious how students would actually wind up using it. We designed it with certain things in mind but what is the actual experience that you've heard of it being used.

Troy: There are a variety of ways that people are using this, from our feedback. Of course classroom teachers are very innovative at taking materials and bringing them to their students. Technology through time is one of those resources that really lends itself to a variety of ways to raise student interest in science, culture, and history. The fact that Technology Through Time's purpose was to show how people in ancient times, modern times, and into the future have been observing the Sun and seeing it as a source of life and energy and why our relationship to the Sun is so important to study. These teachers are coming back and saying that their students do reports and do research themselves based on some of the links you provide. They come up with their own report that is graded. They are also using the imagery that they use to enhance the reports. I think a great activity for this would be to use powerpoint and download them and use them in their own powerpoint presentation along with their own words and credits.

Sten: I continue to use these images in my own professional presentations because I spent time actually finding these images and getting the permissions to use them on a NASA web site, and now that I've done all that work it's like, Wow, these are now available for me to use in my own when I'm in public. The gallery is just a fun resource.

Troy: It's a lot of fun. I love going through the gallery, it's one of my favorite parts of the web site. And in fact based on where our users are visiting, it's the number one hit part of the web site with the exception of podcasting.

There's an essay Sten, that I wanted to talk about. It's one of the Ancient Observatory ones, issue #21 on Hovenweep castle. Do you remember that one?

Sten: It's surprising how much Native Americans did with trying to understand the sun. They tried to do it in a very pragmatic way. They turned figuring out the seasons to an art form in their society and it's just wonderful to see. To them it wasn't just abstract knowledge. They actually built houses and monuments that incorporated this information.

Troy: That leads to a very interesting questions about where do you get your information. In these essays about current NASA missions and future NASA missions. How do you get that information. I know you're a professional Astronomer so much of this you know.

Sten: A lot of the information comes from a professional understanding of the subject. Some other types of information that you'll find comes initially as doing something silly as a Google search under the keyword of the particular ancient observatory. You'll usually find document, some might be good and some might be bad. But as an Astronomer you know how to discern what is authoritative language and you always follow through by contacting the authors to double check their real understanding of the subject and compare them to who they say they are. This way you get the most credible information. You'll find many pages on Stonehenge and other ancient monuments, but very few of them speak with authority even though they are written extremely well. That's where the professional aspect of being an Astronomer comes into this. You have other resources you can consult to make sure the information you get is really on the mark, and not controversial.

Troy: I also know from working with you in the past that there have been some times, for instance, if there is a satellite mission up there now that you have been able to talk to people from those project and receive some input from them when it's appropriate.

Sten: Yes. Generally, whenever we publish anything about a specific mission we will consult the mission web sites authoritative science content areas. Then we translate those goals to something more understandable, and at that point we will send that essay to the scientists of that mission to catch any comments that might not be appropriate or to catch any other errors. The process goes through the initial draft based on the documents that you see from the mission and then include any revisions from the scientists; which then goes to press. The mission web sites are essential in getting the proper information.

Troy: What's really interesting, we're pointing out the importance of looking for it and learning how to dig for information and then how to verify it and cross-reference that information which is very vital. And I know that teachers are constantly reminding students to verify their sources. And in your case you come in with your own knowledge but when you need additional knowledge you'll dig for it, and contact the people and resources, and then verify your sources and credibility of those resources.

Sten: It's absolutely vital to check the credibility of your sources from the web that you'll be using in your report. I can't stress that enough. The last thing you want to do as a scientist is to publish something that isn't the consensus view of your community. My own background is in cosmology and I do understand solar physics from my college education. So I know the basic general ideas. That sensitizes you to what ideas are currently in, and which ones are out and where the controversies are. At the level of web pages we write for Technology Through Time there is no particular reason we would have to present the reader with controversial information because there is so much other non-controversial information available that they need to know.

[The call ends]

Troy: We are very interested in hearing your questions and comments about the Sun-Earth Day Podcasts. If you have something to say, just send an email to [sunearthdaypodcast@mail630.gsfc.nasa.gov](mailto:sunearthdaypodcast@mail630.gsfc.nasa.gov).

Upcoming podcasts will include professional story telling, highlights from our Technology Through Time series, and our new audio voyage tours. For all other details about the Sun-Earth Day program be sure to visit our web site at <http://sunearthday.nasa.gov> .

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This is Troy Cline signing off!!