1000 Word Challenge

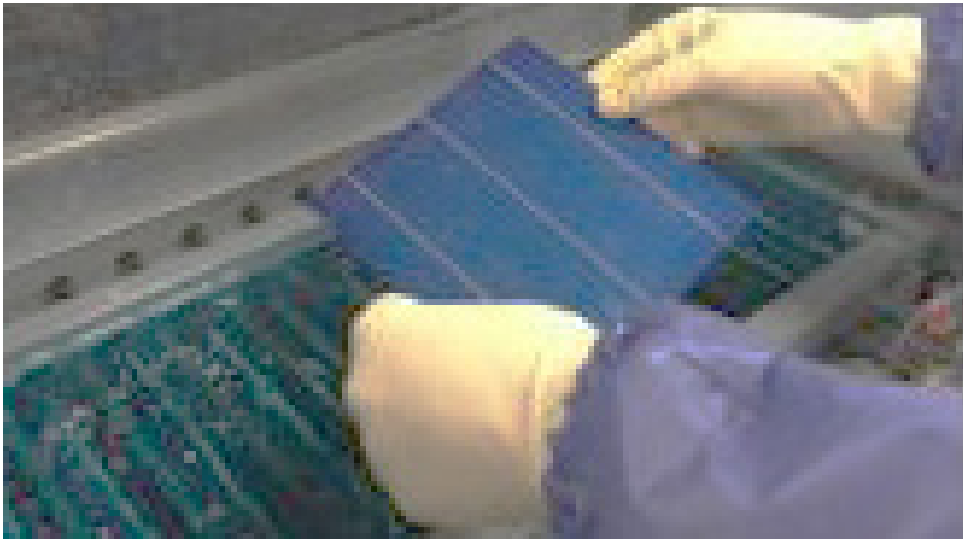
If you've ever done outreach, you know how valuable it is to be able to explain your research and what you love about science in a language that all your audience can understand. This is why QESST implemented a 1000 Word Challenge for their scholars. The requirements are simple: explain your research to the public using only the 1000 most common words in the English language. But describing what you are doing as a researcher and explaining how you are doing it, with such a limited vocabulary, is not simple. Besides, when doing outreach, we should not shy away from using terminology – we should just be aware of it and find meaningful ways for students to make connections to it so they can understand it. Thus, in our implementation, we allowed for a bit more flexibility in the language, without taking the eye from the prize: showing in a manner that's easy to grasp, how Solar Energy impacts our lives and how what we do matters.

Below are three of the winners of this 1000 Word Challenge. We hope you enjoy them!

COPPER IN SOLAR PANELS

Joe Karas, Arizona State University

I'm Joe Karas, an electrical engineering researcher and student at Arizona State University. When I go to work, I try to make special panels that you can put on your roof to collect sunlight. We call them "solar panels", because in some languages the Sun is called "sol". The reason my solar panels are special is because



they turn sunlight into electrical energy. Electricity is what comes out of the plugs in your house and turns on the lights, turns on the TV, and runs the refrigerator. If I do a good job as an electrical engineer, anyone will be able to buy these panels, put them on their roof, and have all the energy they want to turn on as many things as they want.

Right now, your parents could buy some of my solar panels and put them on your roof, but they would cost a lot of money. It would almost be like buying a brand new house! One reason solar panels cost so much money is that they have a little bit of silver inside them, like buried treasure or your Mom's best jewelry. It turns out that silver is really good for helping a solar panel collect more energy from the sun and transport electricity out to where it can be used. I could use something cheaper than silver, but then my solar panels might not work as well. But that's exactly what I'm trying to do!

So, what should I use? Glass, wood, and plastic are great materials because they're very cheap. In fact, they're so cheap that sometimes when we're done with them we throw them away! Nobody ever throws silver away, and other metals cost enough money that we should recycle them instead of throwing them away. But even though those materials are cheaper than silver, they're not good for getting the energy out of the solar panels and into the wires that run through your house.

But let's think about wires for a minute: they're pretty good at carrying electricity! They run from the things you plug into the walls, through the walls of your house, and outside along poles. Those poles go all the way to a power plant, far away. So, what if we just used the same material in a solar panel as we use in a wire?

If you look at the inside of a wire, you'll see that it's made out of a thin piece of metal. Most wires are made out of an orange-colored metal called copper. We use copper for all kinds of things: wires, water pipes, and the coating on the outside of pennies. Copper isn't cheap, but it is much cheaper than silver. Pennies have just a little bit of copper on the outside, less than 1 cent's worth. But if instead pennies were covered with the same amount of silver, they'd be worth 5 cents!

Silver is great for carrying electricity- in fact, it's the best material in the world for carrying electricity. But copper is really great too - it's the second-best! And it's much cheaper than silver, which is why most people use copper instead of silver for making wires. Anybody can afford to buy a little bit of copper wire, they sell it at lots of stores. I want to do the same thing with solar panels. Right now, we make solar panels using a little bit of silver, and it makes the solar panel expensive. If I can replace the silver with copper, I can make it so that anybody, even a kid, could buy a solar panel. With your own solar panel, you could charge your phone or turn on the lights. Or we could make solar panels so cheap that we could give them away to people who need them.

But it's not as easy as it sounds! Copper is just a small part of what goes into my solar panels. We use other materials like silicon, plastics, and glass. Copper has a bad habit of reacting with those materials in ways that cause the solar panel to stop working so well after a while. So my job is mostly to make sure that the copper stays where it's supposed to and doesn't touch the silicon or the plastics. One way I do that is by covering the copper in other metals- like nickel and tin. Nickel is what nickels are made of. Food cans also contains some tin. Nickel and tin don't react with copper, so coating them around the copper in a solar panel helps everything stays right where it's supposed to be. The solar panel lasts for a long time, and if I did everything right, it will provide as much energy after 20 years as it does today.

Powering the World in Colorful Ways

Benjamin Chrysler, University of Arizona

Scientists are always coming up with ideas to make our lives better and safer. Scientists at the University of Arizona want to use the colors of the sun's light to make electricity cheap and safe. Why do they think this idea will work, and how do they plan to do it? First, let's understand how we make electricity now – and how we can already use the sun to do this.

Even though it's invisible, electricity is important in our lives. We use it to light our houses, charge our smartphones, and power our computers and TV's. You already know how to use electricity, but do you know how it's made? Most electricity is made by burning oil – which is cheap. But scientists predict that if we continue to do this, we will hurt the earth by making it hotter than normal and our air will become unhealthy to breathe. This, and the fact that we will one day run out of oil, mean that burning oil is not a sustainable way to make electricity, which means it is something we cannot keep doing forever.

Luckily, oil is not the only way to make electricity. Scientists have known how to make electricity out of sunlight for a long time. Have you ever walked outside on a sunny day and felt the sun's light warm you up? This is because sunlight has energy. Instead of turning sunlight into warmth, a solar cell uses energy from sunlight to make electricity.

When sunlight hits a solar cell, it makes tiny particles called electrons move in the same direction, like a river. This river of electrons is what we call electricity. When you put several solar cells together, you have a solar panel, which makes enough electricity to help power the things in your house. We will always have the sun, and solar panels are safe for the earth – so scientists say that using solar panels is a sustainable way to make electricity.

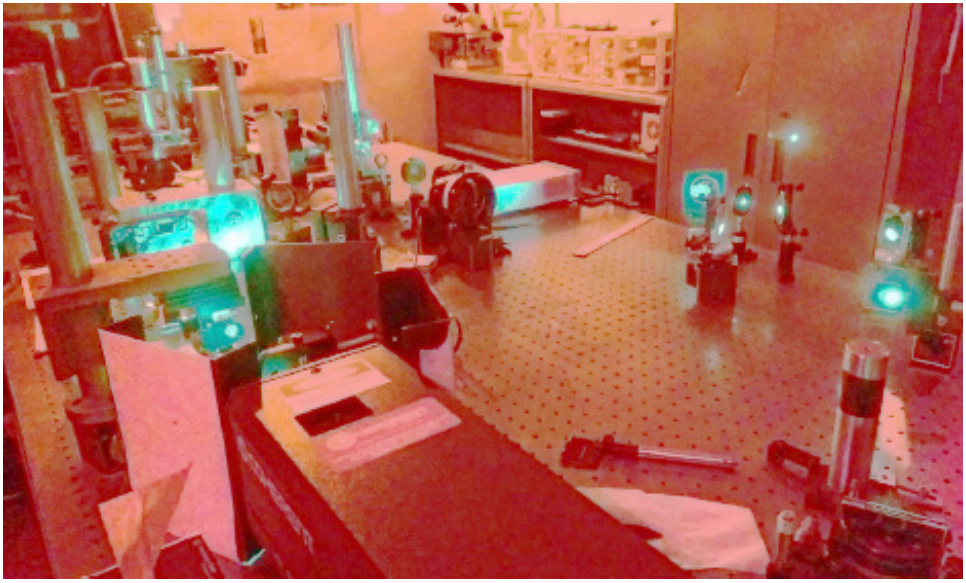
Look Familiar? Solar panels make electricity from sunlight. They can often be found on the tops of houses or parking lots.

Sounds great, right? So why do we still burn oil when we could be using solar panels to make our electricity? The answer has to do with money. It's still cheaper to make electricity from oil than it is from using a solar panel, and many people will not buy solar panels until that changes. Scientists know this, and they are coming up with new ways to make more efficient solar panels. An efficient solar panel is able to make more electricity from the same amount of sunlight. If an efficient solar panel is sold at the same price, then the cost of electricity will be cheaper – you get more electricity without spending more money!

Scientists at the University of Arizona think they have an idea to make solar panels more efficient. Their idea is colorful. But first we have to understand something about the sun's light. Sunlight looks white or a little bit yellow, but it is actually a mix of all the colors – blue, green, red, and even an invisible color of light called infrared. Scientists in the past have learned that solar cells are best at making electricity with certain colors of light. Most solar cells are best at making electricity with red and infrared light, but other types work better with blue and green light.

So why not give everyone what they want? Is it possible to send different colors of the sun's light to different types of solar cells – all within the same solar panel? That is the question scientist Raymond Kostuk and his team of students want to answer. And they think the answer is yes! But first they need to make a hologram. A hologram is a 3D photograph that can send the colors contained within sunlight to the right solar cells.

Dr. Kostuk's team of students spend their time using bright, colored light from a tool called a laser to make holograms for their special solar panel. After using science and math to help them decide how to make the hologram, they hold to show that their idea works in the near future. But first, they need to practice making holograms. They need to do this over and over again while making small changes to get it to work just right.



Scientists at the University of Arizona use lasers to make holograms. This special tool sends out bright green light that travels in a straight path.

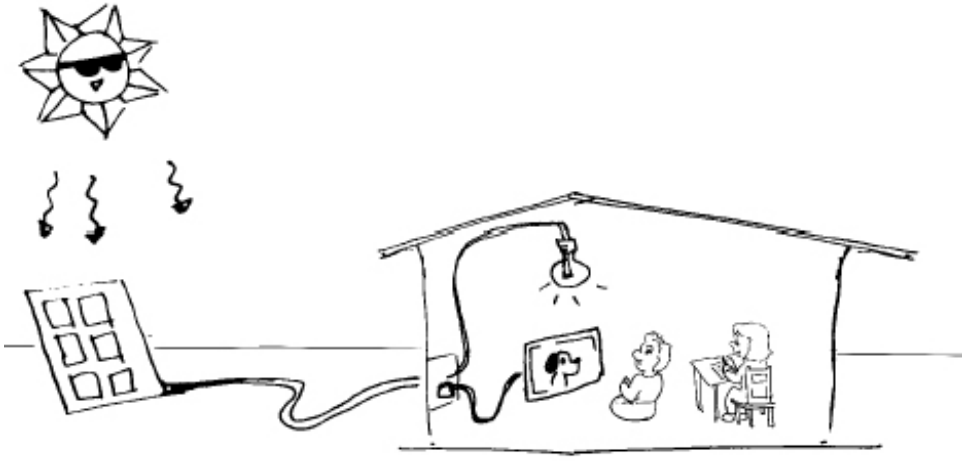
Dr. Kostuk's group is already thinking ahead to how they will set up the new solar panel to test their ideas. Since they do not make solar cells, they teamed up with scientist Zachary Holman's group at Arizona State University to get the right solar cells. With their help, Dr. Kostuk's group now has everything they need to test the new solar panel. If it is successful, the idea could be used in solar panels in the future for a cheaper way to make electricity. If it is not, the scientists will do what they always do: learn what went wrong, and change their idea to make it better.

The Favorite Color of Solar Cells

Silvana Ayala

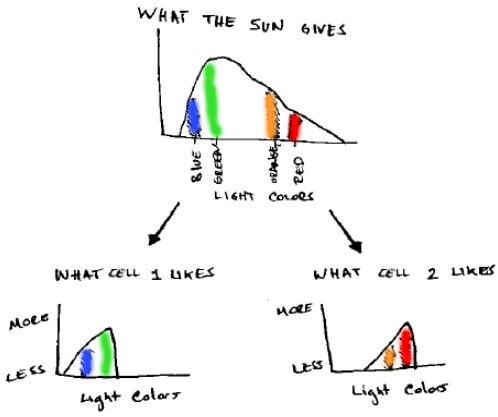
Hello, my name is Silvana Ayala. I am a solar engineering student at the University of Arizona. My work is to make the world a better place, by finding new ways to power everything in your house, like your computer, TV, lights, hair drier, cell phone charger, coffee maker. Most people today use power produced in ways that are not very safe for the world, but I want them to use the sun, because is safe and there is A LOT of it! That's why I study how to best use the sun to power everything you own.

The sun sends us light, which has many more colors than you can imagine. Blue, green, yellow, pink, red... and many colors in between. Fun fact: The sun sends us a lot more blue and green than red, that's why the sky is so blue! But how can we gather that light and make it go into your house? It's not easy: you need something to change it into power you can use. That's why engineering researchers like me created solar cells that like to eat the light from the sun and throw out power you can use in your house.



Solar cells are made from different things, and how you make them so they eat light is a big area of study. Some solar cells like to eat blue and green light, some like more pink and red light. Some like all of the light, but they don't throw out very much power. In my work, I do not make solar cells themselves. Instead, I put different kinds of solar cells together and make different colors of light go to the solar cell that likes it the best. That makes the cells give the most power.

It's like me and my brother used to do when my mother gave us dinner. If we shared our dinner, I gave him what he liked to eat and he gave me what I liked. That way both of us get to eat more of what we like. The only difference is that these solar cells eat light instead of dinner!



But the hard part is figuring out how to make the light go to the right kind of solar cell. But you can do it through Optics! You can use glasses, like the ones your dad might wear to read, with different shapes to make light go into a small, small spot (which is called "focusing"). You can also use mirrors to move light around. You can also use more complicated optics, like grids that are so so so small that they can break the light into the colors! All of this together can make a system that makes the light do what you want. If I can figure out how to make it good enough to not lose any light, and also make it easy to buy, then I'll have figured out how to make this world a better place!