MARK HARTMAN: So we're going to put down-- we're going to talk together about what is the point of the restaurant analogy. What is an analogy? Anybody remember what an analogy is? Chris, you remember what it is. So tell us.

AUDIENCE: Oh, wait. Is it like [INAUDIBLE]?

MARK HARTMAN: No.

AUDIENCE: Oh. Wait, no.

MARK HARTMAN: An analogy. Think back to English class. Lauren knows, so she's going to tell us. Ooh.

AUDIENCE: Well, I don't really know how to explain it. But it's when you take one situation and you relate it to another.

MARK HARTMAN: OK, when you take one situation and you relate it to another.

AUDIENCE: You compare.

MARK HARTMAN: Like what?

AUDIENCE: You compare.

MARK HARTMAN: You compare. You compare two things. An analogy would be like-- ugh, I can't come up with one off the top of my head. So fruit is to apple as zucchini is to vegetable. An apple is a specific kind of fruit, so there's a relationship there. But a zucchini is also a specific kind of vegetable. I heard you guys talking about fruits and vegetables out in the hallway before.

So an analogy is a way to draw a parallel or draw a connection between two situations that seem different, but there's some part of that situation that's the same. And that's what we're going to at here. We're going to make three columns here, and we're going to compare the restaurant.

We're also going to compare-- let's say this is our restaurant data. Or I'm sorry, restaurant observation. Then we're going to look at an astronomical observation. And then we're going to look at what it's called, or the name. So leave a good amount of space underneath this. You

need at least a half a page, if not more.

So the first restaurant observation that we made was this histogram, and it was a histogram of the number of people polled-- does everybody know what a poll is, P-O-L-L? If you've ever heard of an election poll, that's when people stand outside of the election booth and they say, will you tell us who you voted for? You don't have to tell them. But it's the number of people polled or asked leaving the restaurant, the number of people polled leaving the restaurant.

And we made a histogram. That was the y-axis. And we said, how many calories were carried out? Because we asked them, how many calories did you have? And we saw that there were some peaks that were low, maybe went down. And then there was a good amount that were out here at high calories. So we saw, yeah, there was some peak at low, also some peak at high.

AUDIENCE: What's that say?

MARK HARTMAN: It says, number of people polled leaving the restaurant.

AUDIENCE: Oh, yes. Thank you.

MARK HARTMAN: Or if you don't want to use "polled," you could just say, number of people asked. These people came out of the restaurant. We stopped them and said, hey, how much food did you have?

We also, just today-- so down below-- we made another histogram. And again, it was the number of people asked leaving the restaurant. But what was our x-axis this time? We asked them about the number of calories that they ate, but what did we ask them this time?

AUDIENCE: Time. The time they left.

MARK HARTMAN: We asked them what time is it. What time did you leave the restaurant? So we're going to say, time the person left.

And we found that there was kind of a peak here at low times, at 8:00 AM. And then there was kind of another peak here at lunch. And then there was another wider peak at dinnertime. So those are two observations that we made about the people who were leaving our restaurant. Well, it's not our restaurant, but somebody's restaurant.

What is an astronomical observation that's kind of like the first observation? Instead of the number of people asked leaving the restaurant, let's look at the number of photons collected

at the detector. We've made histograms like that before, right-- the number of photons collected. But what was our x-axis? It was?

AUDIENCE: Energy.

MARK HARTMAN: It was energy. We looked at the energy of each photon. What did we call-- and let's look at the supernova remnant spectrum. It kind of looked like this. It kind of went up. There was a spike, a couple of spikes, and then maybe a couple of other peaks. And we found out that each one of those peaks was produced by an element that was giving off a particular energy of photon because it was bounced around.

So let's think about this analogy. Here, we've got the number of things collected. Here, we've got the number of people collected, the number of people asked. Here, we've got the energy of each photon. Over here, we've got the energy that the people carried out. Calories is a measurement of energy. How much food did they have? That kind of makes sense.

What did we call this graph? What was the name of this observation if we looked at the number of photons collected as a function, or on the x-axis, as energy? David?

AUDIENCE: A spectrum analysis.

MARK HARTMAN: We called it a spectrum. When we did an analysis of it, we looked at it and compared it to other things. But we called this a spectrum. And we said a spectrum represents the intensity as a function of energy. We could also call this number of photons collected intensity.

Well, we're going to learn, very quickly, how we can do something similar with time. Again, we're going to look at an astronomical observation. And again, we're going to say, the number of photons collected at the detector.

Actually, I'm going to add in one other thing. Here, we said the number of photons collected at the detector. We're going to say the number of photons of one color because we said, for intensity, we had to specify that it was a certain energy of photon or a certain color of photon.

Well, here, we're going to look at the number of photons collected at the detector. How could we draw the analogy between our situations now? What should we put on the x-axis for our astronomical observation?

AUDIENCE: The time that [INAUDIBLE] by the detector.

MARK HARTMAN: OK, say it nice and loud to everybody else.

AUDIENCE: The time that the shot was taken by the detector.

MARK HARTMAN: OK. We are going to say the time each photon was collected by the detector, time each photon was collected by the detector. And again, it's going to look-- well, we actually don't know because you haven't done it yet. You're about to.

Now, we are going to say that in this case, we're looking at the number of photons collected at the detector. We don't care about what energy they are just yet. So this is again going to be flux. It's just the number of photons that we collected.

Remember, we said before when we're looking at variable sources, we want to look at the amount of the flux change. We also look at the time that it took for the flux to change. Well, look at that. On this graph, we've got one axis for each one of those. How about that?

We're going to call this observation or this kind of observation a light curve. We should really call it a flux histogram, but historically, people have called it a light curve. It's the amount of photons collected at the detector, the flux, as a function of time.