

On the Sensorium

What we're going to start with here, is an introduction to the Sensorium, and what the Sensorium really is. And so, I think the best way to get this started, is to have everyone go through a nice, little, Romantic pedagogical with me. But, it's not like any of these "pedagogicals" that were developed with the Baby Boomers in the '60s, so you don't need to worry about any side-effects, like flashbacks, or pregnancies, or



Merv Fansler leads off the youth panel on creativity and scientific discovery: "How do we really know that there is anything which lies outside our senses?" Seated is Adam Sturman, who spoke on "Extending the Sensorium"—through the breakthroughs in telescope technology for exploring the heavens.

some increased need to consume things.

So, what I'd like you to do, is, everybody just sit still, and look forward. Now, I want you to become aware of what you're actually seeing; go through your vision first, and keep your eyes straight. You can see on the sides of you, without having to turn your eyes, right? So, you have this peripheral vision. Everybody can keep looking forward; don't move. So, that's your visual domain, this is what you can see with your visual.

Second, let's add another sense in here. Let's look at your hearing. Listen to what you're hearing—everything that you're actually hearing. Try to focus both on what you're seeing at the same as what you're hearing. Because you're being presented with two different things, at the same time. You're going to hear some background noises—people coughing, people walking around you; predominantly my voice is what you're going to hear.

So, after this, now we can add in the third and the fourth: We can add in, what you're smelling, what you can taste. Everybody probably just had dinner, so you can taste all the food that you've just eaten, and there's some smell. (This room is not very pungent, so it's not very distinct.)

So, we have all these four senses going on. And, let's add the fifth one, and so, let's see what you can feel. What are you feeling right now? Just focus on all these senses, all these things which you're actually being presented with. So you can feel the clothes on your body. You can feel the pressure of your feet on the floor; the chair pushing on your body. You can feel all these different things: the air going in and out of your lungs.

These are your basic five senses. This is what your presented with. These five senses are separated, but they're together. Everybody can relax now—not that you weren't already relaxing.

And so, this is your immediate Sensorium. This is the "now." This is what you're currently being presented with. And so, what you have is, just all these different feelings that are coming, all these different senses that are coming in. I'm sure the Baby Boomers are very used to this state, because they've been indulging in the "now" for most of their lifetime.

Paradoxes

So where are we going with this? What we have to begin with, is, we have these five different senses; and how are these five senses working together? And how you can think of these five senses, is sort of like a polyphony. If you remember back to the [Bach] Chorale that was sung last night: You had four different voices, and all these different voices were all singing about the same idea, right? But, none of them had the direct idea, of what the idea actually was, but they were "projections," you may say, of an idea onto different voices. And this is what you have with your senses: It's like a projection of something which might lie outside of there. You don't know if there is anything outside of your senses—or, at least, we haven't established that yet. So, you can think of these five senses, as a sort of a polyphonic thing you're being presented with.

And, what you'll find with these five senses, is certain paradoxes that might arise, if you start to play with the things that you're actually being presented with.

FIGURE 1.1

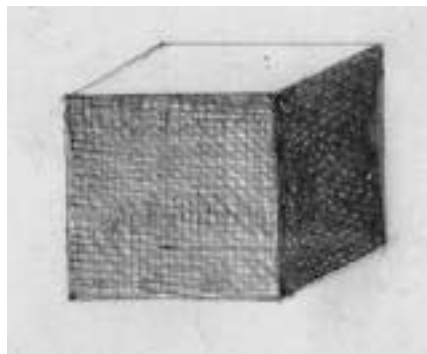


FIGURE 1.2

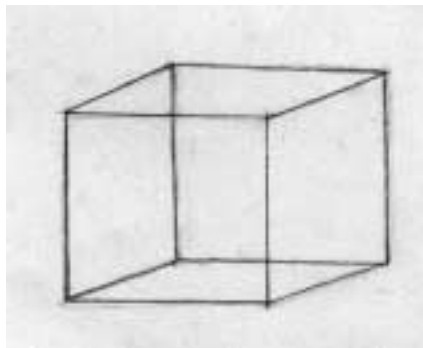
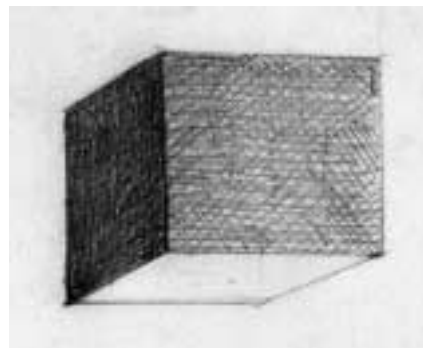


FIGURE 1.3



And so, the first thing I wanted to look at is just a cube (**Figure 1.1**). And then a wire-frame of that same cube (**Figure 1.2**). Now, **Figure 1.3** is another cube—and Figure 1.2 is the frame of that cube, also.

So, both of those two cubes—the first one and the third one—are two different things, but this one in the middle has an ambiguity about it, because you don't know whether it's the first cube, or the third cube: It can be both. And so, there's something going on in this visual Sensorium, such that this ambiguity is arising.

So, what I'd like to do now, is to try another example of this, and do it in music. I'm going to play something very quickly on the piano. I'm going to play a melody, and then I'm going to play a key with that melody. [C-D-E-F-D-E-C-F[#]]. Now, that last note that I played, has a certain type of sound to it, right?

Okay, now I'm going to play another melody [C'-D'-E'-F'-D'-E'-C'-F[#]]. Now, it has a different sound. It's the same note, right? But, it sounds differently.

And, so you can see, that in that note—what I'm actually playing is an F[#] there—in that one note, you're finding that it's really ambiguous about what it really is. I'm playing the same note, but in respect to what's happening, it's having two different meanings arise in it. And so, that's another example of one of these little paradoxes that are arising in our Sensorium.

What we'll find then, if we continue to explore what we're presented with—if we begin to explore these different things—we'll find a lot of small, little paradoxes like this; but we'll also find some things, that are going to stun us, that we can't really explain.

One of the first things that we're really presented with, and what ancient man was presented with—and this is really where the beginning of modern science came from—was the nighttime sky, and what was happening with the stars; and looking upon this, and being amazed by what we were seeing. What I have is a quote from Schiller "About Man." He says: "The view of the unlimited distance, in incalculable heights,

FIGURE 1.4



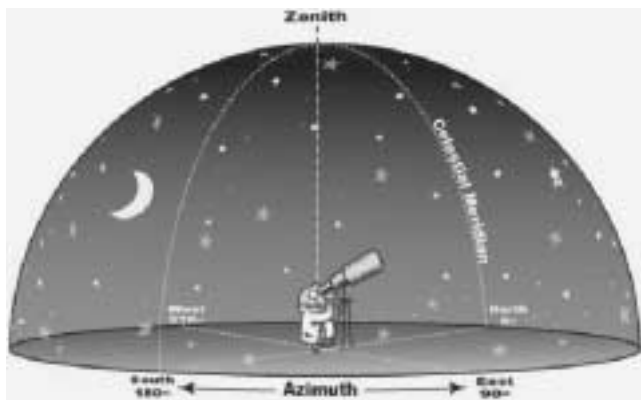
the wide ocean at his feet and the greater ocean above him, snatch his mind away from the narrow sphere of the real and oppressive imprisonment of the physical life. A greater measure of estimation is held before him, by the simple majesty of nature. And, surrounded by its great forms, he no longer endures the small way of his thinking."

So, what I'd like to do is, work through a little about what's going on in this Sensorium, or what we're presented with in the nighttime sky.

Figure 1.4 shows a picture of the nighttime sky, with some stars, some constellations marked out. If you would look out into the sky, what you'll find is, you'll have around you, you'll have a sort half-sphere. And in this half-sphere, you're going to notice a few things going on: You're going to notice that you have stars there, and there are certain relationships between these stars—you have this idea of a constellation. What happens is, you say, "Okay, I want to map what's going on in these stars. I want to find out what's happening here."

So, if you look up, and you try to measure the stars, you can do so, by taking angles between stars. What I'd like every-

FIGURE 1.5



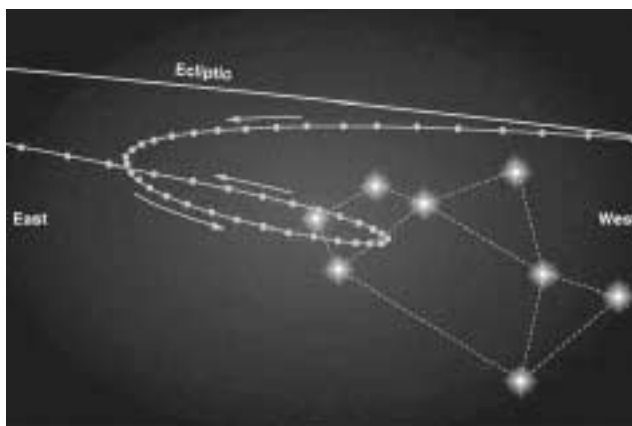
body to do, is just look at the center of this room back here, and then look to the back of the room there. And what I'd like you to do is, then point to the front of the room, here, and then follow the line back to [the back of] the room. (So, everybody's just looking very ridiculous.)

Now, I want everybody to do it again, but look what the other people around you are actually doing. Look how they're doing it. Now, it seems like everybody on this side of the room is saying, "Well, okay: I'm pointing in this direction [toward center-line of room]; I'm going like this." And then, everybody on the other side of the room, is saying, "Well, it's on the other side of my sphere [also toward center-line]!" And so, if everybody says, "Well, I'm the center of the universe," everybody is going to have a different sphere that they're looking at! So, at every point on the Earth, you actually have a different perspective, you have a different "sphere" of what you're going to run into. What you can do, with your own sphere, is, you can measure out these angles, as I was saying before, to find the relationships between the stars (**Figure 1.5**). Like, if you point here, and then follow it back, you have a certain arc-length that I'm going to be tracing with my arm, in my sphere.

All around the Earth, you have a total sphere, right? But, the problem is, how do you reconcile the difference between what the individual person is seeing, when he goes out on one point on the Earth and looks at the stars, sees his own little half-sphere, and the person that goes out on the other side of the Earth, or at a different latitude or a different longitude, and sees another half-sphere? And, so how would you actually construct this celestial sphere, and find the relationships between these stars?

In constructing this sphere, you begin to notice a few things. You'll notice different motions going on in the sky. To begin with, you'll have this background, this mapping on the background, on the inside of the sphere that you're looking from; you're going to notice that this is going to move, slightly, and it's actually going to move, at a rate that it moves

FIGURE 1.6



around the Earth once a year.

But then, you run into a second motion. You'll see this main motion, where the whole sphere, all the background stars, are going to be rotating around you, in an East-to-West pattern. And then, secondary to that, you're going to find these other stars that just seem to move around on this sphere that you're seeing. These were known in the ancient times as the "Wanderers," which today, we know as planets. And these planets bring some problems into how we assume how the universe works, or how the heavens are actually operating.

We run into the problem that we get some funny things going on in the motion of the planets—particularly Mars (**Figure 1.6**). Mars is going to follow a path on the background of this celestial sphere; it's going to come around, and make a loop. So, how are you going to explain that? What is really occurring, to generate some form like that? What I have next, is a film showing the actual motion of this. It looks like it's actually stopping, almost, and then launching off in different directions.

When confronted with this, the empiricists say, "I can sort of explain this. I know what's going on."

Now, let's look at what Kepler did, using the data from Tycho Brahe. Before, he had this model of what was happening with respect to the Earth (**Figure 1.7**). If you have the Earth in the center, and then you have all these spirals and things going around—this is the pattern that Mars is moving in, with respect to the Earth, in a year. So, this is very complicated, especially when you take into consideration, that most people consider everything moving in the celestial sphere, to be moving in circular orbits, because—well, why not? "Circles are the most perfect thing in the universe, so everything is going to follow a circle."

A few people came up with different models for this: First, is Ptolemy (**Figure 1.8**). Ptolemy said, "Well, the Earth is at the center of the universe." It's like everyone says, "I am the center of the universe. So the rest of the universe must be

FIGURE 1.7



FIGURE 1.8

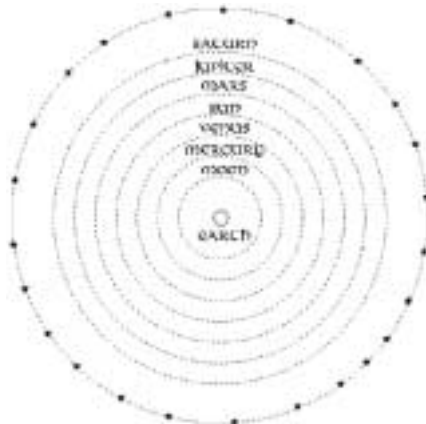


FIGURE 1.9



around me.” And he says, “Everything just follows a circular path, around the Earth.” Next (**Figure 1.9**) is Copernicus. The Copernicus model says, “Well, okay, the Sun is at the center of the universe, and the Earth goes around the Sun.” But, then you had all the religious fanatics say, “Well, this is impossible. The Bible says that this is impossible. So, we’re not going to believe you.” And it was heresy, to actually believe that this was true.

So then, we have the third one, which is Brahe’s. And Brahe’s gets a little complicated (**Figure 1.10**). The Earth is still at the center of the universe—he has the Earth out to the side, but it’s still the center of the universe, everything is revolving around the Earth. Brahe is just compromising with everyone in the Church, to say, “Well okay, the Earth is still the center of the universe. And the Sun goes around the Earth; but all the other planets go around the Sun, then.”

And, finally, I have one of the models of how Ptolemy actually constructed this (**Figure 1.11**), and how Ptolemy is trying to explain the motion here. The Earth is at the center, and Mars is going around the Earth, on little epicycles. On the backdrop of the stars, the celestial sphere, you would see this retrograde motion of Mars: It moves back and then it moves back again, and then it moves forward. So, this is how Ptolemy’s model is supposed to explain this problem.

But what comes up is, that all of these models can *statistically* explain what is going on here. But, can any of them *really* explain what’s going on? You’re presented with things which are really just approximations, shadows, and you’re trying to find out, how do you actually explain these shadows?

FIGURE 1.10

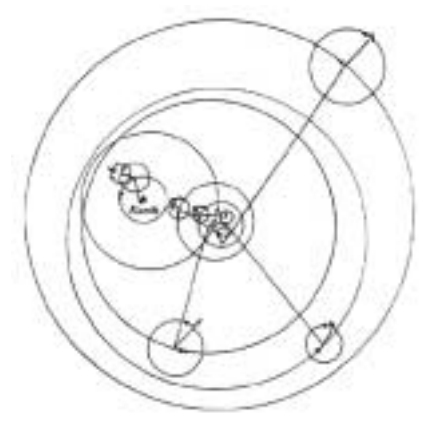
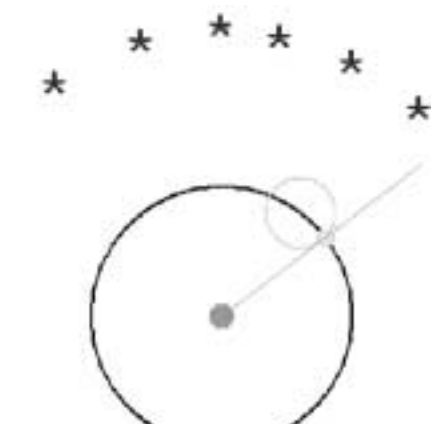


FIGURE 1.11



What is really going on? You’re finding different projections of what is really going on, different shadows of things.

And so, what Kepler said, about this motion of Mars, in particular, he said: “The testimony of the ages confirms that the motions of the planets are orbicular. It is an immediate presumption of reason, reflected in experience, that their gyrations are perfect circles. For among figures, it is circles, and among bodies, the heavens, that are considered the most perfect. However, when experience is seen to teach something different to those who pay careful attention, namely, that the planets deviate from simple circular paths, it gives rise to a powerful sense of wonder, which at length, drives men to look into causes. It is just this, from which astronomy arose among men.”

And so, I’d like to ask a question then: How do we really know that there is anything which lies outside our senses? And, what I’m presented with, or what is a very good question

to present you with, is this thing back here [indicating the podium banner], that says, “World at a Turning Point.” Now, is this a question? How do you know, that it’s at a turning point? You can’t “see” a turning point. You can’t “taste” the turning point. You can’t smell it. So, how do you know that it’s at a turning point?

I think that this is the challenge that we’re presented with.
Thank you.
