

THE WONDERS OF US  
 Making Sense of our Senses -- #4 Vision  
 Tom Kinney  
 October 3, 2004

The Wonders of our World. In a time when we understood less, we named a god Jehovah and credited all the mysteries of life to his control. Today, natural wonders still inspire some to see those wonders as God Tracks. We share their awe and cannot prove their cosmic connection wrong. And that's OK. Others of us label all this "nature" – and leave it at that.

The Wonders of our World – the breadth and depth of them are too much to grasp, to assimilate from all the specialists who devote lifetimes to understanding but small corners of these processes. We can, and some have, built a theology of sorts on this ever evolving, ever changing universe of which our earthly existence is but a small part. Our secular humanists simply say—"Wow! Neat!" and get on with a productive life.

But, possibly, most fun of all in looking at the intricacies of nature is to reduce that universe, universe within universes, until we bring our scope of thoughts down to the universe that is us, you and me. Just look at us, you and me. Each of us a unique but pretty fancy mechanism on our own specific journey.

Let's explore some more Wonders of Us. And it's OK to appreciate the Wonder and share the awe, whether or not you select a god that appears in the credits at the end of this show, or not.

---

Main Talk –

We are on our journeys, our journeys through life. A need in my journey has always been to make sense of the world around me. From the time I was very young, I believed the world was rational, explainable. Then I discovered girls. So I modified my needs [stop the smirking, that's not what I meant] I modified my needs by thinking the physical world must be understandable. However, the emotional, sociological, and political world rationality is still suspect.

My childhood was well served by mysticism – the tooth fairy, Santa Claus, and the traditional trinity. I'm pleased it was because I had so much to learn that believing in these three -- or four -- or was it five beings relieved the pressure temporarily. You see I grew up in Trinity Reformed Church on Cork Street in Kalamazoo and it was never clear to me if I had two more gods than my Methodist friends or one more than my Catholic friends or just what (my Catholic friends seemed to have girls among their gods which was kinda neat). We moved when I was twelve and became Presbyterians, which helped a lot. I could then focus on what wasn't covered by God.

I was awed like everyone else by the beauty of life around me – but maybe a little less so than some at, say, a sunset. I couldn't shut down the technical side. Thoughts would cross my mind as to how those islands of vapor floated in the air, always being reshaped by temperature and winds. Consideration of how the light reflected off those

clouds and was refracted into colors with certain colors being lost through the horizontal thickness of the atmosphere leaving only oranges and reds remaining. But, on second thought, maybe I appreciated sunsets more. I don't know. I did notice everyone did not share my awe at the beauty of a 16 cylinder Duesenberg cabriolet with body by Berlitz – but that's another story for another time.

As my thoughts made progress toward maturity (a process that is ongoing, I guess, because I never seem to wholly get there), a new fascination, a new sense of awe arose, over how we, as humans, and our world got this way. The stages of my thoughts seemed to be – He (the big He) created us. Well, no, He designed us. Well, no, He steered the evolution of us. Well, no, against all probabilities, we just happened. Well, no, our complexity is probable, given enough evolutionary time and we are just the design that did happen. And aren't we AWESOME! And to whom do I express appreciation? –Are there God Tracks here somewhere? I don't know – so it is to you here, my friends, that I hope to express my appreciation and share my awe. And, I hope you'll share and celebrate these wonders and take a little inspiration home with you. So let's start into the last on this series on our five senses – vision. I say the last because I covered touch three or more years ago. If you would like me to update and repeat the magic of our hands in the near future, please let me know.

Anyone who has slowed enough to think about it must marvel at vision. Whereas we have talked about the millions of sense receptors that are a part of hearing, taste, smell, and touch, they amount to only 30% of the body's sense receptors. The other 70% are in the eyes. Lovers close their eyes when they kiss because, if they don't, there would be too many distractions to notice and analyze – a sudden close-up of the loved one's nose, eyelashes, hair, the wall paper, the clock face, dust motes suspended in the shaft of sunlight, a ceiling that needs painting, and, by the way, when are you going to paint that ceiling? We boys especially know the importance of closed eyes.

Our eyes work like a camera or, I should say, a camera was designed to work like our eyes. Where a camera lens focuses by moving the lens closer or further from the object, our rubbery, bean-shaped crystalline lens achieves the same effect by changing its shape; thins for distant objects and thickens for closer ones. A camera opens and closes its aperture if it needs more or less light. The iris of the eye, which is really a muscle, does the same thing; as it opens or closes the small hole, the pupil, where the light enters the eyeball. If you've always wondered why fish are easy to dazzle with bright light ----- you have wondered why fish are easy to dazzle, right? ----- they have no control over the size of their pupils. Irises are individually unique in their patten of color, starbursts, spots, and other features, which is why they can substitute as identifiers like fingerprints.

On the film (or pixel) side of the eyeball are the light sensors. A good digital camera has about 4 to 5 million, is it? Who knows camera stuff? Well our system is dual – parallel transmission of black and white with another system broadcasting in color. To Kodak's paltry 4 million, we have 125 million thin, straight rods registering black and white and another 7 million cones transmitting in color. And that's not just a snapshot every second or so but a continuous reporting of news and views as it happens. And we can detect a candle in absolute darkness from 10 miles away. Some camera, eh?

And you get two, small enough to fit in the sockets in your head, and their free – double prints. They come with their own tripod, automatic aiming, and built in interface cable. A minor shortcoming is where that interface cord, or optical nerve if you please,

hooks in to the eyeball, you do get a blind spot. [Flip Dot] Look at the dot with one eye with the dot centered. Now using periphery vision to keep track of the dot as your move you eye around you will see the dot disappear – blind spot. Open the other eye and it will tell the brain the dot’s still there. [Dim the lights]

Oh, one other feature in your free camera, it’s equipped with a fovea. And this is one of the best features. [Flit the ‘vette] Look at this picture in dim light. If you’re having trouble seeing it sharply, look a little to one side. Now, suppose I shine a bright light on it. Much better, right? The fovea is a tiny crater in the middle of the back of our eye that is jam packed with color cones. And that is why only the center of what we see is exceptionally sharp and, since color cones need much more light than black and white rods, in dim light we can’t see the absolute center of our vision as well. [Turn up lights] That tiny crater amounts to an area of about 4 inches square at eight feet distance. That’s the difference between looking my way and looking AT me. If were to pull out my handkerchief to blow my nose, I know that that handkerchief would be in everyone’s fovea. (bright handkerchief)

We benefit from light from many sources, direct light from the sun and stars, reflected light from the moon, man-made light and light from animals and plants like fireflies and wintergreen. Wintergreen flashes as its crushed as you may know if you have wintergreen in your woods as we do. Step into a dark closet with a mouth full of wintergreen lifesavers and a friend and watch the sparks fly.

Our colors don’t fade to blindness in dim light like those on film. Our eyes work on color ratios, not absolutes, comparing them to one another, compensating for the time of day, light source, and memory. Otherwise our ancestors wouldn’t have been able to find food at sunset or on cloudy days. And we all see a bit differently, especially when it comes to colors.

Now tell me that’s not an awesome piece of equipment that you’re blessed with. And we haven’t even got to the rest of the system – the other end of that interface cable, that optic nerve. You see, seeing, as we think of it, doesn’t happen in the eyes but in the brain. We often see scenes from days or even years earlier, viewing them in our mind’s eye, and can even picture imaginary events, if we wish. Sometimes with our eyes wide open ignoring what our eyes are currently telling us – day dreaming. We see in surprising detail when we dream. Diane Ackerman in “The Natural History of the Senses” reports after intense visual rapture (her words, not mine), an overwhelming landscape such as the Grand Canyon, Antarctica, the Alps, that upon closing ones eyes that night, that landscape can continue to parade across the backs of our eyelids. She claims it is not like dreaming: it was like trying to sleep with your eyes wide open during a fiesta in full swing.

Our vision system has some marvelous skills. One is an ability to monitor our periphery view for novel occurrences or intriguing shapes while we are occupied elsewhere. When something of possible interest happens, it grabs us by the collar screaming “will you please pay attention!” As most of you know, Charley and I do lots of hiking during our warm winters in the south, most of it just cross country through the woods, meadows, arroyos, and desert scrub. Many a time our vision systems have grabbed us by the collar and said “Did you see that!” I hadn’t seen it until I looked in earnest. Yup. That stump sure does look like a mountain lion...or, ya, ya, just another

jack rabbit or armadillo. Or, hey there IS and old building foundation over there – let’s go take a look. It’s peripheral movement and shape recognition.

We were out hunting prehistoric sharks teeth once along miles of deserted beach that was known for such treasures. Shirley was searching in earnest and I was half-heartedly following along enjoying the sun, the quiet wavelets, and checking that the boat was still there...anchored a mile or so off the shallow shore. We had no pockets and our goody bag was empty when we saw a speck off in the distance, another person seemingly with the same interest. We decided to trade our privacy temporarily for the opportunity to meet and possibly learn a bit from this individual. It turned out first that this person was a he and, second, that he was quite knowledgeable in the field having contributed much to science and had been one of the featured individuals on a PBS documentary on prehistoric sharks teeth and related subjects. He reached into his pocket (he had pockets) and gave Charley the first prehistoric sharks tooth she had ever handled. And it was a nice one about 1 ½ inches long. We bid our farewells and went our separate ways. In less than a minute, Charley had found another tooth. And shortly thereafter, another. And as we hopped into the dinghy for the run back to the boat, she counted 36 shark’s teeth to add to her collection which then totaled 36. I may have even contributed a few. But what was marvelous, is that that one gift of a sharks tooth had imprinted it’s and colors shape on our vision computer with an unspoken, “Oh! That’s what were looking for!” And the computer, for the most part, took over. Without conscious effort, our eyes would scan the hodge-podge of pebbles and shell, hundreds of thousands of shapes and colors, and the shark’s teeth would jump to our attention. We have since tried this with other novices like us. No luck, followed by imprint the shape, followed by success. -- - Have you ever noticed how your own name unexpectedly jumps out of a long list of names or page of text? Or how you can rapidly scan for a specific word faster than you can comprehend what you’re looking at. It’s as though your vision system is on automatic pilot. It’s likely the same system that grabs you by the collar and says “Hey, pay attention! I think I saw a bear!” And then sheepishly recognizes it’s just another stump. You sooth the embarrassed occipital lobe by replying “Clam down. Yes, it could have been a bear.. Keep up the good work.. Keep us safe.”

Seeing is believing, we say. Those fancy tools that augment our sight, like the electron microscope and the Hubbell telescope give us even more to see. The ability to see the amazing design of the human eye and learn how it works is made possible by such fancy tools. And that amazing design complexity is part of the argument convincing many that a supreme being, a master engineer, is out there somewhere. In our little corner of this world in White Stone, VA, some may call the marvel of the design of the human eye, God Tracks. But are they really? I see a continuum from the light sensitive spot that helps miniscule creatures turn toward the sun to the eye of the eagle. And a myriad of stages in between – stages in eye evolution? Makes sense to me.

Seeing is believing, we say. We see the sun rise in the East, run its course across the sky, and disappear in the West. The sun is so bright, it interferes with our ability to see Apollo’s chariot which is carrying that sun on its daily route – God Tracks? Early civilizations created explanations for what vision told them was true. Today, some see a cosmic being in things we see but don’t fully grasp. Others create equally unknowable explanations for the actions taken by friends and loved ones. Both assumptions of knowledge can be damaging. We have a tendency to stash these assumptions of which

we feel so sure -- into unknowable places to make it difficult to be shown wrong. The ancients housed their Gods in the skies, like so many quarrelsome neighbors who, in fits of temper, hurled lightning bolts instead of crockery. Or they were stashed at inaccessible mountain tops in a palatial cave, like the God Aeolus of the winds. Or, later, in the invisible ether surrounding us.

It has been said that the human ability to share knowledge, from individual to individual, from generation to generation, orally and in writing, has been the key to the awesome development of humans as creatures, and human society as a whole. A primary reason for the thrust toward the big brain. I think it was Sir Isaac Newton, when asked about HIS vision to see clearly said "I am but a dwarf standing on the shoulders of giants." One theory of why man started walking upright is to raise his eyes over the waving grasslands to see more clearly his destination and sort his real from imagined threats. There may be something in that for us philosophically, because we indeed do have a significant problem sorting real from imagined threats. It seems society sometimes fumes over the imagined threats and while missing the real ones. In a political season, it is easy to be overwhelmed by the threats we are told to see – terrorism, pollution, personal liberties, excess taxes or too little taxes, such that we run the risk of overlooking the nearby threats to the happiness of our home and family – threats sometimes due to our own actions. Seeing clearly can be such a challenge.

We verify facts by seeing. We say "Show Me." Those words have such an impact that they have been adopted as a state motto. The "Show Me" statesman, Missourian Truman, gives us a triple hit on vision. For him to be shown required glasses from childhood on. This opened his vision through his intense interest in history – why people and governments did what they did – sometime over and over again. Truman was neither charismatic nor particularly articulate to the point that the elite of his day mocked him and labeled him a hick, an idiot, among other names. The loveable image of this terribly shy guy physically running away from an attractive woman merely wishing to make his acquaintance puts him in stark contrast to the presidential Marilyn Monroe and Barbara Striesand stories.

History, with the recent help of David McCoullugh, has improved our vision of Truman – avoided the invasion of Japan, assured European recovery and democracy after "regime change" in Germany through occupation and massive investment, made U.N. words meaningful in Korea, and created an intelligence organization to help protect our homeland. One might say the vocal elite said "show me" to this small, owlish guy and he did. He corrected his vision and we are still correcting our vision of him.

See for yourself! The impatient exclaim to disbelievers. After the Bible's first imperative – "Let there be light!" – God viewed each day's toil and "saw that it was good." Presumably, he too had to see it to believe it. Do you suppose he poked his buddy, God Two, in the ribs and said "Pretty awesome, eh?" It's not hard to believe Gods dwell on these wonders, maybe more than we do. Or maybe they also take this stuff for granted and miss the thrill of marveling at these wonders.

Light yields vision and light is quick. Anything that travels at 186,000 miles per second has just got to be classified as "quick." What we see, and hear for that matter, is already history. You know the lightning and thunder game. Count seconds between them, divide by five, and that's how many miles to the strike. But what you saw and heard is indeed already history. What you don't want, at least with lightning, is to be

there when it's happening – or you may also be history, so to speak. Now, in your mind, let's save the world from an incoming asteroid by a nuclear warhead striking it 186,000 miles out. We see the historic flash one second after it happens. As we look deeper into space, we see deeper into history. The sun's light is eight minutes old. The North star light we see set sail in the time of Shakespeare. Distant stars cast off their light before the classic date of creation of the universe – a conundrum for certain traditionalists still stuck on a creation at 9:38 a.m., March 16, 4338 b.c or similar time-scale certainties. Minutes, hours, days, years, centuries, millennia. The further we look, the older is the event we are watching. Consider how much is happening RIGHT NOW over that vast range of time and space that we can not know. Is it any wonder one relatively insignificant earth bound society receives comfort in putting such things in the file drawer of knowledge labeled "God." Simplifies the indexing.

We time travel within our own history, sometimes by closing our eyes and projecting life's scenes on the backs of our eyelids. In another kind of time travel, by catching light, shall we call it "old light" from distant stars, we are essentially viewing the past. Sci-Fi stories have us traveling along side the bundle of light viewing a still picture of an instant in time or traveling even faster, catching older and older globs of light, watching history run backwards. Of course, we could never do that anymore than we could ever travel 20,000 leagues under the sea or ride a rocket to the moon -- or Mars. Exercise your vision. Do you suppose an early humanoid ever stood with her toes in the ocean deciding her kind would never travel across great waters like the porpoise or soar in the skies like an albatross, let alone survive the perceived threats of the day? Until we add time to the vision equations, it is hard to see very far. Given time, lots and lots of time, the remarkable evolution from light sensitive dots to our miraculous eyes gains credibility. If the little humanoid with wet toes factors time into her vision, how can she not be optimistic about the future of humankind, because so much can be accomplished – given enough time.