SIGGRAPH 2002 Course 56

Imagery, Symbolism, and Human Consciousness

Preface

Hi, thanks for taking a moment to read these course notes.

First I want to say I'm glad you're interested in symbolism and consciousness. I find consciousness study both moving and inspiring, and it's exciting to think there are other people who might feel the same way. To me this stuff is cool beyond words, even more than Siggraph was 20 years ago - and this time it's on the *inside*.

I hope we can do a good job of helping you have that same experience.

One of the things that's difficult about creating a course for Siggraph is that the publications deadlines are months ahead of the conference itself. What that means to you is that the notes you have here don't indentically represent the course that will be presented in July, because we're still refining it. In particular, I haven't yet acquired reproduction permission for most of the images we'll use in the course. For these differences you have my apologies. I'll post on the web the complete collection of these notes plus everything else we develop between now and July.

I've written these notes to present the fundamental concepts necessary to be able to appreciate what we'll say on Wednesday. I've also included some things we might not get into the course, but which are important. I think the best way to use the notes will be to review them before the course starts, and then try to stay present and attentive for the course itself.

I hope you find the following notes interesting and useful, and more significantly, intriguing enough that you feel compelled to learn more about consciousness.

Sincerely,

Bruce McDiffett

May, 2002

P.S. My sincere thanks to Stephen Spencer, ACM Siggraph Director for Publications.

Course 56: Imagery, Symbolism, and Human Consciousness

Wednesday, Half Day
1:30 - 5:15 pm

Computer graphics is old enough to be entering mid-life, the years when humans start looking for deeper relevance and meaning, when we start asking ourselves "why?" This course opens a door to the symbolic realm where our images can lead us to those answers.

Prerequisites
None. Since this is an attempt to build a bridge to a new domain previously outside the SIGGRAPH experience, the course provides everything necessary for the journey, and doesn't require prior knowledge of what's on the other side. Familiarity with analytic psychology is helpful. More helpful still: a willingness to relax one's preconceptions and a desire to see the world in new ways.

Topics
Symbolism; different forms of perception; consciousness and the unconscious; analytic psychology; dreamwork; mythology; mathematics, physics, computation, and the origin of time; use of imagery in medicine and healing; deeper symbolic communication in film and television; collective consciousness of groups; questions of personal responsibility as creators of images; examining SIGGRAPH itself through its own imagery; how images and self-reflection tell us about ourselves.

Organizer
Bruce McDiffett
Evil Genius

Lecturers
Loren Carpenter
Pixar Animation Studios
Cinematrix, Inc.

Loren Eskenazi
California Pacific Medical Center

Carole Kammen
Pathways Institute

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Course Outline

Time   Topic

1:30 pm **Imagery, Symbolism, and Human Consciousness**

1:30   **Module One: The Inner World**

1:30   **Forms of perception and consciousness** (McDiffett)

Introduction and course schedule

Forms of perception

Symbols and symbolic perception

What is human consciousness?

1:50   **Organization of the psyche** (McDiffett)

Consciousness and the unconscious

Development of the psyche from birth to adulthood

Principles of analytic psychology

Dreamwork

2:15   **Psychology and mythology** (Kammen & McDiffett))

Myths as dreams

Myths as reflections of personal and collective consciousness

Modern myths

2:35   **Images, dreams, mathematics, and physics** (McDiffett)

Relationships between images, dreams, mathematics, and science

Self-similarity and quantum superposition in consciousness and life

How inner and outer worlds are the same

3:00   **Experiential exercises** (Kammen & McDiffett)

3:15   Break

3:30   **Module Two: The Outer World**

3:30   **Medicine** (Eskenazi)

               How thoughts and images change the body

               Physiology of body response to imagery

               Local and non-local healing

               Possible directions for computer technology in healing

3:50   **Group entertainment** (Carpenter)

               Design issues

               Audience experiences and real-world effects

               Lessons for storytelling and filmmaking

4:10   **Film** (Kammen)

               Film and television as symbolic media

               Films and television as collective dreams

               Examples of analyzing films symbolically

4:30   **Computer graphics and society** (McDiffett)

               Reading the Siggraph proceedings covers as a dream

               Questions of ethics and social responsibility

               Role of computer graphics in personal and collective consciousness

4:50   **Group discussion and Q&A** (All)

5:10   **Closing remarks and open questions** (McDiffett)

How To Read These Notes

Some of the things you read in these notes might seem a little unusual, or counterintuitive. Of course, part of that might be that I haven't explained a particular idea very well. But many of the notions presented here are fundamentally counterintuitive, too. That's precisely why they haven't been well understood until recently. A reaction of "I'm not sure I believe that" is fairly normal.

But even that reaction that will be a great help. Whatever your reactions when reading these notes (or attending the course), pay attention to them, let them guide you. For example, if you have a strong reaction that something might not be true, stop for a moment and ask why you might be having that reaction. Frequently, our reactions serve as a defense mechanism that protects us from things that are in some way threatening.

And of course you'd want to pay attention to very positive reactions the same way.

Overall, I'd like to ask that you suspend for a while your immediate disbelief of things outside your experience. It's important and illuminating to keep around, of course. Pay attention to it. Just don't react to it reflexively. Think of one's normal truth evaluator as a compass, and we're heading to the north pole. It's not like the compass isn't a useful tool, but we're heading places where it's not always the best guide.

We're going to be attempting a transform of domain, but it will take use a little while. Things may seem a little strange in the meantime.

The Importance Of Breathing

Breathing deeply and evenly will help you to understand this material.

(Might as well test your ability to watch your reactions right away!)

In general, deep, regular breathing is both calming and stabilizing. It's also an essential part of yoga, and of meditation. Try to relax, and simply imagine each breath moving from your head, all the way down to the bottom of your solar plexus, and back out. And rather than watch your breath from above, see if you can have your awareness follow it down into your body. For those of you who spend most of your time with your focus in your bodies, see if you can follow your breath up to your head!

We want our awareness to straddle both mind and body, thought and sensation. Just like with mathematical transform methods, the things that are true in one domain aren't necessarily true in the other. And in order to move between domains, we need to stay connected to both. That connection is through breath.

Symbolic perception and consciousness are not abstract notions separate from the body. It's my assertion that they can only be experienced by being fully in our bodies. Our bodies can sometimes have different notions of truth than our minds do. So we need to keep our mental processes connected to the physical. The best way to do this is through deep, regular breathing.

See if you can pay attention to your breathing while you're reading. The optimal state would be to able to stay mostly focused on your reading, while not losing track of your breath.

Practicing this kind of split awareness will be helpful later, too.

Newton's Mephistophelian Bargain

Like a cognitive version of King Midas, Newton and Descartes bargained for the ability to understand the universe. "Let everything I touch turn to thought!" The idea that a human being could understand the universe is amazing, transcendant. It has lead us to all the discoveries of science in the past three hundred years. But the unseen cost of this bargain is that we must live in a dead, mechanical universe.

We've placed our minds above all. Like the ant in the song "High Hopes," this has allowed us to move rubber tree plants when we otherwise wouldn't have even tried.

But what if our minds aren't really above all?

Perhaps the most fundamental principle of the scientific method is the null hypothesis. The null hypothesis essentially says "if I can't see it, it's not there." This is an important rule to apply when trying to break down the world into smaller and smaller pieces. When one's awareness isn't big enough to hold the whole thing all at once, breaking down the whole into pieces is necessary (Newton's method and differential calculus are similar ideas, not surprisingly). But just as if someone tried to understand you by dissecting you, the larger wholeness of a system can get overlooked, if not destroyed, when subjected to this rule.

The null hypothesis, which says "something isn't there, isn't true, isn't real if I can't see it, prove it, measure it, understand it" effectively has us live in a world that's limited by what we can see, prove, measure, and understand. While the upside of this is our minds get to be God, with final say over what is real and what is not - quite a nice state of affairs sometimes! - the downside is that anything that's too big for our minds to grasp doesn't exist. Since at this moment we can neither see, prove, measure, or understand the essence of life, everything we touch with our intellect dies.

Like letting go of other myths of Newton's time, like classical mechanics, or logical systems where all truths can be proved, it's time for a revised version of the null hypothesis. A relative version, where the result is not simply objective, but influenced by the observer. One that says "if I can't see it, maybe it's not there, but maybe I'm not currently capable of seeing it."

With this new hypothesis, we get to live in a world that can hold both logic and magic. We get to live in a universe that's less brittle, less rigid, one where the laws (sic) that define it get to change and evolve. There's flexibility, fluidity. The universe gets to be alive again.

About Consciousness

Before we can talk about consciousness, first we need to talk about the unconscious.

There's more to the world than we see or comprehend. The biggest challenge in looking at the world differently, in our case seeing symbolically, is not learning a new way to interpret what we already see. Rather, the hardest part is appreciating how much of the world we don't see at all.

Once we can accept there might be more to our inner selves than we know, then we can learn how to find the things we don't see.

In broad and general terms, the unconscious part of the psyche is the part of us that holds all of which we are normally unaware. Some of these things we don't recognize because they're larger than our waking awareness can hold, some we don't see because we haven't been taught, and others we don't see because they're too highly charged, too emotionally dangerous, for our waking awareness to accept.

A picture that describes it well is that of a whitecap on the ocean. There's a part that we call the wave, which would be like the ego, and then there's the ocean from which it rises, which would be like the unconscious.

Most of our psyche exists in that ocean, in the unconscious world. It's one of the illusions of ego-awareness that all we are is the whitecap.

A big part of our work will be unlearning the habitual acceptance that what we immediately recognize is all we experience.

This will not be easy. For the ego to accept the unconscious, it first needs to accept there might be more anything outside itself. Though this might be easy to say, it's very, very difficult in practice, because the internally the ego experiences anything larger than itself as death - which, to the idea of ego as the complete experience of the world, it most certainly is.

Another problem with working with the unconscious is - it's unconscious! Said another way, we don't know what we don't know. We can't use our usual methods of communicating to reach into our unconscious, because the unconscious doesn't perceive in the literal terms with which we're familiar. Rather than literal specifics, the unconscious perceives the essence of things, and their relationships to each other. In other words, the unconscious perceives the world symbolically. So if we're to communicate with our unconscious, what we need to use is symbolism.

Unconsciousness Resists Consciousness

It's very important to understand that the development of consciousness takes work. Most of the time, most of the things that are unconscious are unconscious *for a reason.* They're thoughts, feelings, or sensations that are either too highly charged, or too threatening, or simply just too complex, to fit in one's present awareness.

Because they're highly charged, threatening, or complex, the natural tendency is to resist becoming aware of them at all. It takes intention and effort to bring them into awareness.

In other words, unconsciousness resists consciousness.

Unconsciousness resists consciousness at the collective level, too. This is the essence of the story "The Emperor's New Clothes." You can see this historically every time there's a radical new scientific theory. Science, which in general acts as a limiter on how quickly knowledge advances, tends to resist change that is too fast. That's why history is full of people whose brilliant new insights were violently resisted by the established guard. Copernicus. Newton. Pasteur and Lister. Einstein. Theories were once heresy are now dogma. But that's characteristic of the movement of ideas from the unconscious into consciousness.

It's easy to watch this at the personal level, too.

Ever notice when you're talking about something and all of a sudden, poof, you simply lose all track of what you were talking about? That's an example of something starting to come up into consciousness and then getting pulled back down.

A great attention practice is to try and remember one's train of thought that lead up to the moment where memory was lost. The subjects that were coming up just before the loss of consciousness are the ones that are highly sensitive. Taking a moment to find them and then feel them is one way to help anchor them in your awareness.

I was going to say something else about this, but I forget what it was.

Projection

One of the most important things a person can learn about normal perception is:

All ego perception takes place through the mechanism of projection.

Projection is the process by which we recognize not the external world itself, but parts of our own unconscious that are symbolically stimulated by the outside world.

Since none of our five usual senses lets us directly become some part of the outside world, the only possible way for us to experience the world is to take in the sensory input. This sensory input then resonates elements in our unconscious, which we then attribute to the external object. Because this process places attributes from our internal unconscious world on parts of the outside world, it's called projection.

Though this sounds straightforward, the implications are world-shattering.

It is fundamentally impossible (at the ego level) to experience anything about the outside world. All we ever experience are parts of ourselves - which may or may not accurately represent the things we think we're seeing.

An implication of this is that we attribute to others what are really our own feelings, motivations, and conditions. In particular, this is most easily recognized when there's a big emotional affect, a big feeling or a lot of energy, around the projection. When there's a lot of energy associated with a projection, it's because the unconscious contents that are being resonated are highly charged, and difficult to accept. So whenever we have a big feeling about something or someone, good or bad, that's a sign we're really seeing a part of ourselves we haven't accepted.

Projection is how love happens. We find a person who resonates our positive unconscious material, and we believe we love them, when in fact we're loving unseen parts of ourselves. This is why in "true love" the partners feel like they "complete each other."

Projection is also how hatred and fear happen. When we angrily accuse someone else of a particular behavior or motivation, it's a sure sign what we're really reacting to is an unclaimed part of our own nature.

Knowing this makes reading political pronouncements particularly revealing.

Just because we're projecting our unconscious contents on something doesn't mean that thing isn't also that same way. But that's something we can't know. The only thing we can know is that we're that way, and take responsibility for it.

Language

Symbolic perception is about sensing the relationships between things. It's not about seeing the things themselves.

Consciousness isn't about what's out there. Consciousness is about direct experience, about is-ness, about being. *It's in here.*

To the extent that I want to talk or think about something at which I could point, that thing is not consciousness. Consciousness simply is.

This brings up an important point about language. Language is, by its very nature, a separating, linearizing mechanism (poetry is an exception). The words we use to talk about something are not the thing itself. The language we use can fool us into believeing we're experiencing something, when in fact we're just talking about it.

To be specific, standard English sentences take the form of subject-verb-object. Even so much as using English sentences leads to an experience of subject as separate from object. In consciousness, there is no difference between subject and object - they're the same.

Language is a linear, time-bound relationship. Symbolism is multidimensional and instantaneous.

A interesting linguistic construction to try is one where the sentences are single nouns or adjectives. Instead of saying "I am warm," one would just say "warm." There's no "I" separate from the warm, there's just warm. Or instead of "I am hungry," just say "hunger." Use words that represent the essence of the feeling.

Try having a discussion with someone using this structure. I think you'll quickly notice how even the words we use to think separate us from world.

As an aside, the word consciousness can have two meanings. Most of the time, in everyday discussion, the word consciousness denotes ego-consciousness, those things of which we're normally aware when we're awake and wandering around, and our mental maps of how to relate to them.

Consciousness can also have a larger meaning, the full and direct experience of existence. I hope this different meaning will always be clear by context.

The first goal is just to learn how those two states might be different.

Communications Pathways Between Entities
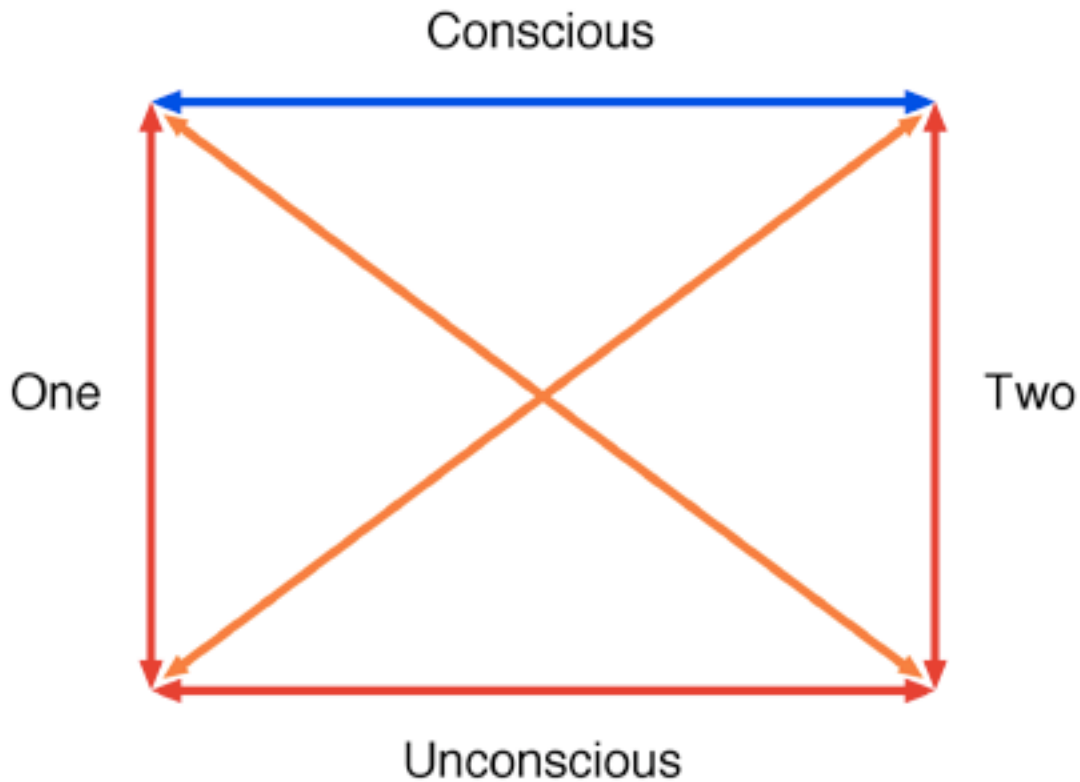
This diagram shows the information pathways active when two parties communicate. Since human consciousness scales in a self-similar way, this diagram holds when the entities are either individuals or groups.

Each party has both a conscious component (of which they're aware), and an unconscious one (of which they're not).

Two important points here:

Each party has an information pathway from the unconscious to their conscious awareness. This pathway is active outside of conscious control.

Five of six paths in which energy flows have an unconscious component.

Consciousness Is An Inherent Property

OK, since I can't find anyone else who's said it exactly this way, I'll stick my name on this, just to make sure I'm not sullying someone else's reputation when these notes make their way into the pantheon of famously wrong ideas.

McDiffett's Principle:

Consciousness is an inherent property of the everything in the universe.

It's my belief that consciousness is not an emergent property of systems, but a fundamental, inherent property of all things. People have consciousness, animals have consciousness, rocks have consciousness, galaxies have consciousness, quarks have consciousness - everything has some measure of it, like mass and energy.

In the same way that mass can be combined to form all sorts of different things, from subatomic particles to dessert toppings to stars, but it's all mass underneath, consciousness seems infinitely scalable and flexible.

I might almost be disappointed if it were otherwise. I'd be fairly narrowminded to require that consciousness always be the same.

The idea that the universe is pure consciousness has been around for millenia. But since *I* haven't been around for millenia, and I can't know the subtle ways my beliefs might differ from Vendantic mystics like Shankara, or physicists like Heisenberg, I won't claim the above represents anyone else's view but my own.

Creation Or Discovery?

We can look at the great inventions of history, like antispesis in medicine, or the great works of art, like Beethoven's symphonies, and marvel at their creation, and the greatness of the people who created them.

But let's look at a different question:

Was 2+2 = 4 before the first person noticed it?

If 2+2 = 4 before anyone noticed it, then what about every single one of man's other creations? If 2+2 = 4 before man noticed, then surely the sequence of notes in 5th Symphony was just as real before Beethoven wrote it down. If one wants to claim that Michelangelo's David didn't exist before he sculpted it, then one must also accept that 2+2 was not 4 before someone long ago realized it.

Michelangleo actually had the belief that his sculptures were already fully formed inside the marble. He simply worked to remove the marble that was hiding them and let them out.

And was 2+2 = 4 more true where it was first realized than all the other places it wasn't? If not, then the Mona Lisa was just as real all the other places in the universe as Leonardo's studio.

The big idea here is that **everything already exists everywhere**. We just don't always notice. And our experience of everything that already exists everywhere is just that subset which we can let in.

I want to emphasize that when it's not in our consciousness, it's truly not real to us. We see this same notion starting to be recognized in particle physics. Particles can be many places at once, and the notion of existence is fundamentally tied to the notion of observation.

The act of creation is simply opening to let some already existent thing come into our awareness. This is true of everything, whether those things are mathematical theorems, or images, or feelings and sensations.

That's why the creation is so often associated with the feeling of flow, of being a channel.

Symbolic Perception Is A New Sense

Here's another unorthodox idea, but this one is absolutely essential for ever perceiving things symbolically:

Symbolic perception is a new sensory mechanism.

It is not a cognitive process.

This means that thinking about what symbols might mean is, if not useless, then mostly ineffective. Thinking about symbols is a lot like thinking about one's other senses - thinking about a taste, or a sound, or an image. It has utility, but it's absolutely not the same thing as the direct experience through the sense itself.

With apologies to Julie Andrews, thinking about the sound of music is not the same as hearing the music.

Now thinking about a sense has a very real value, it helps us correlate both different experiences of the same sense, and different experiences of different senses. But no matter how adept we become at correlating these experiences, it's never the same as directly experiencing the senses themselves. Whether I've become a great painter, or a great composer, or a great chef, none of my imaginations are the same as me seeing the painting, or hearing the music, or tasting the food.

It's true that at certain levels of proficiency, thought can assist the senses. For example, I might decide that in a song I'm writing, playing the solo in Minoxidilydian mode might be particularly evocative. But that thought isn't the same thing as hearing the music it later expresses.

And those thoughts are the result of a study of the experiences themselves. In order to become the composer that could think about how notes work together, I would have had to have heard the notes, and then made some mental associations. It wouldn't work well for me to simply think about notes if I had been born congenitally deaf. If I'd been born deaf, then I'd be musically quite limited, and the compositions I might create mentally would almost certainly not have as much depth and breadth as if I could truly hear. Perhaps I could use my sense of touch to feel rhythm, and my sense of sight to see musical structure. But most probably my songs would just be noise (though you might feel that way about my compositions anyway!).

To perceive symbolically, a person must develop their direct symbolic sense.

Symbols And Signs

The difference between symbols and signs can sometimes be hard to appreciate. I believe it was Carl Jung who said "a symbol is visible sign of an invisible reality."

Unfortunately, that definition doesn't always make the distinction clear.

Recognizing that symbolic perception is a new sensory mechanism, we can talk about the differerence between the two somewhat more meaningfully.

A symbol is a sensory stimulus that is experienced through the symbolic system. A sign is a sensory stimulus that is interpreted cognitively.

If you don't have much experience with your sense of symbol, the above won't immediately be of much help, either. But this new definition can act as a guide.

In follows from the above description that to experience signs symbolically, one must first work to develop one's symbolic sense. This is not accomplished by reading, any more than developing one's sense of taste is developed by reading cookbooks. No matter how many cookbooks I read, I'll never learn from them the what's salty and what's sweet. The only way to know this is to taste them directly.

I should clarify that I'm speaking about an ego-awareness relationship with symbolic perception. Our deeper psyche, our unconscious, experiences the world symbolically all of the time. In fact, that's the only way it can experience the world. It's not differentiated out enough to have literal experience. So when I speak of developing our symbolic sense, what I mean more specifically is developing conscious control of the pathways between our ego-consciousness and our unconscious.

These pathways function intrinsically, which accounts for the level of symbolic understanding we seem to get without effort. And there are some people, unconscious adepts, for whom these pathways open somewhat spontaneously. But in general, they're much like motor skills. Without explicit practice, they stay undeveloped. Ever try to play the piano without lessons? Or watched a baby try to take its first steps?

So we're left with the problem of how we develop our symbolic sense, especially if we don't have much relationship to it in the first place. This we can do. It's a lot like bootstrapping a computer - we start with simple things we already know.

Characteristics Of Symbols

Fundamentally, symbols mediate energy. In other words, a symbol is a kind of door, or a lens, through which psychic energy of a certain kind can flow.

It's this perception of psychic energy that characterizes our symbolic system as a new kind of sensory system, and not only an interpretive or associative mechanism.

Again, thinking about symbols is not symbolic perception.

Because literal thinking about symbols is so nonsensical (in the same way that trying to listen to a painting would be nonsensical), thinking about symbols generally leads to results much like machine translation of poetry. It's sometimes amusing, but rarely right.

Other symbolic follies to avoid are symbol dictionaries. Not only do they mistake the literal for the symbolic, but they then generalize that mistake to an entire population. The same symbol can have different meanings at different times, different meanings for different people, even different meanings simultaneously.

A symbol dictionary not only usually gets the meanings wrong, but has the added misfortune of then crystallizing the readers perception around the wrong meaning, blinding them to what the true meaning might be.

Would you let someone else see for you? "There's a thing with five points on it, and Phil says a thing with five points is a police officer's badge" - but what if it's really a starfish?

Even though it's slower and more difficult, the only path to symbolic perception that works is to learn to feel directly for oneself.

Developing A Sense of Symbol

So how do we develop our sense of symbol? Practice, meditation, and working to bring parts of our unconscious into our conscious awareness.

First, practice. There's clearly no chance of developing a new, rudimentary sense if it doesn't get used. If it were going to develop spontaneously, it most likely would have done so already. Dreamwork, work with the symbol systems like the Tarot, anything that exercises the conscious paths to the symbolic system are good.

Second, meditation, and in particular, meditation that develops the heart center, the seat of compassion. It's only by deepening our wellspring of compassion that we gain the capacity to be compassionate with the parts of ourselves we can't yet accept.

Finally, we work to bring parts of our unconscious into conscious awareness. Anything we can't yet see symbolically about ourselves, we will also be blind to in the outside world. In order to clear our sight, we must remove the obstructions within. This happens through what's generally called personal growth work, but most effectively in an analytic psychological process that appreciates the nature of symbol.

It's very, very, very hard to follow this cycle on one's own, because the very nature of one's unconscious makes it hard to see. But it may not be hard for someone else to see (unless they too have the same psychological blocks). So working some of the time with either another person or a group is almost a necessity.

Symbolic perception may be the first of our human senses that's consciously developed.

Dreamwork

Dreamwork is what we call the process of interpreting dreams. Though the dreams we have when we sleep are the most direct communication we get from our deeper psyche, any situation can be interpreted as a dream.

Dreamwork isn't a scientific dissection. As you know by now, an attempt to analyze a symbolic message by tearing it apart and looking at the pieces would be pointless.

Dreamwork is more of a mutual exploration, a back and forth process of feeling into scenes, seeing what kinds of reactions come up, following those reactions to memories, following memories to other feelings.

In order to be effective, it requires the person or people doing the dreamwork to both stay in relationship with the dream (the dream isn't a thing to be inspected, it's a part of the person with which the person wants to reconnect), and stay connected to their symbolic perceptual system.

One of the most fundamental rules of dreamwork is

All parts of the dream are you.

This dreamwork mantra is the reminder that both the dream and the person are whole, not partitioned. Though a dream is often remembered as happening from either from the point of view of a protagonist (the dream ego), or from a removed observer, it's the dream as a whole that represents some condition within the dreamer's psyche.

For example, if you have a dream, and in it you find yourself, some other people, some animals, some water, and some fire, it's not just the "you" that's you. The other people are a part of you, the animals represent some part of you, the water and fire other parts of your psyche as well. The symbols within the dream show the relationship of forces within the dreamer.

When brought to the waking world, the same mantra, "all parts of the dream are you," is a reminder to see the outer world symbolically. If the outer world is a dream, then the people and things around me must be part of me, too. What parts of me do the people around me represent? What's my ego's relationship to the larger forces in my world/psyche? What can I learn about my internal state by watching my external world?

Myths

Myths are the stories that hold the defining notions of self for a collective.

They don't have to be true, or even have any relation to reality, just as our own personal ideas about ourselves don't have to correspond to reality. They just have to resonate with something unconscious in the culture.

When myths are active in a culture, they aren't really perceived as myths, they're perceived as truths.

Just like it's easy to see where someone else may be stuck in themselves when we're not stuck there, it's easy to look at a myth as just a story when it's not a myth for our collective.

Ages ago, people believed the world rode on the back of a turtle. That was their myth, and it's probably easy to see it as a myth. Today we have our creation myth, the myth of the big bang. You might check to see if this myth is active for you by your reaction to it's characterization as a myth!

In our western culture today, we develop our creation myths through science, and our personal myths through infotainment.

And just as collectives have myths, we have our personal myths as well, and they can be recognized the same way. The things that are absolutely, unshakably, unmistakably true are the myths.

Though myths support our development by stabilizing our consciousness, they equally well restrict our development by denying the parts of us that exist outside the bounds of the myth.

Take any of the things you believe is fundamentally true about yourself, whether that's a characteristic, or something from your past. What if it weren't really true? We've already seen that we only experience the world through projection, anyway, so it's very possibly not true. After getting past the initial resistance to this idea, even shock and destabilization, there follows a new set of possibilities, a potential for growth into something not yet imagined, not yet defined by understanding.

It's Like Reading

There's a nice quote from Galileo that's relevant here.

"Philosophy is written in this grand book - the universe - which stands continuously open to our gaze. But the book cannot be understood unless one first learns to comprehend the language and interpret the characters in which it is written. It is written in the language of mathematics, and its characters are triangles, circles, and other geometrical figures, without which it is humanly impossible to understand a single word of it; without these one is wandering about in a dark labyrinth."

But mathematics is just a first-order symbolic system, the best that Galileo knew. What Galileo is really saying, to the limits of his understanding, is

"It is written in the language of symbolism, without which it is humanly impossible to understand a single word of it...."

Learning to perceive the world symbolically is a lot like learning to read. But remember how many years and years you've spent learning and practicing reading? Over a dozen, certainly, and starting from a very young age. And the the people around you have all done the same. It's just woven into western culture.

Where we are with learning to read symbols is much like the Middle Ages. Then, reading was mistrusted as a kind of magic - it made inanimate objects talk! Most people couldn't read, and had no interest in learning. They worked, played, married, died - why did they need to read? If they were interested, they probably had to learn it as part of a larger religious system, for example, as a monk in a monastery. It was the prospect of a deeper connection with life, in this case being able to read books like the Bible, that motivated the adults to do the years of hard work necessary to read and write.

Over many centuries, the things that took a religious devotion to develop as an adult moved out of monasteries and into children's classrooms.

We can learn two things about symbolism through self-similarity. First, today it will usually take years of adult devotion to learn to read and write symbolically. Most people just won't make the effort. The ones that do will often be motivated by the prospect of a deeper connection with life, the desire for which will carry them past the very real difficulties.

And second, at some time in the future, when children are taught from infancy to read the symbols that surround them, the world will become very, very, very different.

Images Affect Both Body And Psyche

Because images can be very powerfully symbolic, and because the deeper psyche is always experiencing the symbols it encounters in the world, the images we see have a deep and real impact on both the psyche and the body.

Just because we might not be aware at the ego level of the impact an image has on us, that doesn't mean the effects aren't happening.

Though this might seem hard to believe, it's not even unusual. We all know not to stare at a solar eclipse because of the damage the UV rays will cause our retinas. We won't feel any pain, even while the damage is being done.

Numbness to the effects of imagery isn't necessarily bad. Numbness is a very useful defense against pain, or more generally, against sensory overload.

So numbness isn't inherently a problem. But assuming there aren't any effects to exposure to certain images, simply because I may be numb to them, *is* a problem.

Studies done with monkeys tried to find some of these physical effects. One of the more revealing ones compared monkeys that were traumatized with monkeys that just watched images of other monkeys experiencing trauma. Both the monkeys experiencing pain and the monkeys just watching the images activated the same parts of their brains - there was little cerebral difference between watching pain and experiencing it directly.

On the positive side, imagery can just as well be used to promote a preferred state of being. This is the basis of imagery used in meditation. It's also the effect underneath the pain management techniques that use immersive head-mount displays to distract children in burn units from their pain. The HMD induces in the children a meditative state, which allows their ego experience to detach from their pain. A person trained in meditation can do the same thing without the display.

We'll do some simple exercises in the course to see if we can let you experience how much imagery affects the body.

Since images can have such a significant impact, I believe that as the creators of images we have a responsibility for the images we create. Numbness to the effects of our creations does not absolve us of responsibility for their effects.

Consider whether the rapid-cut style of television popular today trains children to have short attention spans, resulting in problems like ADD. If you could feel that rapid-cut imagery promoted ADD in children, what would you do?

We Affect Each Other

If images are powerful because they are so symbolically rich, then by far more powerful are people.

We are constantly affecting and being affected by the people around us, whether we sense it or not. We don't have a choice, it's not optional. We are tethered together, whether we realize it or not.

How might our lives be different if we could learn to see and influence the ways we connect to others, rather than constantly and unconsciously reacting to only the effects?

Self-similarity

A defining characteristic of Consciousness is self-similarity. Self-similarity is when parts of a part of an object resembles the entire object. Because Consciousness is complete, being self-referential is unavoidable.

Some familiar self-similar objects are natural features, like riverbeds and coastlines, and fractals.

In essence, a self-similar system is symbolic, because it refers to itself.

The ability to refer to oneself is the great leap of consciousness.

In mathematicals, self-referencing is the basis of Godel's theorem, one of the great theorems in all mathematics. Godel's theorem says that in any formal system (one where there are axioms, and theorems which are derived from those axioms), there will be statements that are true, that cannot be proved to be true.

This is an amazing notion!

Roughly speaking, the heart of Godel's theorem is the reflexive statement "this statement cannot be proved true." Through some brilliant mathematics, Godel constructs a formal system in which that statement in English gets represented as a mathematical theorem built in a formal system. Thus, if the statement is true, but it can't be proved true, then there must be true theorems which cannot be proved. On the other hand, if the statement is false, and it can be proved true, then there false statements which can proved true - which is even worse!

This theorem says you can't ever hope to prove everything that is true, there will always be some things that are true which must be simply be accepted. In other words, faith is hard-wired into the universe.

We can use the characteristic of self-similarity to help us recognize when apparently dissimilar objects or events are connected.

Consciousness exhibits self-similarity not only horizontally, across disciplines, but vertically, across scales. This means that systems energized with human conscious energy follow similar rules, whether those systems are comprised of one person or a billion.

In other words, people, families, businesses, countries, all have psyches and personalities, an ego-awareness and an unconscious.

Self-similar Developments

Since we've noticed consciousness exhibits the property of self-similarity, let's see if we can notice anything about some recent developments in science and mathematics.

Godel's Theorem: There are true statements that can't be proved.

Hubble Limit: There are astronomical distance which we can't see beyond.

Schwarzchild Radius: There's a radius around a black hole, within which we cannot see.

Heisenberg Limit: There's a precision about the position and momentum of subatomic particles, below which we cannot know anything.

Chaos Theory: There's a dependence on initial conditions so sensitive that we cannot know its effects.

Discovery of the unconscious: There are parts of the psyche which we cannot objectively know.

There are certainly others, but I think this list already makes it clear. The big developments of the 20th century were all essentially the same. There are limits to the capacity of ego-perception, beyond which things exist only by trust and faith. It's all about consciousness.

Remember how unconsciousness resists consciousness? That's is why we're talking about consciousness now, and not 30 years ago. It took the amazing breakthroughs of the above observations, which for years fought the battles of consciousness indirectly, to prepare us to be able to discuss consciousness directly.

Pixel Consciousness

I like this notion because a familiarity with computer graphics makes it so easy to see. I like to call our initial, smallest, most unconscious state, the state where we're unaware of anything outside ourselves, "pixel consciousness."

A pixel is small, with clear boundaries, and no notion of anything else other than its own color, its own existence. Other pixels? What are they? Raster? What's the sense of a raster when there are no other pixels?

This state corresponds to our condition when we completely unconscious to anything other than our ego-awareness. Other parts of myself? What are they?

The next level of pixel consciousness starts to move along the raster, perhaps noticing the pixels that come before or after. In human terms, we start to acknowledge how we're different than we were before, than we will be tomorrow. Or we start to see how the people around us have an existence, and experience, that's separate and different than our own.

We eventually progress to the pixel consciousness of the entire picture. We recognize the grand sweep of the raster, the multiplicity of different pixels, the image we create together.

This stage corresponds to the stage where we feel the movement of time through our lives, start to see the threads of our existence woven into the fabric of the lives of the people around us. We truly experience that all parts of the dream are us.

But the final stage in pixel consciousness is the recognition that the picture, for all it's potential diversity and beauty, merely captures part of a much larger reality, one that's whole, that isn't defined by separate pixels or the temporal sweep of the raster at all.

About Time

"Time is what keeps everything from happening all at once."

That's an old joke, but it's also the truth. Time is simply an effect of partitioned consciousness, a consciousness that isn't large enough to hold everything at once.

In personal terms, this isn't necessarily a bad thing, in fact, it can be seen as a blessing. Given your current awareness, what would your life be like if you knew everything that was going to happen to you and the people around you, from now until your death? There'd be no more anticipation, no more hope, no more surprises. You'd know all the pain, all the suffering, all the misfortune that would befall both you and the people you love.

Quite a lot for one small soul, isn't it?

Time is also what allows each moment to be experienced as separate from the whole, as a essential, undivided, pure. When the entire universe is completely connected, when everything is part of everything else, it might be the most wonderful gift to be able to be separate.

And yet, as we divide things into smaller and smaller elements, until each is a moment of pure essence, that we find ourselves back around at the other side of the circle, because having everything be an indistinguishable part of every other thing is exactly where we started. In its infinitesmal purity, each element is a reflection of the whole.

The game is in moving back and forth.

Time is also what gives the universe itself a psyche, a conscious and unconscious. In a human, the elements of our awareness that are safe enough to experience we call our ego-consciousness. All of the safe things live in what we call the past. From the ego level, they must live in the past, because we must have experienced them (past tense) to become aware of them. And though they've moved into our awareness, because they live in the past, we don't know how to change them. Similarly, the elements that are too dangerous to experience yet stay in the unconscious. And we can't change these either, because they live in the future.

And so it is that the universe itself gets a psyche from the flow of time. The things that are too charged, too destabilizing, live in the future, the things that are safe, the past.

For both the universe and each of us, these two realms are connected by a moment of experience we call the present, the now.

It's also true that time flows in two directions, not just one. In the same way that there's an unconscious wave carrying the ego-consciousness forward from the beginning of time, there's a simultaneous wave, a conscious wave pulling from the end of time to the beginning. Where we experience these waves meeting is what we call the present.

There are some theories in physics that are starting to recognize the bidirectional nature of time. These are just the first echoes of the full conscious wave coming into our awareness.

I suspect this wave is what influenced the old ideas of the Akashic Records, the records where the entire future and history of the universe were written.

As one develops one's symbolic sense, and one's personal consciousness, it's possible to directly experience this future wave. I can say that because it's happened to me. Sometimes it's been as a feeling of moving energy, which could somehow identify itself as a temporal stream. Other times it's been as a multidimensional picture, being able to sense all the possible futures of all the people in a room, overlayed on each other, and meeting in the present like a tesseract made out of not cubes, but human lives.

It hasn't happened to me often, and even for an intensity junkie like myself, it was too overwhelming, so I don't seek it out that often. I can say that having felt it, I was instantly filled with a unforgettable feeling of absolute wonder and love

And finally, the linear movement of time, whether backwards or forwards, is still a side effect of partitioned awareness. Whether it's the past pushing, or the future pulling, the movement is effected only because of an awareness that doesn't experience the whole thing directly. For an awareness that can take in the entirety of something, there is no time, there's just the is-ness of the thing, or, more accurately, the is-ness of all the possible things simultaneously.

All This Stuff Is Mortal, Too

I'm not going to suggest that any of the things you read here are the new, fundamental truths to supplant the old, fundamental truths. If history has shown us anything, both personally and collectively, it's that our beliefs about the world change as we grow.

What I suggest is that these ideas are ones are right for this time. How long that time will last, I don't know. Like life itself, they're impermanent, and at best we get to be in the moment with them, to live with them until the next generation comes along.

I think the big difference is that these ideas are aware of their own mortality. And that's okay.

The First Step

If there's only one thing you carry away from these notes, or this course, perhaps it should be the question "What's the bigger picture I'm part of?" You might not be able to see it right away, but don't get discouraged. Just remember:

The first step in seeing anything is to start looking.

Thoughts Change The Body - Real Data

Images, sounds, thoughts, and feelings affect the body. As creators of images and sounds, we should be aware of how our creations might affect those who experience them.

Here are some simple yet compelling observations that illustrate what kinds of effects our thoughts can have.

The following results are from a study done at the University of California at San Diego. They wanted to see whether cardiac mortality is abnormally high on days considered unlucky.

In Mandarin, Cantonese, and Japanese, the words "four" and "death" are pronounced almost identically. Among Chinese and Japanese, the number four is widely considered to be unlucky. (Perhaps the association follows from the pronunciation, or the maybe pronunciation converged because of the association.)

Most white Americans do not consider the number four unlucky.

The following charts compare the cardiac mortality rates of white and Chinese and Japanese Americans over the days of the month.
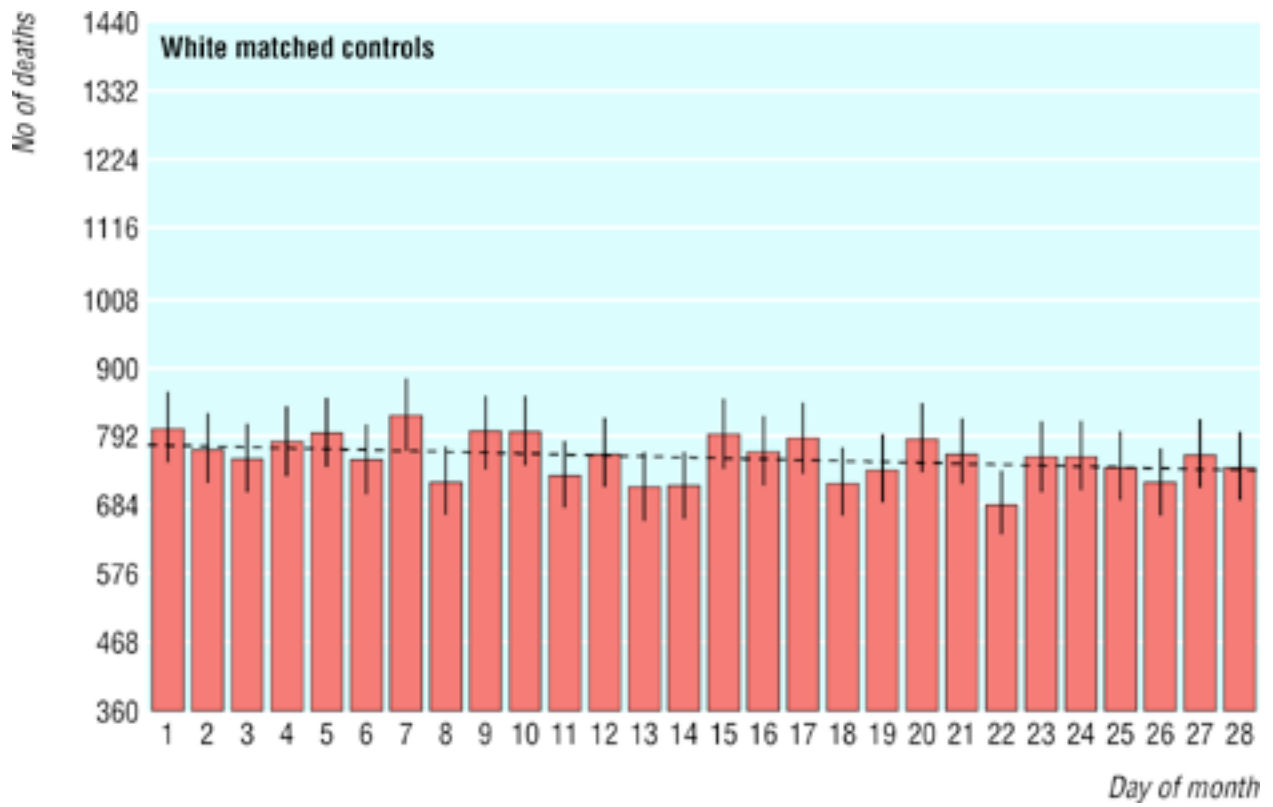
This chart shows the cardiac mortality rates for the control group, white Americans.

Chinese and Japanese subjects
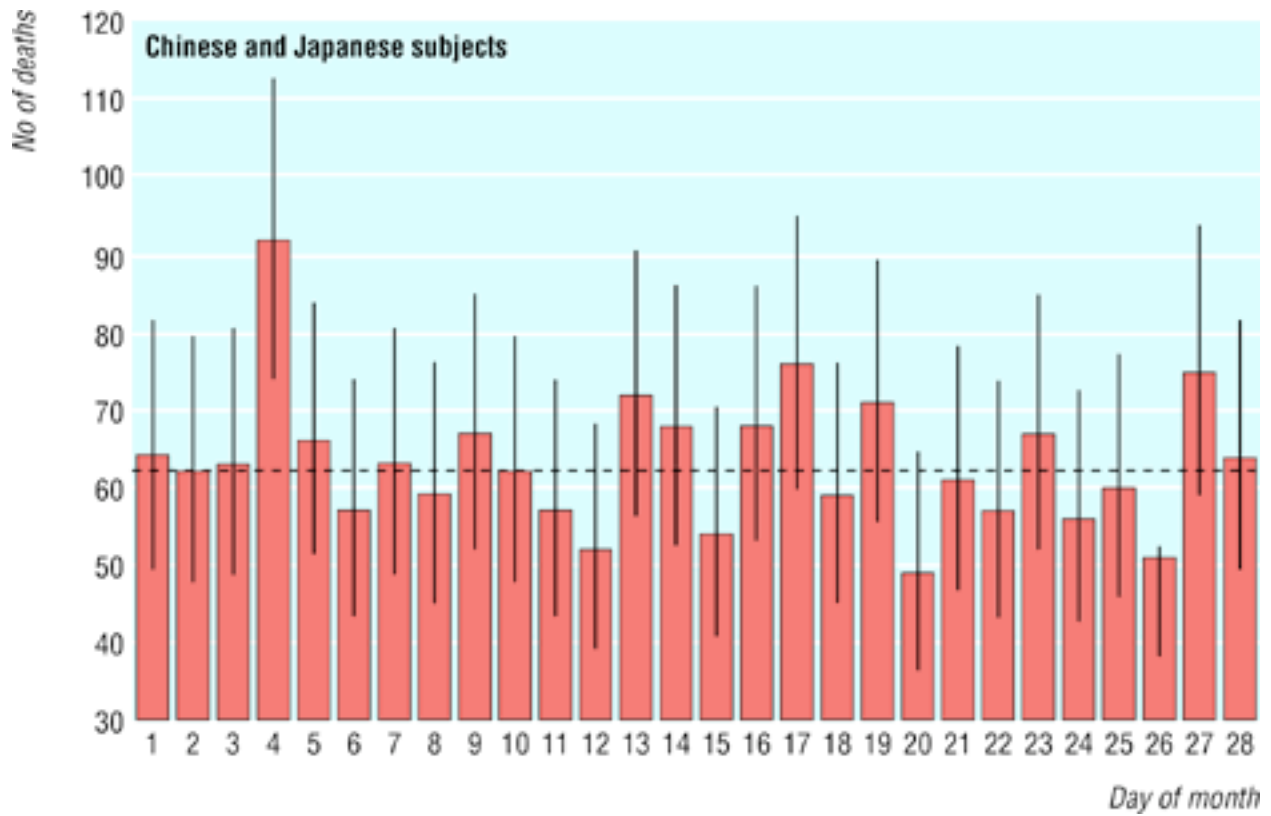
This chart shows the cardiac mortality rates from Chinese and Japanese Americans. Note the big spike on day four.

(From Phillips, *et al*)

Symbols And Recognition

고양이

What would you do if you saw this somewhere, say, next to you on a park bench?
Would you have any response? Would you mostly ignore it?

猫

How about this?

01000011
01100001
01110100

Do you recognize this? Do you have any emotional reaction?

Cat

Do you have any relationship to this? Compare what happens when you see this symbol to what happened when you saw the previous three.

Notice how much different your reaction is when you recognize the symbol. What if the world were full of symbols - but you just didn't know how to read?

This is in fact what's true. But what's also true is that underneath our conscious awareness, our unconscious symbolic perceptual system *does* know how to read, and is doing so all the time.

The question for us is how we can have a conscious relationship with our symbolic perception.

Do you have any feelings, sensations, thoughts, or memories when you see this?

How is this symbol different at representing cat for you?

This is still just a black marks on a white page. Any experience of cat you may be having is completely a projection onto this symbol.

Now we add color to our cat symbol. What cat responses are you having now?

We could continue this sequence, perhaps by adding movies of Spice, or sound. But just like the previous images, all we're doing is stimulating your sensory system.

So we have a sequence of symbols, which are better or worse at communicating some type of energy to you, depending on both the symbols themselves, your relationship to them, and your relationship to your unconscious.

Here's the big leap: what we might consider "the real Spice" is just another symbol in the sequence. He *is* probably much better at mediating "cat-ness" than the words or drawings, but he's also just a lens focusing symbolic energy. Our experience is an internal one, developed from what our senses tell us. Though he may have some kind of external existence of some kind, to us all Spice can be is a placeholder for what we internally relate to the experience of "cat."

This notion is true for every single object in the world around us.

What's Really Out There?

Here are some amusing optical exercises. They're here to emphasize just how much our experience of the world is an internal fabrication, and one which we can often accept instantaneously and unquestioningly.

How do you know your experience of your world isn't exactly like these exercises? What things are there that you don't see? What things aren't there that you do? Is there even a difference?

What would it mean if at any moment you could choose to see any situation?

Learning to see symbolically requires learning to recognize when we're interpreting the world habitually. Once we can even recognize we're reacting out of reflex, then we can learn to choose to take the time to experience the world differently. **In the end, we may choose to see it just as our reflexes would have, but that's consciousness - we've made a choice.**
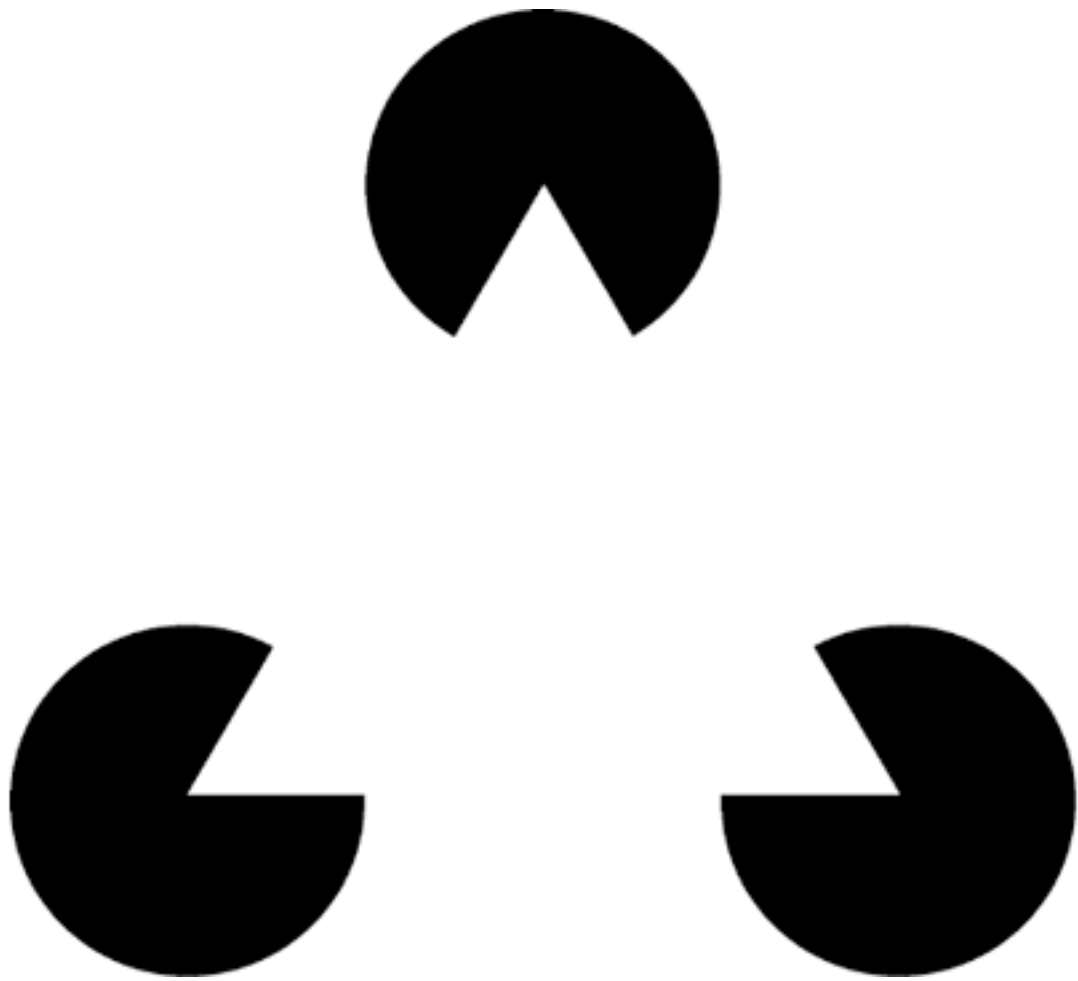
Is there a triangle here?
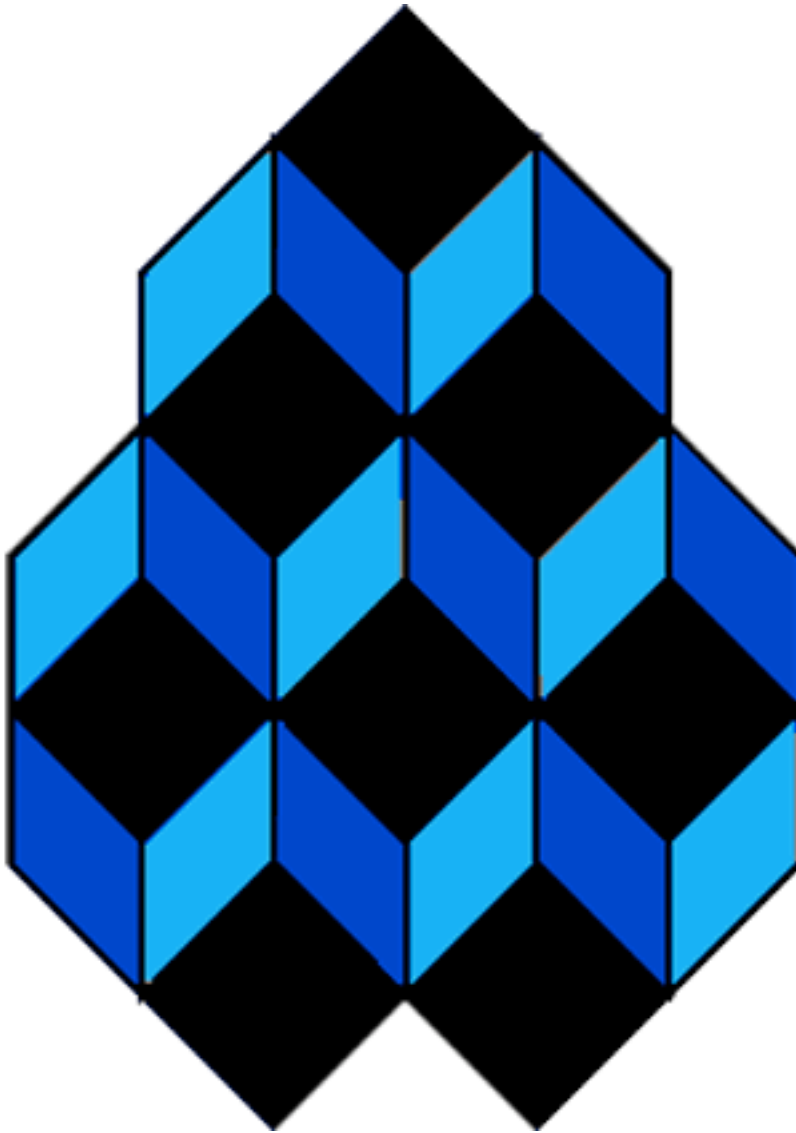
Is this a letter?
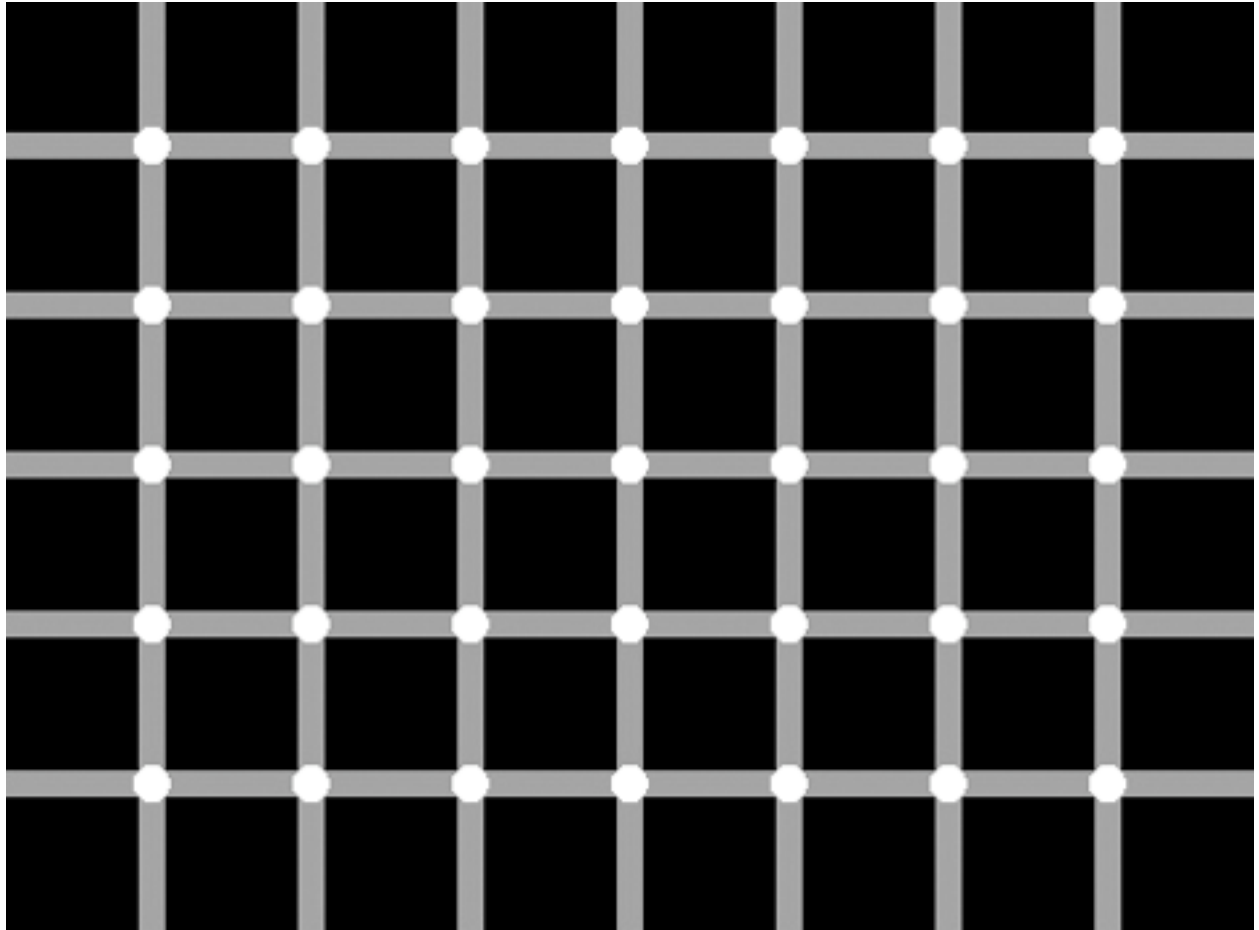
What do you see in this collection of spots?

One's perception of a situation...

depends very much on one's point of view.
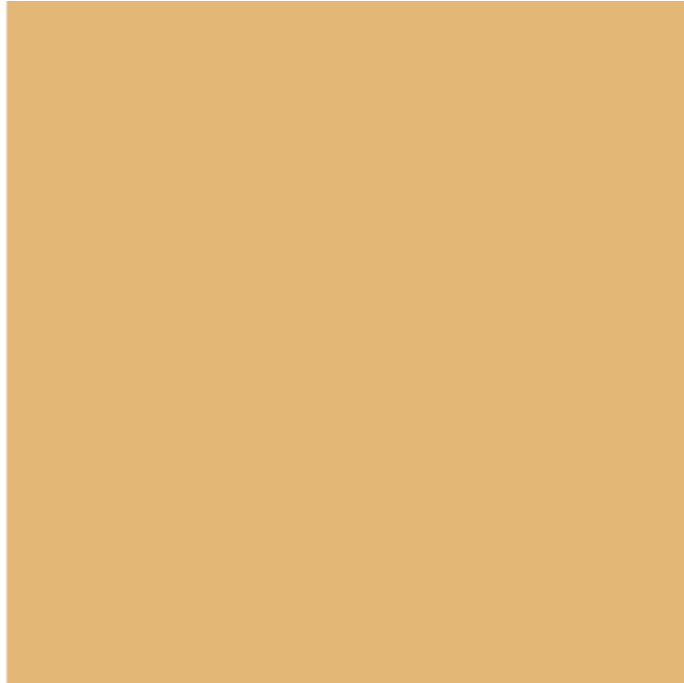
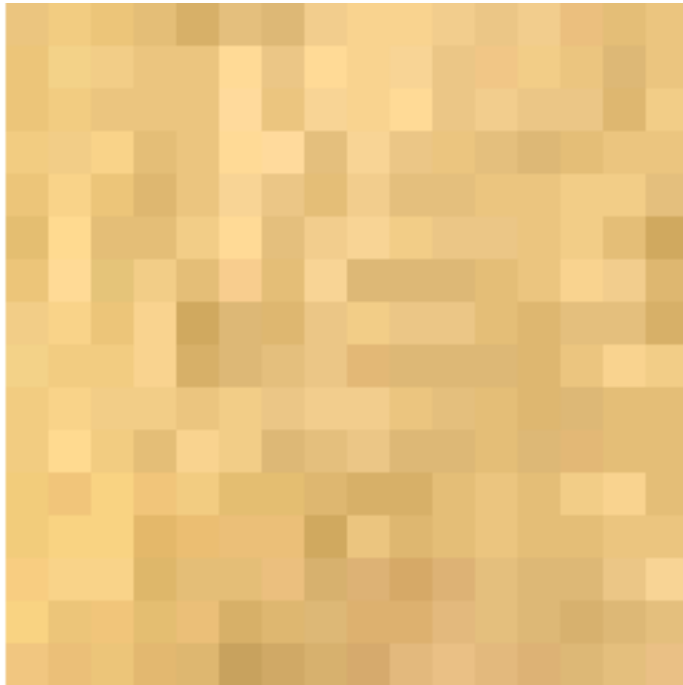Six cubes or seven?

Count the black dots.

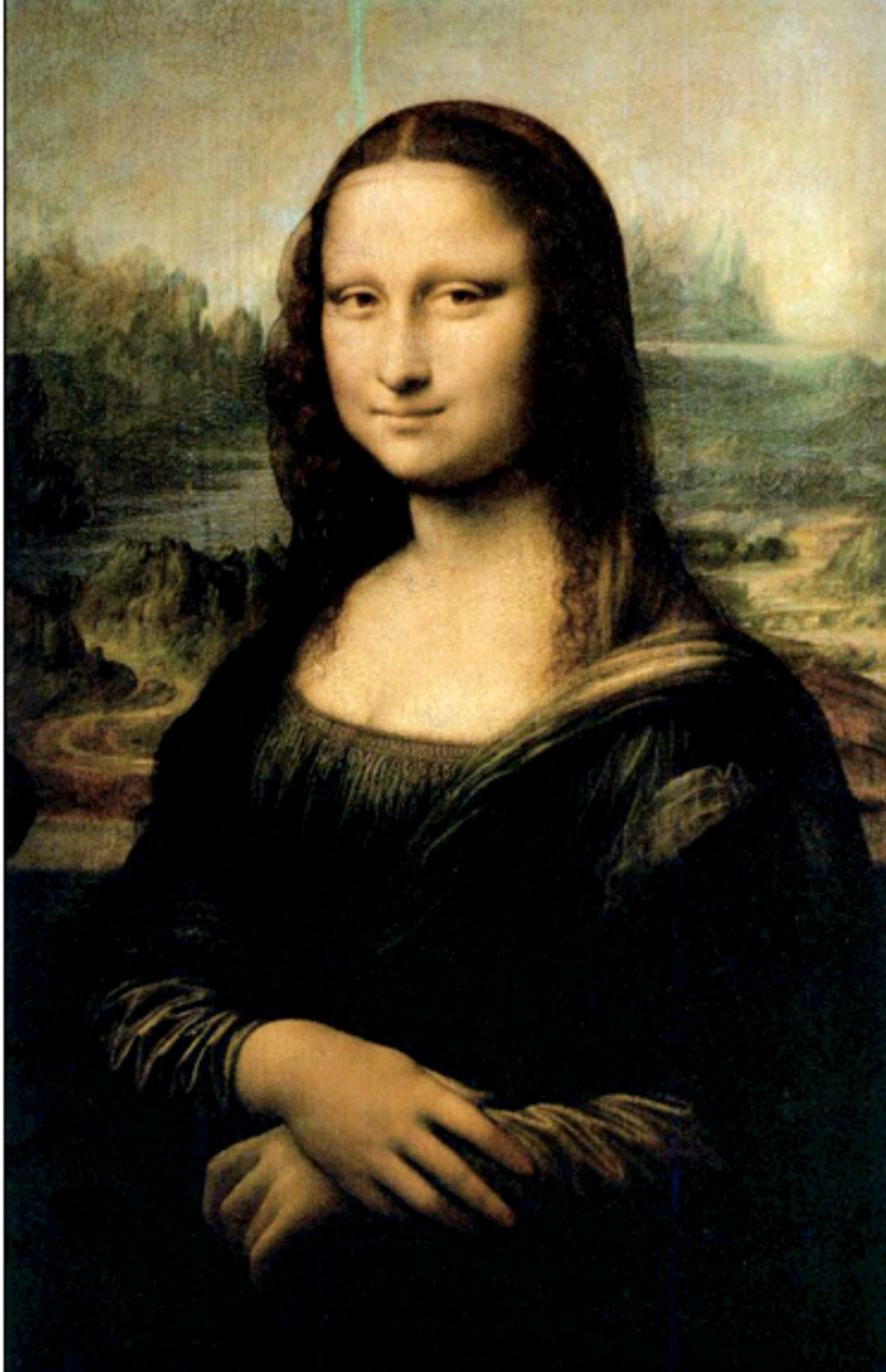Does the foreground define the background?
Or vice versa?

Pixel Consciousness Revisted

Pixel consciousness, whole and pure.

The first stages after pixel consciousness.

Much more fully developed consciousness. Could a single ever pixel know?

And remember, there's a woman beyond this stage, and other stages beyond her.

A Plan for the Improvement of English Spelling

(Attributed to either Mark Twain or M. J. Shields, depending on whom you ask.)

For example, in Year 1 that useless letter "c" would be dropped to be replased either by "k" or "s", and likewise "x" would no longer be part of the alphabet. The only kase in which "c" would be retained would be the "ch" formation, which will be dealt with later. Year 2 might reform "w" spelling, so that "which" and "one" would take the same konsonant, wile Year 3 might well abolish "y" replasing it with "i" and Iear 4 might fiks the "g/j" anomali wonse and for all.

Jenerally, then, the improvement would kontinue iear bai iear with Iear 5 doing awai with useless double konsonants, and Iears 6-12 or so modifaiing vowlz and the rimeining voist and unvoist konsonants. Bai Iear 15 or sou, it wud fainali bi posibl tu meik ius ov thi ridandant letez "c", "y" and "x" -- bai now jast a memori in the maindz ov ould doderez -- tu riplais "ch", "sh", and "th" rispektivli.

Fainali, xen, aafte sam 20 iers ov orxogrefkl riform, wi wud hev a lojikl, kohirnt speling in ius xrewawt xe Ingliy-spiking werld.

Here we have another example of self-reflectivity, this time in language. Notice how quickly things can change when they start to become self-aware.

Tarot Reading

This is an exercise you can try if you want to see if "it works even if you don't believe in it."

Among other things, the Tarot works like a set of symbolic basis vectors (to use an analogy from mathematical transform methods). To see how you might use the Tarot to become more facile in how you interpret images, we're going to look at two images, and practice shifting how we see them.

It'll be best if you do this somewhere where you can audio record your voice. If you can't do that, perhaps you can try this with someone else so they can transcribe what you say. You want to be able to stay focused on the card, and that will be very difficult if you're also trying to take notes. The shift back and forth into linear thinking will make it hard for you to stay connected to your unconscious.

First, find some way to not be distracted too much. You can't do this exercise well while talking on the phone, or waiting in line for lunch. Put down anything else and just concentrate on the Tarot images on the following pages.

Relax. Breathe slowly and deeply. Try to feel your body get quiet as you breathe.

Remember, energy follows thought. Visualize yourself opening to whatever this card might have to communicate to you.

Keep breathing, and with your breath, open to and breathe in the force of the card.

After you feel settled and focused, do the following for each card:

Find one positive interpretation of the card.

**Find one negative interpretation of the card.**

Find a break-set interpretation - one that's unusual or unexpected.

For example, a break-set interpretation of the Tower card might be "I see roadkill along either side of a median barrier." Or a break-set interpretation of the World card might be "I see a swimmer in a Busby Berkeley musical." The cycle is positive, negative, break-set.

Open to the images on the card, and see what comes up for you. Say whatever comes into your mind, and try to stay open to the card while speaking. There aren't any right or wrong answers, so just be open and see what comes out. You can repeat this three-interpretation cycle for as long as you like.

After a few cycles, you should start to feel yourself becoming less constricted in how you see an image. If you were to perform this exercise often, using cards randomly drawn from a full Tarot deck, you'd rapidly become quite flexible with it. That flexibility would mean you'd be less likely to be locked into a habitual interpretations of images, and more able to feel the other things there that you might not have seen otherwise.

I'll say more about how to read your interpretations in the course.
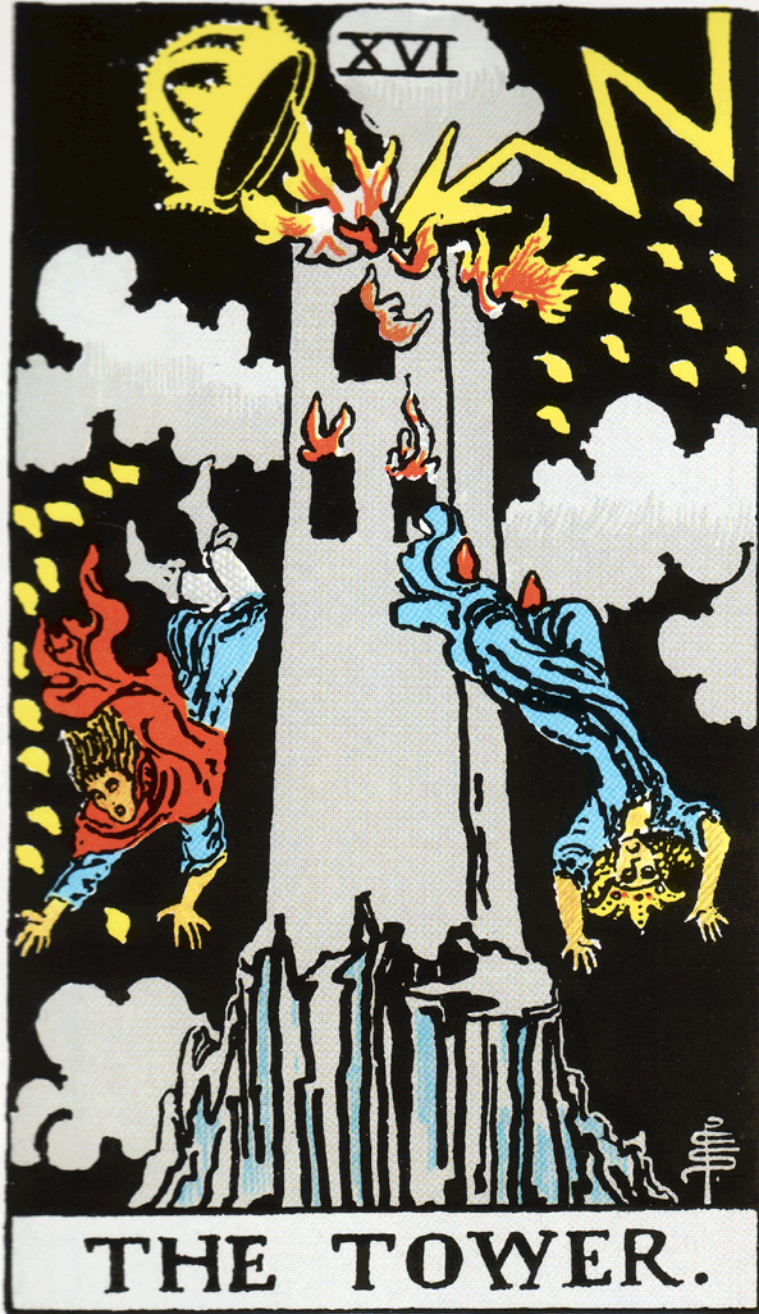
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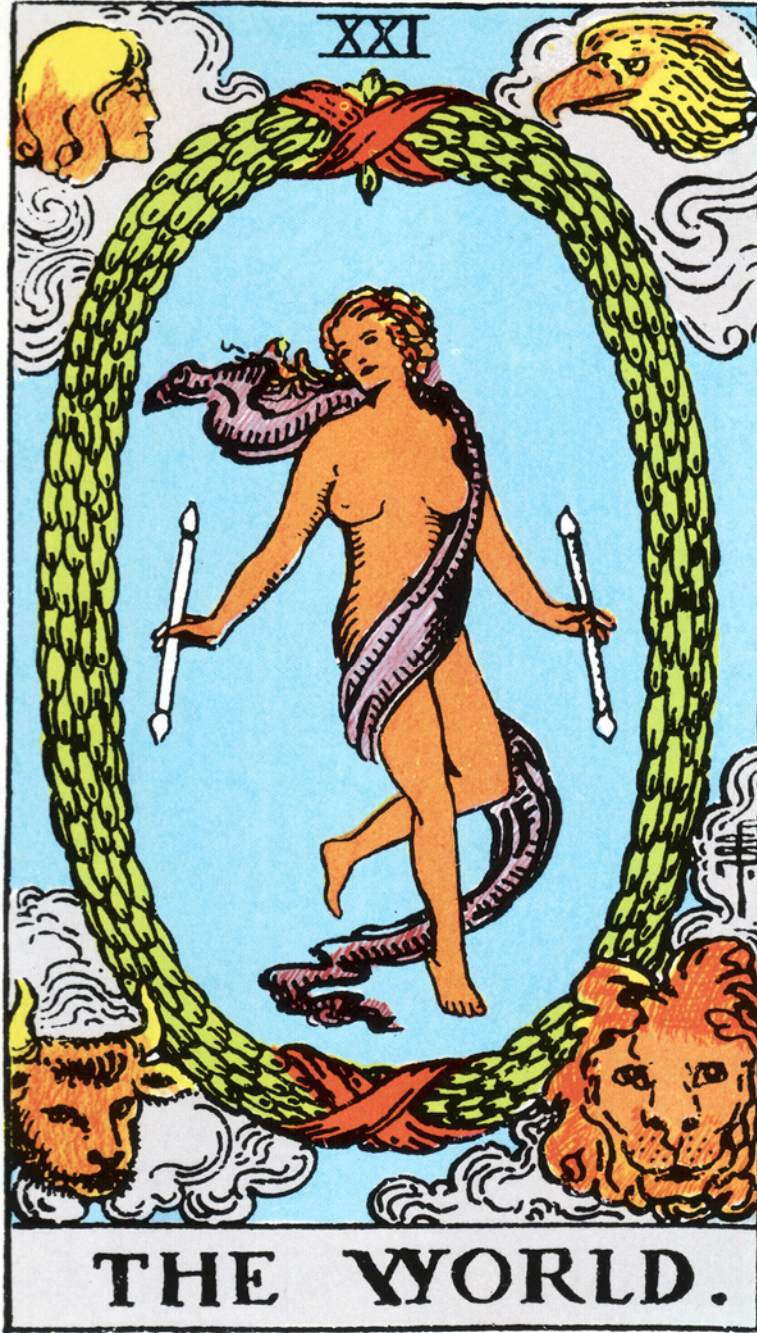
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I don't believe in it…but I'm told it works even if you don't believe in it.

– Niels Bohr

(joking with Werner Heisenberg about horseshoes and luck)

What we observe is not nature itself, but nature exposed to our method of questioning.

~ Werner Heisenberg

There is no better way to thank God for
your sight than by giving a helping hand to
someone in the dark.

~ Helen Keller

Wisdom is knowing what I don't know.

- Socrates

No pessimist ever discovered the secret of the stars or sailed to an uncharted land or opened a new heaven to the human spirit.

~ Helen Keller

When even the brightest mind in our world
has been trained up from childhood in a
superstition of any kind, it will never be
possible for that mind, in its maturity, to
examine sincerely, dispassionately, and
conscientiously any evidence or any
circumstance which shall seem to cast a
doubt upon the validity of that superstition.
I doubt if I could do it myself.

~ Mark Twain

Absurdity - A statement or belief manifestly
inconsistent with one's own opinion.

- Ambrose Bierce

There is no better soporific and sedative
than skepticism.

~ Friedrich Nietzche

I regard consciousness as fundamental. I regard matter as derivative from consciousness. We cannot get behind consciousness. Everything that we talk about, everything that we regard as existing, postulates consciousness.

~ Max Planck

Technology is the knack of so arranging the world that we do not experience it.

~ Max Frisch

Nothing tends so much to the advancement of knowledge as the application of a new instrument. The native intellectual powers of men in different times are not so much the causes of the different success of their labours, as the peculiar nature of the means and artificial resources in their possession.

- Sir Humphrey Davy

Thus, the task is, not so much to see what no one has yet seen; but to think what nobody has yet thought, about that which everybody sees.

~ Erwin Schrödinger

There are children playing in the street who
could solve some of my top problems in
physics, because they have modes of
sensory perception that I lost long ago.

~ Robert Oppenheimer

The test of a first-rate intelligence is the ability to hold two opposed ideas in mind at the same time and still retain the ability to function.

~ F. Scott Fitzgerald

The discovery of truth is prevented more effectively not by the false appearance of things present and which mislead into error, not directly by weakness of the reasoning powers, but by preconceived opinion, by prejudice.

- Arthur Schopenhauer

Science for me is very close to art. Scientific discovery is an irrational act. It's an intuition which turns out to be reality at the end of it ~ and I see no difference between a scientist developing a marvelous discovery and an artist making a painting.

~ Carlo Rubbia

New and stirring things are belittled because
if they are not belittled, the humiliating
question arises, 'Why then are you not
taking part in them?'

~ H. G. Wells

Let the mind be enlarged... to the grandeur
of the mysteries, and not the mysteries
contracted to the narrowness of the mind.

~ Francis Bacon

It is through science that we prove, but through intuition that we discover.

~ Henri Poincare

I know that most men, including those at ease with problems of the greatest complexity, can seldom accept even the simplest and most obvious truth if it be such as would oblige them to admit the falsity of conclusions which they have delighted in explaining to colleagues, which they have proudly taught to others, and which they have woven, thread by thread, into the fabric of their lives.

- Leo Tolstoy

I believe there is no source of deception in the investigation of nature which can compare with a fixed belief that certain kinds of phenomena are IMPOSSIBLE.

-William James

A new scientific truth does not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die and a new generation grows up that is familiar with it.

~ Max Planck

The laws of nature are the myths for the universe.

~ Robert Bruce McDiffett

The heresy of one age becomes the orthodoxy of the next.

~ Helen Keller

A new idea is delicate. It can be killed by a sneer or a yawn; it can be stabbed to death by a joke, or worried to death by a frown on the right person's brow.

~ Charles Brower

A danger sign of the lapse from true
skepticism into dogmatism is an inability to
respect those who disagree.

~ Dr. Leonard George

The most incomprehensible thing about the universe is that it is comprehensible.

~ Albert Einstein

A human being is part of a whole, called by us the "Universe," a part limited in time and space. He experiences himself, his thoughts and feelings, as something separated from the rest--a kind of optical delusion of his consciousness. This delusion is a kind of prison for us, restricting us to our personal desires and to affection for a few persons nearest us. Our task must be to free ourselves from this prison by widening our circles of compassion to embrace all living creatures and the whole of nature in its beauty.

- Albert Einstein

Just as there is no loss of basic energy in the universe, so no thought or action is without its effects, present or ultimate, seen or unseen, felt or unfelt.

~ Norman Cousins

Change your thoughts, and you change
your world.

~ Norman Vincent Peale

The lens that focuses the light is not the light. And the light is not that which it illuminates.

- Robert Bruce McDiffett

All is illusion - including illusion.

- Robert Bruce McDiffett

Loren Carpenter

Loren Carpenter happened to have the slides for a presentation that will be fairly similar to the one he'll be presenting, so I'm including them here. Even if Loren's talk ends up being completely different, this is still a good talk to have.

Introduction

Loren Carpenter is Senior Scientist at Pixar Animation Studios and, with his wife Rachel, a founder of Cinematrix Interactive Entertainment Systems. He has been actively involved with computer graphics research for 27 years. In March of 2001 he was awarded an Oscar by the Motion Picture Academy for his pioneering inventions that led to the digital filmmaking revolution.

Interactive Digital Cinema

Loren Carpenter

Pixar Animation Studios

and

Cinematrix Interactive Entertainment Systems

1

Good afternoon.

I'm pleased to be speaking to you today about interactive digital cinema. We all know digital cinema projection is coming. The operational advantages will force it. You can find loads of specifications and market projections if you look for them, so I will not bore you with numbers.

A digital cinema projector
is a computer screen

There is a point I want to make about digital cinema projectors. Using one to show movies is like using a computer to only play DVDs. Every pixel of a computer monitor is under total real time control. We have an extraordinary opportunity before us: a completely blank canvas to paint anything we can imagine.

The customer and the market will be our critics and tell us what works and what does not. So, one of the goals of my talk today is to convey to you some ideas and experience to guide us in our preliminary exploration of this new world.

To learn about the future, I'm going to take a journey into the deep past. For tens of thousands of years prehistoric humans lived in hunter-gatherer societies of tribes, clans and small extended family groups.

Prehistoric shamans invented and refined storytelling

Survival was often in doubt and necessitated a constant vigilance and attention. Most, if not all, groups had one or more shamans. The shamans served as keeper of tradition and history, finder of lost objects and people, guide as to where to find game, and generally a communicator with the spirit world.

Whether you personally accept the reality of a spirit world is irrelevant. The people of that time did and acted accordingly.

Shamans of whatever culture or land described a similar initiation process that spontaneously overtook them at some point in their life. They describe being taken to an "underworld" where they struggled with demons and "died" and were "reborn" to return to the land of the living with new powers and a communication channel back to the underworld. The "underworld" was seen as a dangerous place with strange inhabitants that could provide beneficial services if properly approached.

Why am I telling you this?

Because the way the shaman and the tribespeople responded to situations and each other is in our genes. We humans evolved that culture and behavior independently all over the world by trial and error over thousands of years. It is a reflection of our inner processes and it arises spontaneously from our life experience.

When a shaman was called to heal someone he first would reenact his initiation story of death, struggle and rebirth, often with props he made himself. That would get him into the proper altered state, as well as convince the people present of his credentials.

People want to help

4

Now, here's the important part. The members of the tribe **really wanted** the shaman to succeed, so they would help in any way they could; by chanting, singing, dancing, beating drums and so forth. Many of them would fall into a full trance.

Audiences have a natural propensity to participate, especially if they believe they are contributing or helping something or someone they value. Sometimes it's their team, sometimes it's their preacher, and sometimes it's just pure excitement or ecstasy.

It so happens that when hunter-gatherer societies gave way to agricultural societies the death and resurrection story of the shaman transformed itself into what we call show business.

Think about it. What is the most general structure of a good story? "A protagonist overcomes an obstacle and is transformed in the process." This is exactly the structure of the shaman's retelling of his initiation. Where would a movie or play be without a second act where everything looks hopeless or without an ending with some kind of resolution?

I know that the Pixar story teams continue working on a story until every character has a credible transformative experience. This is no accident.

So where does this all lead?

To empower an audience
give them an obstacle
they can overcome

If you want to involve an audience, you have to give them **something to do**.

And, this thing that they are to do must give them a sense of overcoming an obstacle and a sense of a transformation or empowerment. Otherwise they will get bored and never come back. I guarantee it.

To plan our future we need to examine the recent past as well.

There have been several well-publicized attempts at interactive cinema, usually taking the form of what we could call "branching movies". Branching movies have multiple alternative narrative threads that fork under audience control. The threads often coalesce to a few standard endings to reduce production costs.

Branching Movies

- ν Dramatis interruptus
- ν Statistical ruts
- ν Disappointed minority

There are some obvious and non-obvious reasons why branching movie ventures failed commercially.

The first one could be called "dramatis interruptus". When the audience is engaged in the story and a branch point occurs; the film stops, the lights come up, and they are jolted out of their reverie. This is just plain unpleasant.

Second, for a given movie in a given location there will be a relatively consistent demographically constituted audience. They will be statistically biased to make their branch point decisions the same way each time. The larger the audience, the stronger the tendency to follow exactly the same track and bypass all the alternative paths. If someone returns hoping to experience a different branch, they will invariably be outvoted.

Third, when an audience is forced to make binary yes/no decisions, some of the members will be disappointed at each vote. This is not a recipe for repeat business.

So, what do we do? I'll get to that in a while.

We first need to investigate the way an audience can communicate its intention or will. In a theater environment with a digital projector this input must be translated into digital form for the computer to digest.

Any viable audience input method for cinema venues must be inexpensive to install, inexpensive to maintain and operate, reliable, easy to learn, fun, and add value to the experience.

Input Modes

- v Voice
- v Show of hands
- v Buttons
- v Keypads
- v Cinematrix

The simplest method is by voice. Converting sound intensity or frequency to digital form is straightforward, but the noise of the audience severely limits the kind of shows possible.

Then we have a show of hands. A lot of research money has been spent on computer analysis of gestures. The results so far are pretty noisy and jerky, even with good lighting and one camera per person. Accurately determining the gestures of audience members in a dark room by computer image processing is way beyond the horizon of the possible.

The most common form of computer readable audience input is to wire the seats with pushbuttons, or sometimes more complex devices. Due to the installation and maintenance expense it has only been employed in small special-purpose venues like theme park attractions, television commercial testing facilities, and the aforementioned branching cinema theaters. Buttons have the advantage that the computer signals are simple and immediate. But they demand that the audience hold at least one hand down where it can reach the button panel. Solving this by connecting the button panel via a cord is a maintenance headache. Buttons work best when the excitement level is low and people have time to find them.

A similar method is wireless keypads. These are often employed when there is no time or budget to wire the room, such as with a business meeting in a hotel. Keypads are good for complex multiple-choice questions that require deliberation. Moreso than with buttons; they are hard to use for people with near vision problems. Those users are constantly putting on and taking off their reading glasses. As with buttons, keypads tend to inhibit excitement.

The next method I will describe is one that we at Cinematrix have been developing for the last 8 years. It has been experienced by millions of people around the world.

Cinematrix
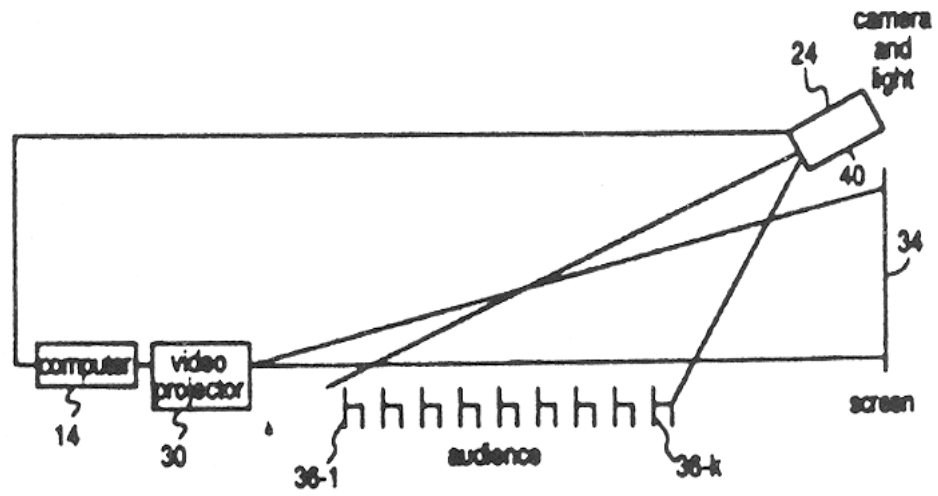
The principle is simple. Everyone in the audience is given a simple colored retroreflector, red on one side and green on the other. A retroreflector is a special kind of mirror that sends incoming light back the way it came, like the safety reflectors on bicycles or traffic markers. A small lamp mounted next to a standard video camera illuminates the retroreflectors. The camera is adjusted so that it sees only the reflections and not the room. The video signal from the camera is fed to a computer that has a digital map of the seats in the room so that it can associate every reflection with a specific seat. What this provides is a clean realtime communication path from the audience through the computer to the screen and back to the audience. There are no moving parts and all the significant components are out of sight or out of reach.

We have used the Cinematrix technology to do about a hundred shows for about fifty clients in several countries the last seven years. Systems have been installed in four theme parks and a planetarium.

Card Wands
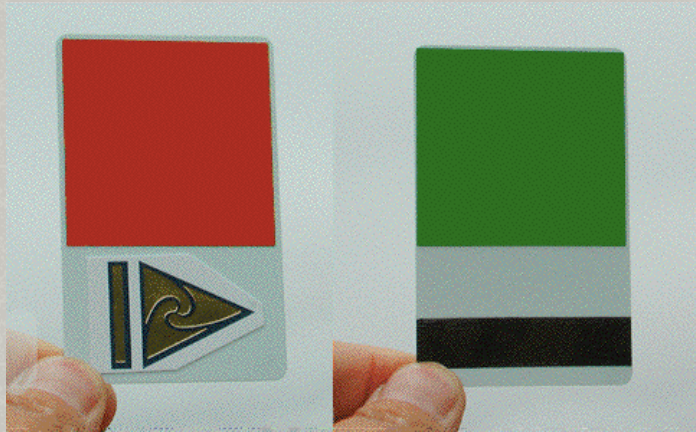
Over the years the retroreflectors have evolved from wooden sticks with plastic tape through die cut plastic foam to today's credit card reflector with a magnetic stripe. The five centimeter square reflective material can be read and tracked with 100% reliability at 100 meters with a standard video camera, enabling audiences of thousands to participate together. The largest audience so far was 8,000 people standing in the town square of Linz, Austria.

The system easily accommodates multiple cameras and since it has a digital map of the venue everyone is counted exactly once. Camera overlap is never an issue.

Cinematrix shows consist of a variety of games and activities; most taking from three to ten minutes to play. Some are designed to orient the audience, as when we display the seating chart and audience members can find themselves by knowing approximately where to look on the screen, changing their reflector color from red to green, and seeing the result. Some games are competitive. For a typical competitive game we form teams by dividing the audience down the middle into two roughly equal parts. Each team collectively controls their side of the game. The exuberance this releases in the room has to be experienced to be believed. Some games are cooperative. One popular cooperative game is for the audience to fly an airplane. One team controls the horizontal direction and the other controls the vertical direction. The teams then cooperate to fly the plane through a number of targets. It's amazing how quickly an audience acquires the skill.

Realtime control is far better than voting

One of the most important lessons we have learned is that there is an enormous difference between voting and realtime control. In voting, the majority determines the outcome and the minority loses. In realtime control everyone contributes to the control parameter, and they know it. The system functions well as a polling system and we have many satisfied customers, but the only time we see high energy from the audience is when they are actively controlling what they see and hear.

We have multiple ways for an audience to control a parameter. The key principle is that everyone has equal control. The simplest method is to compute the percentage of green responses to give a number between zero and one. Anyone can change the value up or down by a little bit. We can also track motion and have had 3,000 people drive a virtual submarine by moving their reflectors the direction they wanted it to go and showing green or red to control the speed. The precision of their control was astounding.

A synchronized audience
is ecstatic

Another very important lesson we learned is when an audience is engaged in a realtime game and the speed of the game exceeds the speed of conscious thought, so that responses become automatic; an ecstatic energy erupts. The entire room synchronizes their will and a rarely used brain circuit is activated. It's our belief that this is exactly the same circuit that was energized in the tribespeople assisting the prehistoric shaman.

Cinema venues need to schedule some blank time between showings for cleanup and audience arrival. Where we live the screen during this time is occupied with a slide show of advertisements interspersed with movie trivia. Then a few trailers for coming attractions are run followed by the feature film.

The feature film itself will for the foreseeable future remain passive. People want and need downtime where they can relax and have someone tell them a story. However, that is only one of an infinite range of possibilities.

Theaters can have multiple uses

In a theater instrumented for interactive use, the audience could be playing games based on coming attractions (interactive trailers), taking trivia quizzes, registering their opinions on political issues, having fun with goofy flash animation concocted by the local advertisers, or competing in aerial dogfights over the net with other theaters in other cities. A theater instrumented in that way could also be available during a weekday for business meetings and during the weekends for birthday parties. The full spectrum of applications from meetingware through web animation to sophisticated PC and arcade video games can be mined for content.

Adapt the story to the audience

Storytellers of old worked with small audiences and adjusted the content of the story and their manner of delivery by watching the way the listeners reacted. Stories evolved for maximum effect.

Someday technology will exist to adapt a film to the mood of the audience by continuously monitoring their reactions. Subtle adjustments in lighting, pacing, dialog, stress, and so forth could be made to a digital film without resorting to multiple narrative threads. This concept has enormous commercial potential. Cinematrix provides an interface technology that makes this possible.

The hardware is here now. The challenge is now in the hands of the storytellers and producers. I'm eager to see where their imagination and skill takes us.

Thank you for your attention.

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The best book to read on this subject hasn't been written yet. I suppose that means I'll have to write it!

Since the definitive book doesn't yet exist, here are some books and journals that look at different parts of the picture. Some of these are very directly related to imagery, symbolism, and consciousness, others simply do good things for one's psyche.

Don't forget that reading any book about symbolic perception will be only indirectly useful, in the same way that reading about playing an instrument is indirectly useful. Music only happens when you play.

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