



Scientists tell stories and it's important if you are a scientist to know what story you're telling. It's also important if you're a non-scientist to realize that scientists are telling stories and that some of these stories have non-scientific content. There are people throwing spells at you. They're casting spells at you to make you think things that are not scientifically true. For instance, the notion that the female reproductive tract is a passive conduit through which sperm race and that the first sperm that reaches the egg fertilizes it. Those are wrong. The notion that the egg is the passive recipient of the active sperm. That's wrong. The notion that all the important phenotypic characters that you have, the way you walk, the way you think, your intelligence, your behaviors are made at fertilization. That's wrong.

Now I want to talk about the language of spells. There are many ways of defining similarities and difference. You've probably learned in high school, simile and metaphor, and analogy. Simile, using like or as. Now a simile is a rational way of doing things. If I told you that the mesodermal cells move like a tractor. You might not know anything about mesodermal cells, but you can envision how they move. A metaphor is a hidden identity, often emotional. The trophoblast invades the uterus on Day Eight. I didn't say that the trophoblast was like an invading army. No, I said the trophoblast invades the uterus. Metaphors are magical. They make equations between two different things. If I were to say, you are the promised breath of springtime. I'm using metaphor.

Analogy states the similarity between relationships. Crystalline is to the lens cells as globin is to the red blood cells. You might not have ever about crystalline before, but you know that it fills up the lens cells as hemoglobin fills up the erythrocytes. Now metaphors channel the way we think, and I've just used a metaphor, channel. Did you think of fluid being directed into a narrow passageway? Or did you think of ions being excluded or allowed into a cell? Of the many possibilities there are, certain things are allowed, certain things are not allowed. That's what metaphors do. They channel the way one thinks. Now this was actually noticed by Ballentine in the early 1900's, when he was talking about the relationship between the early embryo and the uterus. He asked, does the embryo dock on to the uterus? Envision that docking. Does the embryo



implant into the uterus? Imagine kind of it folding in to the uterine tissue. Or does the embryo invade the uterus? All those metaphors are true of what's happening. It's a way of describing what's occurring between the early embryo and the uterus. But you get a different vision in your head.

Now what's interesting is the word gamete, which defines sperm and egg, the set of sperms and eggs. Gamete means marriage partner, so we're talking about marriage partners here. And the behaviors of the sperm and egg, of the gametes, are modeled to reflect the expected behaviors of men and women. The metaphors make sperm into men, eggs into women. Now the first model, proposed shortly after fertilization was discovered, was that the sperm were the suitors of the egg. The egg would sit in its ovarian parlor and to the egg would come sperm. And the sperm would actually be chosen by the egg. The egg was active in choosing which sperm would fertilize her. As McClung wrote, "The ovum determines which sort "of sperm shall be allowed entrance into the egg substance. In this we see the extension to its ultimate limit, of the well-known role of selection on the part of the female organism. To it, come two forms of spermatozoa, the x-bearing sperm, the y-bearing sperm, from which selection is made in response to environmental necessities."

The second model for these gametes, for these marriage partners, was the egg as Sleeping Beauty and the sperm as the valiant prince who survives the brambles of the zona pellucida, and has defeated other sperm and gives the Sleeping Beauty, the dormant egg, a magic kiss. Here we see the magic kiss, this is in a Developmental Biology journal, 1990, and there you see the sleeping egg, and there you see an egg which is definitely activated and aroused by the kiss of the sperm, which we see in the lower corner.

The third model, is the sperm as the heroic victor, it's kind of like the Sleeping Beauty but now we put a little bit of competition into the picture. This is a German birthday card, which basically translate, this is what happened so many years and nine months ago. And you see the sperm holding onto the egg saying, "First!" All the other sperm kind of



look disappointed that the first sperm won the race and got there. This whole notion fits in very well with what Joseph Campbell calls the founder myths of royal lineage and The Hero with a Thousand Faces. The founder myth is this; each of us is the decedent of a heroic sperm and an oocyte princess. An oocyte princess, think of the words used to describe the oocyte. It has a corona radiata, a radiant crown. So we have a hero sperm and a royal egg.

The fourth model, the sperm is conquering warrior. In an article about sperm wars, one writer says, "Casualties in the sperm war are staggering." Sperm are described there as tactically smart foot soldiers. They're called well-armed, and a .000024 inch weapon tipped with a chemical warhead. According to this article, "The female does all she can to encourage the sperm. The egg sends out alluring chemical cues. The tense maneuvers between the well-armed sperm and the fortified egg echo back to the first moments when sexual reproduction evolved." And then this author asks, "Why do males need to produce millions of sperm and release them with such intensity?" The problem of sperm, and thus of males, are of course the fault of females. Female fickleness sets up a quandary for males.

So what myth are we seeing here? What myth has a fortified woman sending out alluring chemical cues to an army of spermatozoa. I think we're talking here about Helen of Troy. And so this is a context to put in the story of sperm and egg. It has nothing to do with the story of sperm and egg, but what it's saying is for the same reason that Helen launched a thousand ships, men launch millions of spermatozoa. So we're seeing a myth here, this is not science, it is myth. Sperm for instance, become capacitated in the oviducts. The oviduct is not a passive conduit through which sperm race. We also know that the sperm is activated by the egg, and it's activated by the female reproductive tract. So the sperm is told how to get there by the egg. It's hyper activated, its motility is increased by the egg. So the egg is not passive. The sperm does not drill into the egg. Matter of fact, if there is any metaphor that might be used in mammals, it's spooning. That the curvature of the acrosome meets the curvature of the egg and the egg cell membrane actually wraps around the sperm cell membrane and they dissolve



and fuse together. So, there are social spells that are being cast on you, that the egg is a passive prize being awarded to a victorious sperm. That the female reproductive tract is a passive conduit through which sperm race. That the fastest sperm get the egg. That the sperm rescues, or activates the dormant egg, and the sperm drills into the egg. These are all scientifically invalid.

Ross Granville Harrison, one of the most famous American embryologists of the 1930's wrote, "It is never less important to realize that even the language of science is bound by tradition and is by no means free of anthropomorphisms and relics of our demonology, which are difficult to escape, and which may not only lend a false sense of security to our explanations but may also suggest foolish questions that can never be answered." So it's important as a scientist to realize the language that's being used to describe fertilization and it's important as a layperson to look at what scientists say and be able to deconstruct what they're saying, be able to find myth patterns in them.

So one of my questions to you is, what metaphors are being used in the textbook that you're reading? Are they any less socially constructed than metaphors of soldier or suitor? The main point though, is to be wary of descriptions that are used to discuss fertilization. Because they often contain hidden messages about the way men and women are expected to behave.