

Science

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The very nature of science is contained in the single word *wonder*. More so than *curiosity*, the word *wonder* implies not just the discoveries of the curiosity-minded but the development of an associated *why*. We can be curious about why the sky is blue, but to wonder why it is blue leads to science.

And so it was that my own curiosity led to a career in science. And so it is that the pre-eminence of the internet as a tool of science has led to my fear for the demise of science altogether. In truth, I like the internet for what it provides. We now have instant access to unbelievable amounts of information. We also have learned that not all the information on the internet can be trusted. We no longer are required to be patient enough to drive over to the library and look things up before we have what we may surmise to be an answer to a question we posed. What we have traded for our instant gratification is the time given to us by our trip to the library. We lose the time needed to just let ideas stew. These couplets represent examples of the trades we have made with the rise of the internet as a mainstay of research. But they are not the reason for my fear for science itself.

Science, as I mentioned, commences with wonder. But in its application, it is often more aptly described as a controlled wander. Sure, we like to think of our science as being very structured and linear. We make an observation, develop an hypothesis, test it, and derive a conclusion. But that's not the way it happens. That's just the way we present it to others.

As scientists, we wander. In taking a hike through the woods, we tend not to travel a straight path. We are drawn to the butterfly, but before we finish our observations on this aerobic delight, we become distracted by the lily beneath the oak. Looking into the flower, we see a bee that takes off to a new flower, just as we are noticing the pollen on her legs. The flight of the bee is lost to our sight, and we wind up looking at how the leaf of the Hickory waddles in the wind. Right next to it, the leaf of the Cherry delights us with a completely different dance. *Same wind*, we think to ourselves. Why does one twist and turn while the other is limited to a sort-of flapping motion?

This is the stuff of science. This is the stuff lost in the internet. Back in the library, as we begin to look up the butterfly, we reach for a book on insects. Unfortunately, it is right next to a book on birds. Once again we are distracted. Once again we wander, but this time, it is through the works of others. The works on the shelves. In the butterfly book, once we finally get it open, we see our elusive butterfly and are satisfied that we have successfully achieved our goal - we have a name. On the facing page,

however, there is another butterfly and we wonder why we saw one of these and not the other.

It doesn't take long before I have put down the textbooks and field guides and found my way to the journals. Now, for those of you who may not know, a scientific journal is like a magazine. Just like the Ladies Home Journal, each one has a theme, but all the articles are on different topics. So, in the Journal of Entomology, I look for and find a scientific paper on my butterfly. Unlike the Ladies Home Journal, scientific articles are reviewed by other scientist who make sure that the information is good and accurate. This process is called *peer review*. Internet problem No. 1 is done away with. We can be confident that what we are about to read is probably good information. It's not always correct, but the probability is higher than that of random internet searches.

Opening the journal, I scan the table of contents looking for my article. And then it starts all over again. Wonder and curiosity take hold and before I can get to my intended report, I am drawn to a study on Grasped crabs. Scanning the abstract, I resolve to read it later and resume my search for my butterfly. Shortly afterwards I find myself delving into a study of Large frogs. Once again, I was distracted by a different article.

And then the magic happens. It turns out that the frog has quite an appetite. Selectively, this frog likes to eat butterflies. Not my butterfly, but the one on the page next to the one I saw. Quickly, I find the herpetology journal and begin looking up the natural history of the frog. In no time at all, I also have a couple issues of the ichthyology journal open and am looking at the diet of a fairly common perch. It seems the perch likes to eat the tadpoles of my frog. Three hours later, I have a fair understanding of the fact that I was much more likely to see the butterfly that I saw and not the other one because the heron population had exploded. The herons ate the perch that ate the tadpoles, thereby increasing the number of frogs and decreasing the numbers of the butterfly that I had not seen. This is the recipe for knowledge. Like a recipe, it has quite a few ingredients. Like shopping for ingredients, the books, the journals, all on the shelf next to each other are like the aisles of a well stocked grocery store. A person with time will wander through a grocery store and create a masterpiece by matching up seemingly unrelated ingredients. The person in a hurry will usually end up with a package of hot dogs and box of macaroni and cheese.

Science isn't linear. Internet searches are. There is no way to connect dots with the highly focused answer machines called search engines. There is no peripheral vision with which to even see the dots. Getting lost in a stack of journals may not always get you the answer, but it will always increase the wonder.