WHAT WOMEN BRING TO GEOLOGY
Part 5 in a series on the mind of the geologist

By Sarah Andrews

Women bring unique talents to geology. We are by nature adept at gathering geological data. Our deep capacity for nurturance brings support and fresh civility to the professional community. And, as we mature in our professional lives, we enter a state of knowing that is sublime.

What do I mean by knowing? I'll illustrate my definition by telling a story:

Once upon a time in the oil patch, I was asked to help interpret some drill core that was laid out in Amoco's research facility in Tulsa. I was just a kid from one of the regional offices, but I happened to have experience with sand dunes, ergo eolian sandstones. Two men who had much bigger, juicier postgraduate degrees and decades more experience than I, and who had been puzzling over the core for some weeks, walked behind me as I strolled past the layout "reading" the depositional history of the rocks aloud to them. I do mean that I strolled: I had learned from working with eolianites to first build an overview rather than immediately try to decode each separate lamination. Mine was an intuitive approach, built on a kinesthetic sense of what the rock meant at the scale of its depositional rhythms, and how that might affect an oilfield.

It was a beautiful core, a thousand feet of Nugget Sandstone from Wyoming's thrust belt, and it sang to me of wetting and drying climatic cycles, an epic story of fluvial and eolian processes vying for depositional supremacy as the sands stacked up in a descending basin.

As I reached the last box of core, I turned and looked at the men. I was greeted by two very dark countenances. One man glared at me, unwilling to name his emotion. The other snapped, "How do you know all that?"

Stumped for an answer, I opened my undiplomatic yap and said the first thing that popped into my mind: "The rock speaks English."

The look in their eyes evinced a desire to burn me at the stake, but they weren't half as shocked as I was. My own words jammed in my mind. How indeed had I known what I knew about that rock? With that question, a geo-philosopher was born.

Fast-forward one job change and a layoff later, when an urge to write about my experiences and observations filled my suddenly idle moments. I chose the mystery form because it was a natural match with the kind of unraveling geologists do. I soon discovered that in order to interest readers in a detective story starring a geologist-sleuth, I must show them what's compelling about the way a geologist's mind works. It wasn't long before I began to write philosophical essays, including others in this series (Andrews, 2002, 2003a, 2003b, and 2003c).

In those first four essays, I celebrated the capacities of geologists of both genders to think in four dimensions—the three dimensions of space plus the full measure of the fourth dimension, deep time. We easily visualize 3D objects such as synclines and ore bodies, and have no trouble mentally morphing them through the processes that function through time, either running the clock backward to construct a history or running it forward to create a prediction. In this 4D mental playground, we can simultaneously project the impacts of erosion, deposition, tectonism, climate change, and myriad other earth processes. We can construct symbolic graphic representations of these 4D concepts (maps), and at a glance interpret the maps of others. We can reach rational solutions using incomplete, even ambiguous data. We are pragmatic, more interested in arriving at correct answers than using proscribed routes to get to them. We get there through a combination of intuitive leaps and deductive logic, and "there" is not one fixed answer but a Venn diagram of overlapping possibilities. We run a risk analysis to select the possibility most likely to be correct, then immediately attack it, a sort of built-in scientific method.

Unlike the early-blooming but also early-peaking intellectual talents of 2D (linear) thinkers, the mental talents of geologists mature through life as we continuously accumulate observations and thereby develop judgment. That day in Tulsa, my personal matrix of knowledge matured into the joyous confidence of knowing. Yet in that moment, knowing was so new and apparently unwelcome that it spooked me. I didn't yet understand it, and I wondered if I did in fact deserve to be burned at the stake.

Luckily, superstition fades as we explore reality. In *Knowing Woman: a Feminine Psychology*, by Jungian psychologist Irene Claremont de Castellejo (1989), I encountered the useful concept that—regardless of one's physical gender—the receipt of inspiration and information is feminine, and that capacity to process that input into a product is masculine. Think of a fully visible landscape washed by a soft, scintillating glow versus a tightly-focused flashlight beam illuminating one spot in an otherwise darkened room. To put this in fully sexual terms, think receptive versus penetrating.

What does this Jungian paradigm have to do with the practice of geology? Plenty, because we approach science intuitively. My definition of intuition is open communication between the conscious and unconscious minds, and that communication is opened most widely through the soft interface of diffuse awareness. The more widely and intentionally we open that door, the better we can compare, sort, and categorize data, and predict results. Think of a computer with a 64-bit buss as compared with an old-fashioned 8.

All geologists, male and female, are rich in feminine diffuse awareness. It is within the soft, receptive ground of diffuse awareness that we transcend the boundary that stretches between conscious and unconscious thought, and engage the power of intuition, that place where the "aha!" of consciousness and our lightning-speed access to the stored observations of the unconscious unite. At this nexus we receive and integrate connections, embrace ambiguity, and enter the state of four-dimensional flow in which we know what we know.

Christine Turner (2000) points out that this relaxed, receptive state of mental functioning is most pronounced when geologists do fieldwork. Those of us who have done a lot of it get downright irksome if we're deprived of it. We need the down time, need to remove ourselves from the psychological over-stimulation of human culture and commune only with the puzzles of geology. Thus restored to our finely-tuned senses, we return to town for a long season spent reducing the data we have gathered, focusing down toward a product like a map or a report.

When speaking to geoscience audiences about these concepts, I sweep my hands around the sides of my head to indicate feminine diffuse awareness, and point to the center of my forehead to represent focused masculine. The women in the room smile and nod their heads knowingly. We know this modality well. The enriched zone of the feminine is our home ground. If we struggle at all, it is to arise from the flow of observation long enough to put metes and bounds to it, call it good, and write up our results. It is in conscious integration of the feminine and masculine that we become whole, striking a balance between taking in and producing outward. In this state of wholeness, at the open vessel of diffuse awareness brought to directed use, rests a woman's knowing, a capacity to evaluate and decide with clarity and confidence, an assured connection to the center of her being.

A woman geologist's native capacity for diffuse awareness is not simply an artifact of personality, but also the direct consequence of her chromosomal—and hence hormonal—makeup. Being female can present intermittent physical symptoms best treated with analgesics or a hot bath, but estrogen and progesterone also boost our diffuse and focused states. In the years between menarche and menopause, I learned to greet the new moon for the depth of intuitive/receptive capacity I found there. In the full moon I emerged recharged and refreshed to present my findings. I cycled between inward-looking receptivity and outward, knock-heads assertiveness. I planned my work around the intensity of the extremes and used them to great advantage. I use the past tense because I have now passed through menopause into a less differentiated ground. My current state is perhaps what men experience throughout their lives, except that having been that far inside, I know that that space exists, and have learned other ways to get there.

Which is not to suggest that any of this is easy. As women immersed in a male-dominated professional culture, not to mention the patriarchal values of our culture as a whole, we struggle to strike a balance between feminine and masculine cultural norms. Shall we bear children, or concentrate on career, or have both? And what compromises must we make to hold a household or a marriage together?

Once upon another time, I was asked to teach a group of middle-aged women to read topo maps. They wanted to be able to hike together without their husbands without getting lost. I gave a lecture on theory, then equipped them with maps and had them orienteer their ways around a nearby park. It soon became apparent that each was in fact reading her map with far greater precision than a short lecture could produce. I pointed this out and asked, "Who told you that you couldn't read maps?"

After a pause, one woman said, "My husband." Several others nodded sadly. I realized that I had me a pack of good girls who had abdicated orientation in time and space to get along with their mates. On the same soft, receptive ground where we can so easily gather information and inspiration, we are also vulnerable to social pressure. That's not always a bad thing. Yielding our boundaries helps us gather in our children and tend to our mates in times of need, and I'm sure that abdicating the authority of time and space to the tribe's protective warriors (while simultaneously remembering exactly where each medicinal root could be found) had its survival value back when we were all hunter-gatherers. Nature prepares us to cope with stress in a special way. Instead of the tight focus of the hierarchical male "fight or flight," women "tend and befriend," a diffuse strategy based on nurturance and protection that can be applied in the workplace just as easily as in the home.

Working two or more "jobs" at a time requires hard choices and sometimes messy compromises. In 1986, Rocky Mountain Section AWG asked me to lead a two-day field trip to Great Sand Dunes National Monument. Participants opted to bring their families along, planning to leave their children with their men during the days and rejoin them at the campground in the evenings. This plan changed as the men decided that they'd like to join in on the geologizing, which meant that the kids came, too. Sunburns, fatigue, fighting siblings, and other domestic distractions ensued. At the end of the first day, the women were done splitting themselves between geology and family, and scrapped the second day's fieldwork in favor of family time.

I had not yet married or become a mother, so I shook my head in dismay. Now I know better than to judge. Integrating career and family, like managing any other conflict (to quote uh…I think it was Sartre), becomes a matter of style. A woman's style is ever that of pioneering, that great mother of invention; or, now paraphrasing *Caddie Woodlawn* (Brink, 1935), women are a nurturing, civilizing force. Applied to the working world, tend and befriend coping strategies function as a natural system of networking. When applied as leadership tools, the feminine ideals of trust and (literally) co-operation (Gray, 1992) inspire us to work together effectively without the need for rigid hierarchies.

Mary Catherine Bateson (1989) points out that, because women have long practice adapting to the requirements of childbearing and our mates' careers, women know how to cope with the 21st-century reality that most professionals will change careers an average of five times. If the demands of motherhood haven't taught us to multitask, parallel process, and be flexible, nothing ever will. We take our lumps and come back again and again, building a new home and life in each place fate deposits us.

When I presented these ideas at the 2003 AWG convention in Seattle, Marilyn Suiter laughed, "This is great, Sarah. You've single-handedly overthrown the paradigm that women aren't as good at science as men. You're saying we're even better."

I've decided that it's worth the risk of being burned at the stake to know what I know, and know it out loud. Marilyn and I exchanged smiles, two professional women enjoying the fruits of learning, hard work, and our very special talents.

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