

The evolution of ideas about animal intelligence

Already in this series of mini-essays, I have related two examples of personal revelations triggered by observations in the field (three, really, if I include my own). Stan Cook and Glenn Sutherland experienced things in the meadow that shook them, in the sense that the evidence of their senses contradicted knowledge they had come to believe as true. In both cases, the revelations led to formal investigations that in the end when their results were published, corrected misconceptions in the professional literature.

Gradually, over a period of several years in both cases, news began to make its way from the professional journals where the work was published into textbooks and into teaching. In some cases it takes much more than a few years for news of advancements to filter out, even as far as textbooks, largely because people hold so tenuously to old knowledge and resist anything new. (Remember the hummingbirds' responses to switch experiments?) How long does it take for ideas to change in the general public?

Here I will describe something relevant that occurred when I was just beginning my masters' studies, before I taught high school and then returned to graduate school to study hummingbirds. At that time, I was studying newts, the dark brown salamanders with orange bellies that breed in water all up and down the Pacific coast each spring. (They breed in our ponds on Quadra Island). Mine was mainly a field study of reproductive isolation between two species that breed in the same watershed in the Sierra Nevada mountains in central California, but I also kept a few newts in a terrarium in my office.

On this day, my research supervisor Tom Rodgers and I had arranged to go for lunch together, and Tom had invited his colleague Homer Lowe to join us. When Dr. Lowe and I arrived at Tom's office, Tom was on the phone so we chatted for a while.

"How's it going with the salamanders, Lee?", asked Dr. Lowe.

"It's fantastic, Dr. Lowe. I'm getting lots of good data in the upper Butte Creek drainage on the distribution of the two species. But one of the best things is that the salamanders get so excited when I feed them earthworms."

"Lee! Lee!," he said with a disappointed tone of voice, "You took the animal behaviour course. You *know* that salamanders have such simple nervous systems that they *can't* get excited! You should really be more careful about how you say things."

Well I didn't argue with Homer Lowe about whether newts could get excited. For one thing, he was devoutly religious, and his views about most things were deeply coloured by his religion. I had learned long before never to argue about religion. Besides, I had learned in Dr. Lowe's entomology and teaching methods courses that his view of animal intelligence was not rich enough to embrace many things that simple observation of behaviour could reveal, and that it did not pay to argue with him about anything. (Tom Rodgers was the opposite; we argued about everything, and both of us thrived on it.)

Besides, I knew very well what happened whenever I dropped a piece of earthworm into the water at one end of the terrarium. The newts became activated to an extent that I never saw in any other situation. They oriented their actions directly in relation to the worm, and the most active newt always got the worm. Not only that, but I had realized over the months that the newts no longer waited for the worm to hit the water before becoming activated. As soon as I got the worm and the scissors ready and lifted the lid of

the terrarium, the newts were ready. They were already “excited”, and that is what I meant by the term.

I never found out exactly what Dr. Lowe meant by “excitement” when he chided me, and Tom Rodgers didn’t help much in his dismissal of Lowe’s criticism as “religious babble”. Whatever he meant by the word, it is hard to believe that he would not have agreed that newts become highly activated and motivated in relation to their food. The disagreement could not have been about how the newts actually responded, on a level that can be seen and recorded precisely, but about our interpretation of that action. While our observations would have been identical, our interpretations were vastly different.

That brief, informal interaction with my teacher deeply influenced my development. For example, it strongly reinforced my existing tendency not to trust what teachers say, especially about interpretations rather than observable facts, until I confirm it through my own experience. By illustrating how powerfully what we experience is biased by our expectations in the context of my own early research efforts, it gave me one of my first clear views of the basic nature of science. While our observations are *of* the world, they are really *about* our ideas about the world. Scientific understanding progresses through the replacement of old ideas by newer ones, forced by observation, and it never stops as long as people are free to question their understanding.

Much later, I was asked to review the animal behaviour chapters of a new first-year biology textbook before its publication. I had been told that those chapters had been written as a subcontract by a famous scientist whose work I knew well and whom I had met, and so I expected to find nothing of real concern.

But when I read the chapters I was shocked! Although the biological content that my colleague had written about was intact, its interpretation was totally unlike anything I could have expected from him (or from anyone else I respected professionally). Anything that could have challenged Homer Lowe’s simple, fundamentalist notions of animal capabilities had been expunged, and the only thing left, even for higher vertebrate species such as chimpanzees, was so impoverished conceptually as to make it impossible to imagine how animals could stay alive in the complex world we were beginning to appreciate in those days.

Because I knew publication to be imminent, I telephoned the author of the textbook, the Dean of Science at a premier research institution, to express my concern. As I put it to him, his book was not only misleading scientifically, but it was so dangerous in its interpretation that I would do everything possible to discourage anyone, anywhere, from using it in its current form. I told him what I had seen, and promised to send a complete review. But I cautioned him that it was as if the publishing house had been occupied by fundamentalist infiltrators, and that they were intent on colouring science textbooks with their religious biases. I recommended that he review certain other parts of the book for similar biases, and suggested almost as a joke that he see whether my hypothesis about infiltration held any water.

He got back to me after a few days with the disturbing news that my conspiracy theory was essentially correct, and that other parts of his book had been similarly compromised. It was too late for wholesale revision, so he hired me to write 2-page “boxes” to be inserted in each of the animal behaviour chapters to express what he chose to call “an

alternative interpretation” of the content. I was pleased to see that the book did only moderately well in the marketplace (but not at UBC).