



## *Let's Get Something Straight*

by Charles H. Calisher  
[calisher@cybersafe.net](mailto:calisher@cybersafe.net)

> Croat Med J. 2008;49:436-40

> doi:10.3325/cmj.2008.3.436

### What Do We Know About Anything?

Ozymandias  
"I met a traveler from an antique land  
Who said, "Two vast and trunkless legs of stone  
Stand in the desert. Near them, on the sand,  
Half sunk, a shattered visage lies, whose frown,  
And wrinkled lip, and sneer of cold command,  
Tell that its sculptor well those passions read  
Which yet survive. Stamped on those lifeless things,  
The hand that mocked them and the heart that fed.  
And on the pedestal these words appear:  
'My name is Ozymandias, King of kings:  
Look on my works, ye mighty, and despair.'  
Nothing beside remains.  
Round the decay  
Of the colossal wreck, boundless and bare,  
The lone and level sands stretch far away."

Percy Bysshe Shelley  
(1792-1822)

We all know a great deal about very little and very little about a great deal: what pH is needed for a certain diluent; how to distinguish among the three polioviruses; the placement and function of the anther on the stamen of a plant; how much air pressure one's auto's tires require; the number of days in a week; the number of carats in Elizabeth Taylor's most recently acquired diamond ring; the name of the Governor of Svalbard; etc. These are important facts, if you are to be conversant and popular at a cocktail party, but not terribly useful in general. Alternatively, there are important facts that do not seem to matter very much but which, in actuality, are critical to know: which mushrooms are poisonous; when to bring your auto to a full stop (a chimpanzee likely could be taught to drive an auto and to know the significance of the colors of traffic lights but might drive through an intersection with a pedestrian or another vehicle in it, even if the light was green); who to drink and play

cards with; the need to pay a debt on time; etc.

Still, for each of us, if we are to hold onto a job, it is best to know something useful, otherwise we could be replaced by just about anyone. Being replaced means (a) having to look for another job (always stressful and annoying), (b) having to look for an even smaller auto (not a bad idea these days), and, perhaps, (c) having to look for another spouse (always stressful, sometimes not so annoying). Therefore, the responsible among us attempt to learn as much as possible, to memorize as many facts as we can. Alcohol does not help, unless it is rubbed on.

Those who know a great deal about a limited subject area are called "experts," which means they know as much or more about that subject as does anyone else. It does not mean they know everything about that subject, nor does it indicate that they know anything at all about other subject areas. The honest "expert" will admit to this. Almost everyone believes they know "a great

deal” about something but “a great deal” is a relative thing. For examples:

1. We all know a great deal about dogs (*Canis lupus familiaris*). We know they are related to wolves (*Canis lupus*), and that long ago they were bred from wolves, civilized, and domesticated (we husbands know what that means). We know that dogs can be sorted into “breeds,” but that, genetically, a Bernese Mountain Dog is no more different from a Basenji (both *Canis lupus familiaris*) than an NIH Swiss albino mouse is from a house mouse (both *Mus musculus*). Clearly, there are huge differences between canid subspecies and we can identify those differences easily because we are the ones who decided they were important distinctions. Black dog, white dog? Big dog, small dog? Pleasant personality, annoying personality? These traits do not matter to taxonomists and I do not care about the characteristics of your dog, so long as I have my dog. Such characteristics may be biologically trivial, but personally significant. If I ask a dog “expert” to tell me the maximum acceptable height or weight of a certain breed of dog, s/he will do so. I have a question for the “expert,” however. When you walk into a room where your dog is lying and the dog sees you, it may lift or lower its ears, may wag its tail, and may stand. This response

by the dog requires production of messenger RNAs, protein release, and much more, a remarkably complex series of responses, neurological and otherwise. Here is my question for the expert: “How does that happen so quickly, essentially instantaneously?” There are many more conundrums I can think of off hand and many times more than that for which I do not have sufficient imagination or knowledge to enumerate.

2. I have been studying hantaviruses (family *Bunyaviridae*, genus *Hantavirus*) for well more than a decade and I still do not understand under which combination of conditions these viruses are amplified. We have characterized trapping area habitats, continually monitored precipitation, determined ground moisture, humidity and temperature, measured berry production, captured ground-dwelling insects, studied night-to-night rodent movements, genetic traits, weight gain or loss, and breeding preparedness, tested urinary pH, taken blood and salival samples from captured rodents, tested the blood samples for antibody to determine the prevalence of the hantavirus known to occur in the capture area, tested bloods from infected rodents for presence of hantaviral RNA, observed the presence of many predators, analyzed multiple captures (more than one in a trap), and analyzed all

this in light of rodent population sizes, juvenile:adult ratios, virus prevalence, and seasonality. The initial idea and continuing goal was and is to predict increases in virus prevalence and to correlate that with numbers of human hantavirus pulmonary syndrome cases. Can we now do that? “No” or “Not yet,” which is at least hopeful.

3. We do not know the mechanism by which people fall asleep. When we go to bed at night we might stay awake for a time and then go to sleep. I have no idea how we do that. No one else does either.

4. We see a person or an object and it reminds us (memory recall) of someone or something not seen or consciously thought of for many decades. How does this occur? Bigger question: “Why does this occur?” That is, is this a residual, evolutionary defense mechanism?

5. Where I live in Colorado (about 2600 m), as elsewhere at high altitude, birds of certain species, mostly corvids (the crows and their close relatives), harvest seeds and nuts of various pine trees (family Pinaceae), including Limber pines (*Pinus flexilis*). They then bury the seeds in the rocky hillsides (here called “scree”) or in the ground, under leaves and branches or under snow, or they eat them. Remarkably, an individual bird may bury (hide, cache) hundreds of food items and may also

remember exactly where it buried many of them, even months after they were cached. Nonetheless, at least some of those they bury sprout and new trees spring forth. The Clark's nutcracker (*Nucifraga columbiana*) and the Limber pine have a particularly co-dependent relationship, an evolutionary "accident" of nature, no doubt (or perhaps there is doubt?). Limber pines depend on these birds to plant their seeds for them. This nutcracker (a particularly aggressive bird, also called "Camp Robber" because of its proclivity for landing on picnic tables and stealing food) harvests, disperses, and caches the seeds of pine trees, to the benefit of both species. The Clark's nutcracker has developed a sublingual pouch that can hold as many as 30 Limber pine seeds or more than 50 seeds of the closely related White-bark pine (*Pinus albicaulis*) and the trees produce wingless seeds. These and other characteristics are of mutual benefit. For example, the powerful beak of this bird is particularly adapted to removal of the large seeds of the limber pine. Fortuitously for the tree, these birds may fly as far as 17 km, thereby widening or enhancing the geographic distribution of the tree, and each bird may harvest as many as 30 000 seeds while only recovering half of them. Seeds that germinate in spring may grow as a cluster, appearing to be a multi-trunk tree.

Clusters of unrelated trees may grow together but retain their individuality. If the trees arose from seeds of different trees (this particular nutcracker may plant 5-15 seeds in a single hole in the ground), the bark fuses and encloses multiple genotypes within a single cylinder of bark, guaranteeing genetic diversity.

Furthermore, if the birds are to be able to retrieve the seeds during winter or spring, they must cache them in places that are not covered deeply under what we at high altitude in the essentially rain-free Rocky Mountains call "potential water", ie, snow. So, the nutcracker uses cache sites that are wind-swept and the resulting distribution of Limber (eg, flexible) pines is restricted to ridges and hillsides, often at high elevations, sites that other trees cannot tolerate, sites that do not experience fires and which are essentially insect-free. Limber pines may live for 1000 years or more in such places. How does all this happen?

Thousands of books have been written about avian activities (I recommend highly the book by Bernd Heinrich; details below), seminars given, careers made, students burdened, binoculars and peanuts sold, and hypotheses offered. The question remains: "How do they manage this?", ie, "What is the mechanism by which these characteristics occur?"

6. When we first moved to the mountains from the city where my university is, we began making lists of the birds, mammals, and plants of our property. I took on the birds and mammals because I had some background in identifying these creatures (or "critters," as they are known locally). My wife took responsibility for identifying the plants, which keeps her out of trouble. One of the first things we learned was that Red squirrels (*Tamiasciurus hudsonicus*) feed on the soft material under the bark of Douglas firs (*Pseudotsuga menziesii*) and the Tassel-eared squirrel (*Sciurus aberti*) feeds on the soft material under the bark of Ponderosa pines (*Pinus ponderosa scopulorum*). Each of these trees produces terpenes, chemicals that have a variety of roles in mediating antagonistic and beneficial interactions among organisms, including defense against beetles. Squirrels that feed on these trees cannot tolerate high terpene content, so they feed on trees that have low terpene content, eventually killing them. Thus, these squirrels help to select beetle-resistant trees by not killing those that have high terpene content.

Drought-stricken pines in the western United States currently are under heavy attack by beetles (examples: Mountain pine beetle (*Dendroctonus ponderosae*), Douglas-fir beetle (*D. pseudotsugae*), Western pine

beetle (*Dendroctonus brevicornis*), Western spruce budworm (*Choristoneura occidentalis*), Ponderosa pine budworm (*Choristoneura lambertiana ponderosa*), and other insects. When they kill the trees, or even when they damage the trees severely, the risk of fire increases considerably. This is bad for the trees and bad for my home. Enormous disfiguring and economic damage has been done to our forests by these insects and this tragedy causes increased availability of wood from dead trees, the wood many of us burn to heat our homes in the winter, so it is not a complete loss, but is a long-term disaster. Tree removal results in fires, erosion, and other devastating losses. Therefore, it is incumbent upon us to protect and defend squirrels of various species.

The question remains: "What was the evolutionary mechanism by which these particular birds and trees and rodents made these marriages?" Chance alone? Over many thousands of millennia? Probably so.

7. Recently, in a few eastern United States, an unusual die-off of overwintering (hibernating) bats was recognized. Bats in affected caves were shown to have lost weight, to have less stored fat, and to be further characterized by having a white fungus populating the area of the nose and mouth, hence the name "White nose syndrome." The

fungus is not found in the lungs of affected bats, viruses have not yet been isolated from their tissues, no bacteria or parasites have been detected with regularity, no pesticides or other potential toxins have been implicated in this condition, there is no difference in attack rates by gender or age, etc. There has been no solution to this problem, at least not yet. This is an egregious situation, because some of these bats are important and endangered. Meanwhile, an increasing number of deaths are occurring. Can the cause be traced to global climate change (bats in caves at lower temperatures appear to be unaffected, in contrast to bats in caves whose temperatures have increased over years of observation)? What about a bat immunodeficiency virus, infection which might allow other agents to further erode the health of the bats? A previously unrecognized pathogen? Batricide?

This epizootic has been continuing for months, perhaps for at least two years. Why is there a problem in determining the cause and the solution? As I sit in on conference calls about all this, I am impressed by the considerable amount of information possessed by the experts. Still, for all that expertise, we have no useful answers. Why not? Because for all the information we do have, there is a much greater amount of information that we do not have: bat meta-

bolic data; fungal, bacterial, and viral prevalence data; data regarding food intake in relation to seasonal temperature means and fluctuations; effects of dual (fungal/viral, fungal/bacterial, viral/bacterial, etc.) infections on hibernating bats; recent changes in fertilizer use, management and disposal; effects of changing presence of hormones in the environment; specific or general changes brought about by increases in human presence in the caves (ie, overuse); noises; and others, for which I do not have sufficient imagination to conjure.

These and other questions that are not simplistic and superficial (and certainly unanswerable by me) bring to mind the abundant arrogance of politicians, public construction engineers, and the delusional among us, those who purport to know the answers to very difficult questions.

Is God the answer? Well, sure, but that answer is an evasion of the question and not an explanation. It is easy to say that God did all this and that we do not need to know His thinking. Perhaps so but, as my wife says, "Religion trivializes God." I do not accept the fact that He is a magician. Albert Einstein said, "I want to know how God created this world. I am not interested in this or that phenomenon, in the spectrum of this or that element; I want to know his thoughts; the

rest are details.” and J.B.S. Haldane thought that, God has “an inordinate fondness for beetles.” Good thoughts to keep in mind when someone introduces God to a discussion (or argument). It might simply be better to grab your coat and hat and leave. I have a friend who says that G-o-d means “Generator-of-Diversity”. Evolution then? How? By exactly what mechanism?

It would take huge outlays of money to begin to answer the myriad important (or simply interesting) questions that arise. Nonetheless, along the way we would incidentally answer other questions, most of them not asked in the first place, perhaps not even originally considered. Each time we learn something, more questions arise. Decades ago, my graduate school advisor suggested to me that there were more questions then than there were when Louis Pasteur was alive; it has gotten a great deal more complex since then. But where will the funding come from? Could be from a “peace dividend,” if we ever invent peace. [It has been estimated by Leitenberg that 246 million people died as a result of wars dur-

ing the 20th century. Imagine how much those people might have contributed to the tax base had they not died prematurely.]

No individual or foundation could fund all such studies, so perhaps raising such a large amount of money is a matter of governmental organization. In June 2007, The Center for Strategic and International Studies, Global Organized Crime Project, Financial Crimes Task Force, estimated that global organized crime reaps profits of close to €1.4 trillion per year. It seems to me that if our countries were as well organized as the crime bosses they also could profit at least that much, and Naples would have a place to put its garbage; Russia and Saudi Arabia already are so organized. Conceivably, with better fiscal organization and fewer expensive suits and haircuts for administrators (What administrators actually do is unknown to me), huge amounts of money could be invested in answering important and fascinating questions. The outcome, the results and derived thoughts, would be useful, perhaps critical, and the journey would be fascinating

and informative in unintended ways. Unfortunately, we seem to be perpetually in the grasp of Ozymandias and would-be Ozymandias.

Albert Einstein: “The hardest thing to understand is why we can understand anything at all.”

#### Further reading

- Calisher CH, Mills JN, Sweeney WP, Root JJ, Reeder SA, Jentes ES, et al. Population dynamics of a diverse rodent assemblage in mixed grass-shrub habitat, southeastern Colorado, 1995-2000. *J Wildl Dis.* 2005;41:12-28.
- Calisher CH, Root JJ, Mills JN, Rowe JE, Reeder SA, Jentes ES, et al. Epizootiology of Sin Nombre and El Moro Canyon hantaviruses, southeastern Colorado, 1995-2000. *J Wildl Dis.* 2005;41:1-11.
- Calisher CH, Childs JE, Field HE, Holmes KV, Schountz T. Bats: important reservoir hosts of emerging viruses. *Clin Microbiol Rev.* 2006;19:531-45
- Heinrich B. Ravens in winter. New York (NY): Vintage; 1991.
- Leitenberg M. Deaths in wars and conflicts in the 20th century. Available from: [http://www.einaudi.cornell.edu/peaceprogram/publications/occasional\\_papers/Deaths-Wars-Conflicts3rd-ed.pdf](http://www.einaudi.cornell.edu/peaceprogram/publications/occasional_papers/Deaths-Wars-Conflicts3rd-ed.pdf). Accessed: June 19, 2008.
- ProMED mail. White-nose syndrome, bats – USA (06): Northeast. March 31, 2008. Archive number 20080331.1195.
- Werner RA, Holsten EH, Matsuoka SM, Burnside RE. Spruce beetles and forest ecosystems in south-central Alaska: A review of 30 years of research. *For Ecol Manage.* 2006;227:195-206.