One gambit used by creationists in discussing (may we say, "dissing") evolution is to call it a ("only a") theory. This plays on the common lack of precision in using the word "theory," while scientists in general, not only biologists, have a very definite meaning of the word.

- A theory is not a guess. It is far beyond a guess.
- A theory is not a hypothesis, which is an informed guess posed as a testable proposition. (Note that creationism cannot even be called a hypothesis, in that it is untestable. It is accepted on faith or rejected, independent of physical evidence.)
- A theory is, in fact, the intellectual framework that encompasses the knowledge within a field.

Many theories are extremely well-tested and extremely powerful. An example is electromagnetic theory, describing how electric and magnetic phenomena occur. It has been used literally billions of times to design computers, the national power grid, radio, TV, …It works, and it works in extremely complicated situations. No one "guesses" that electromagnetic theory "might work" as he or she designs an integrated circuit.

Another example is the theory of relativity. It explains magnetism (see, e.g., http://van.physics.illinois.edu/qa/listing.php?id=2358). It explains gravity, and thereby allows us to predict eclipses (or asteroid near misses of the earth, or satellite orbits) to exquisite precision. A potent demonstration of the theory is the operation of the global positioning satellite system (GPSS), which depends upon exquisite timing of signals from satellites. When the GPSS was first developed, some engineers doubted the necessity of relativistic corrections, whose theory lay so far from their core disciplines. They incorporated switches in the satellites that could apply relativistic corrections or leave them off. With the corrections off, the apparent positions of locations on earth could still be determined with reasonable accuracy but the time drifted between earth-based and satellite-based clocks by 46 microseconds per day (by itself, for a single satellite, that would have been equivalent to about 11 km/day. See http://en.wikipedia.org/wiki/Global_Positioning_System#Relativity. The remaining relativistic (Sagnac) correction is required to get accuracy below tens of meters. We can even use GPS now to measure continental drift at centimeters per year, from satellites moving at over 3,000 kilometers per second, or over 90 billion kilometers per year.

Another potent theory is quantum theory, synthesizing our knowledge of how matter and energy behave, beginning from the smallest scales. On its own, it explains why and how chemical reactions occur, or the same for nuclear reactions. It is the basis for the laser that is ubiquitous. It even generalizes electromagnetic theory, as in the Nobel-Prize-winning work creating quantum electrodynamics. It is the basis for atomic clocks that keep time within nanoseconds per day, more accurately than using the rotation of the earth - in fact, showing us that the earth's rotation is slowing by about 15 microseconds per year. Additional, and also powerful, geophysical theory explains the role of tidal "sloshing" in the oceans, driven by the moon's gravity, as the origin of this slowing.

Yet one more example of an extremely powerful theory is thermodynamics. The design of every automobile engine, every electric power plant, every heating and cooling system uses thermodynamic theory. Thermodynamics lets us know which chemical reactions will occur under which conditions.

In summary, "theory" holds an extremely high place in science and engineering. Theory holds every science together. Science, contrary to frequent public perception, is not a collection of demonstrated facts. It encompasses such facts, but essential to it is the *process* of proposing an explanation or pattern – a hypothesis – and then subjecting it to experimental testing.

Evolution is another overweening theory, and it holds biology together. The famous evolutionary biologist, Theodosius Dobzhansky, said that "Nothing in biology makes sense except in the light of evolution." Every living organism shares such exquisite detail with every other organism, by reason of common descent, that, as my wife, Dr. Lou Ellen Kay puts it, "If I ground up a sample of your tissue and another sample from a sponge, your own mother would find it difficult to distinguish the two based on their biochemistry." The interplay of organisms with each other and with the physical environment shows literally billions of examples of natural selection, and all its quirks and necessary imperfections.

Creationists may cite that some members of their community are practicing scientists. Can one be a scientist and deny a core theory? In a limited sense, perhaps this is possible. One can be a microbiologist and not believe in evolution, but then one is limited to *ad hoc* and often misleading explanations of drug resistance, or the emergence of AIDS, and much more. One can be a chemist and not believe in atoms, but then one is following recipes without understanding, and without a great deal of the potential to add knowledge.

I use the word "believe" in these contexts reluctantly. The word is in the realm of faith, on matters ranging from trusting a rumor to taking the existence of a deity as fact. In science, we may use the word "belief" casually, but a proper word is "acceptance." We accept the existence of atoms from demonstrations of all their attributes in the behavior of the world. We similarly accept electromagnetic theory, the predictions of thermodynamics, and all manner of other things, based on countless years of work by countless scientists. The system coheres, and it corrects and refines itself. Not to denigrate the arts, but an excellent expression of science from Claude Bernard is, "Art is 'I,' science is 'we'." We work together to perfect, endlessly, our view of the natural world, including the view of ourselves as the product of evolution.

The next time anyone says that evolution is a theory, thank them for acknowledging its supreme importance in biology.

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