Survival Of The Fittest

H. L. Mencken once famously said that a democracy is a place where people believe that the opinion of two fools is better than that of one wise man. 100 years have passed since then, and I say that American democracy is now a place where people believe that one million votes in favor of making pigs grow wings is more important than the opinion of the pig.

Case in point: The nonsense known as Creationism. I admit that I teach physics, and I do not have much interest in biology or medicine. Nonetheless, I know the difference between biology and bull. I am amazed at how many science students enter our university without the slightest knowledge of what Darwinian evolution is or what it means. It would seem that the American Taliban who wish to replace science with Creationism are doing a pretty good job of intimidating school boards into brushing evolutionary theory under the carpet. Maybe the school boards are just happy that they are still allowed to teach biology at all, rather than Creationism – but letting the Taliban bully them into teaching biology without Darwin is a great victory for the Taliban.

The sad part is that evolution is very simple, in its broad outline. Far from being an esoteric maze of theory, one wonders why it took so long for science to figure it out. Right beneath the noses of the learned sages prior to Darwin, farmers managed to transform white sheep into black ones, breed helpless turkeys so fat they cannot fly, and mutate wild wolves into Pekinese lapdogs. Wow. Talk about your evolution. The farmers did this by using extremely *unnatural* selection – that is, they did it by choosing which animals would be bred to each other, and for what purpose. As far as I know, even the archest of arch-Creationists admits that unnatural human selection is the only reason behind the stupefying variety of rose colors available to gardeners, even if the rose itself is a natural plant.

The main difficulty the Creationists have is that they do not possess the same intellectual courage that Darwin had, 150 years ago, when he pushed the idea of evolution to its logical limit. The Creationists simply cannot stomach the idea that biological laws apply to humans as well as to roses.

Darwin's great contribution to science was his realization that selective breeding also operates in the wild, but is more subtle and (usually) takes far longer to manifest itself than human-driven breeding does. In nature, the factor that forces breeding to move selectively in one direction or another is simple survival. If an antelope is not fast enough or agile enough to escape predators, then it is more likely to be killed and eaten. Hence only the fastest antelopes survive, and hence they have become a remarkably swift species without receiving the slightest help from any Kentucky horse-breeder.

Darwin famously described this slow selection as "survival of the fittest". One of the sillier sidelights in all the squawking about evolution – especially here in the United States, in the land of broad shoulders and rugged independence – is the almost complete lack of understanding of what Darwin meant by this. It is all but an axiom in the USA that Darwin's "fittest" must be interpreted as meaning the animal with the biggest claws or the most powerful muscles. Americans even like to apply the phrase to non-biological activities, such as sports or business, where it again almost always refers to the biggest or most powerful. Indeed, we tend to interpret "survival of the fittest" as literally meaning nothing but survival itself – survival of the most brutal, the most ruthless, or the most greedy – and if you think otherwise, then you clearly aren't watching your fair share of TV reality shows.

Nonetheless, "fittest = strongest" was *not* what Darwin meant. In the wild, there is one very serious drawback to being three times as big and three times as strong as the competition: you also need three times as much food. As a biologist friend of mine once put it, "Size is a great survival trait, right up until the day you starve." The most spectacular example of this is of course the dinosaurs, who ruled Earth for 170 million years with a size so legendary that they have been the model for Hollywood's monsters since the days of silent film. Then a giant meteor impact obscured the Earth's surface with dust clouds, the vegetation withered and the 50-ton monsters who were the dinosaurs quickly starved – but the insects, the tiny mice-like

animals, the tiny lizard-like animals, and in fact, almost all life on Earth except the dinosaurs, survived on a few seeds or tree roots until the Sun came out again. Nature has plenty of room in it for very small, very fragile creatures.

Charles Darwin was an English gentleman of the Victorian period, with a corresponding education and a corresponding formality of speech. If I were to translate, from Victorian English into 21st century American, what Darwin really meant by "survival of the fittest", I would translate it as "survival of those who fit in the best". By "fittest", Darwin was using "fit" in the sense that a key fits a lock, and therefore the fittest key is the one that opens the door, not the one that weighs the most.

Some years back a very amusing research project was conducted on two populations of Grand Canyon spiders. (I have long since lost the original reference. I hope someday someone will read this and enlighten me.) The research took place in a micro-climate, which is bio-speak for a place where the climate varies tremendously in a short distance. In this case the micro-climate was an oasis beside the Colorado River where trees could grow, providing shade, and where there was water enough to support grass and flowers. But only a few hundred yards away, nearly straight up, at the top of the walls of the canyon, there was nothing but bare rocks and baking desert. Both the forest and the desert held spiders, and these spiders were, in every possible way, physical duplicates: same size, same shape, same colors.

But – their *behavior* was different. The forest spiders were a timid bunch who spent nearly all their time hiding in underground burrows. They only emerged to hunt for food, and even then only if the prey wandered so close to the door of their lair that they could leap out, grab the prey with their mandibles, and immediately drag it inside. The desert spiders, by contrast, were boldly aggressive and if they spotted any prey they would gallop after it and doggedly pursue it until they either caught it or it escaped.

A biology professor who was very interested by this wondered if the difference in behavior could possibly be due to anything the spiders had learned? (Answer: No. Bugs do not learn. They are as mindless as plants. They move, yes, and find food, but it does not take a mind to do that. If life were machinery, then a spider would have the brains of a lawn sprinkler.) I am certain the professor knew that the likelihood she had discovered the first educated bugs on Earth was very, very remote. However, given that she would probably have won the Nobel Prize if they were, one can hardly blame her for pushing ahead with the research.

With remarkable attention to detail, she marked off sections of both the forest and the desert, using sticks and strings to divide the area into a grid of equal squares. She invented a simple code of dots and with the use of an ordinary fine-tip marker, "tagged" hundreds of spiders by catching them, carefully daubing codes onto their backs, then releasing them. For weeks she monitored every spider inside every square of the grid, keeping meticulous records of their movements and their behavior.

Disappointingly, but predictably, she was able to document that the forest spiders and the desert spiders were two tribes. The spiders from the two regions never visited each other, hence they could not be "talking" to each other. It was time for one final experiment. In a single afternoon she gathered up approximately 400 spiders, all of them "old friends" of hers whom she had already dotted with codes, and switched their homes. 200 timid spiders from the forest were moved to the desert, and 200 aggressive spiders from the desert were moved to the forest.

When I said that "bugs do not learn", here is what I meant: when the forest spiders were moved to the desert, they immediately dug burrows and hid. And hid. And hid. Down on the forest floor, if they waited a little while, prey was sure to come by. But up in the desert, where there was scarcely a single living thing, all that blew past was dust. Nonetheless, all the forest spiders just sat in their burrows, unmoving, while the baking heat slowly toasted them into dry, lifeless crisps.

So much for old bugs learning new tricks.

As for the desert spiders, once placed on the forest floor they all but wept for joy as they chased down the abundant prey and gorged themselves on the unending bug banquet. Someone with a poor understanding of Darwin's "survival of the fittest" might claim that such an outcome was inevitable. Isn't it obvious that those bold, aggressive denizens of the desert are the "fit" spiders, whereas those pitiful timid things roasting to death in the heat are the "unfit" ones?

Well, no, because that is not the way evolution works and it is not what Darwin meant. You see, the problem with hunting for food in a lush forest, where there are oodles of juicy bugs to eat, is that there are also oodles of feathered monsters living there who like to eat the juicy bugs too. Birds are much larger than spiders, and also far faster, so running or fighting aren't really good options for a spider caught in the open. (Suddenly, hiding underground all the time doesn't sound quite so foolish . . .) The aggressive desert spiders, racing to and fro in the open, were little more than tasty snacks for the birds, who simply swooped down and slaughtered them all. Not a single desert spider survived 48 hours.

The professor concluded that the two tribes of spiders were, in fact, different species. They were obviously very closely related, as seen from their identical physical characteristics, but at some point in the past they had developed different "hardwired" responses to their environment. That invisible neural wiring had made them incompatible and separate species, which is to say, they were both wholly incapable of living in the other's territory.

All of which makes a neat demonstration that Darwin's "fittest" means more than strength or speed. It means "fit to survive". In the desert, where prey was rare and birds even more rare, the winning strategy was to race across the ground and aggressively pursue what little food there was. In the forest, where prey was ample but sudden death from the sky was always threatening, the winning strategy was to hide and let the prey come to you. Neither strategy can be called better or worse, because each depended on the circumstances that the spiders found themselves in. The best key depends on which lock you are trying to fit your key into.

Many Creationists don't understand any of this – and they prove it every time they open their mouths – yet they feel free to take on far more complex aspects of evolution and proclaim that they must be false, based on faulty logic so preposterous that it makes a Three Stooges routine look like a Nobel Laureate Lecture. Millions of Americans believe them, for no better reason than because they have heard it so often that they figure at least part of it must be true. A friend of mine claims that if you could reason with religious people then there wouldn't be any religious people, so there is no point in logically arguing with Creationists because they don't give a rat's kiester about the facts and will simply lie if they can't think of any other way to make their point.

Maybe so, but I think that if they are going to talk about "survival of the fittest" then they could at least have the courtesy to talk about Darwin actually meant, rather than what some rugged individualist Republican claims Darwin meant.