

Trinity Institute, *The Good News Now – Evolving with the Gospel of Jesus*

It is an honor to be invited to join this conversation. Some people have physics envy. I have preacher envy, and so this is my big, big chance. So I thank you and I look forward to communing with you during the next four days. And also, hello to the Trinity Memorial Church in Binghamton, New York, my hometown, who is participating by Webcast.

Now the theme of this conference, *Evolving with the Gospel of Jesus*, sets up an interesting contrast. On the one hand there's something about the story of Jesus that is enduring and might even be called eternal. On the other hand there's something about the same story that evidently needs to change with every generation to remain relevant. So some things are eternal and other things need to change. And I want to focus on these two things in turn, and I want to make as much progress as I can as a scientist and evolutionist before turning to theological questions, such as the meaning and the existence of God.

So what can be called evil from an evolutionary perspective? My first candidate is the problem of evil. For a Christian theologian, the problem of evil concerns how the existence of evil can be reconciled with the existence of an all powerful, all knowing, and beneficent God. For an evolutionist, the problem of evil concerns how activities that qualify as good can prevail over activities that qualify as evil in the Darwinian struggle for existence.

Now moral philosophers agree on very little, but even they agree that morality is inherently oriented towards the welfare of others in society as a whole. If I do something that's good for you or us, then that counts as moral, and the more it costs me, the more moral it seems. If I do something that's good for me but harms you, or our common cause, then that counts as immoral, and the greater the harm, such as betraying my country during a time of war, then the greater the evil. So good roughly translates into behaving for the good of one's group, and evil roughly translates into benefiting oneself at the expense of one's group. Now I'm aware that this translation is rough, and a more comprehensive treatment must explain apparent exceptions, such as individual rights, which place the needs of the individual above the group, but let it suffice for the moment.

From an evolutionary perspective, the existence of evil is easy to explain. If I benefit myself at your expense, then I survive and reproduce better than you, and I win the Darwinian contest. So the problem is to explain why evil doesn't always prevail over good. And this problem is as famous among evolutionists as the problem of evil is among theologians. But the solution is amazingly simple in retrospect. Even though good individuals are vulnerable to evil individuals within any given social group, a

group of individuals who are good to each other has a decisive advantage over a group of individuals who are evil towards each other even in strictly Darwinian terms.

And so the Darwinian contest takes place at two levels, the struggle for existence within groups pulls in the direction of evil, and the struggle for existence between groups pulls in the direction of goodness, at least among members of the group. This conflict between levels of selection not only pervades human life, but also pervades life in the biological world, and if life exists on other planets, then the conflict between levels of selection will pervade those worlds, also. And the reason we can say this with confidence is because it's a basic manner of tradeoffs. Evolution explores all options, designed for me, an individual, whose only purpose is to benefit themselves at the expense of other members of their groups, and that individual will be different than an individual whose only purpose is to work for the benefit of their groups. These require different trades, and so, therefore, there's a fundamental tradeoff.

And so the net result of these opposing selection pressures will depend on the relative strength. Sometimes evil prevails, sometimes good prevails, and sometimes the result is a standoff, an uneasy coexistence, where both good and evil traits are maintained in the population.

So this concept of two-level selection can be expanded to become a multi-tier hierarchy, groups within groups, within groups. And when we do this, something happens that, for me, is more frightening than any fire and brimstone sermon. Traits that qualify as good at one level of the hierarchy can easily qualify as evil at higher levels. What's good for me can be bad for my family. What's good for my family can be bad for my clan. What's good for my clan can be bad for my nation. What's good for my nation can be bad for the global village. What's good for the corporation can be bad for the global economy.

And this is in contrast to the economic concept of the invisible hand, which pretends that a lower-level self-interest robustly benefits the common good. Nothing could be further from the truth from an evolutionary perspective. When we study examples of activities that qualify as evil in the sense of benefiting some individuals or groups at great harm to others, and society as a whole, we find that the so-called evil individuals are often abiding by the moral dictates of a smaller social order. They're being as good as gold within their groups, but their goodness has permeated to evil at higher levels of the multi-tier hierarchy. At this moment nations are striving to grow their economies, the national good, and they might be committing the ultimate evil of planetary extinction. Who needs a fire and brimstone sermon when we're confronted with this real world possibility?

So now that I've introduced you to the concept of multilevel selection, I need to add the concept of major evolutionary transitions. It turns out that the balance between levels of selection is not static, but can itself evolve. Mechanisms can evolve that suppress the potential for disruptive selection within groups, so that between-group selection becomes the primary evolutionary force. In human terms, good triumphs over evil. And when this happens, the group becomes so harmonious and functionally organized that it actually becomes an organism in its own right, a superorganism. This event is called a major evolutionary transition. To repeat, evolution occurs not only by small mutational changes, individuals from individuals, but also by groups turning into higher level individuals. Life itself might have originated as groups of highly cooperative molecular interactions. Life might have originated as communities of molecular interactions. And then we have the first cells as groups of genes, and their cellular machinery, nucleated cells as groups of bacteria, multi-cellular organisms as groups of cells, social insect colonies as groups of insects, and as we will see, the evolution of our own species.

Now a major evolutionary transition has three hallmarks. First, it is a rare event in the history of life. It is not easy for selection within groups to be largely suppressed. Second, it has momentous consequences when it occurs, as the new superorganism dominates an ecological competition. It's estimated that social insects, the ants, the bees, the wasps, the termites, originated only a dozen times in the history of life, but once they were originated, they've become so successful that they radiated into many species, and now over half of the insect biomass on earth is social insects.

Third, it is never complete. Within group selection, disruptive self-serving behaviors within the group is only suppressed and never entirely eliminated. Even organisms such as ourselves, that are miracles of coordination, have genetic elements that are spreading at the expense of other cells within our own bodies. We call that cancer. Cancer is literally an evolutionary process taking place within our bodies. We are the population of cells, and the cancer cells are now winning the Darwinian contest within our bodies, spreading at the expense of other cells, dispersing to other locations. All good for the cancer cell, until, of course, it brings the organism, the group, to an end. So that is within organism selection.

Now before describing human evolution as a major evolutionary transition, let me tell you a few stories about honeybees, in part, because they're so widely admired by people as a model of individuals working for the good of their groups. Religious folks are always praising honeybee colonies. Beehives are pictured on the roadsides of Utah. I love a Hutterite quote that says basically that their colonies are like the bees. "We see the same thing among the bees, who work with equal zeal, gathering honey." So a honeybee colony consists of thousands of individuals that on any given

day are dispersed over several square miles as the workers search for honey. Nevertheless, they are so well coordinated that the colony counts as a single organism, a single coordinated organism. And this organism even has a group mind. So the concept of a group mind actually has been documented very well for the social insects.

My colleague, Tom Seeley, at Cornell University, has done the most wonderful experiments, in which he takes honeybee colonies to an island in Maine, where there's no places for honeybees to live, and honeybee colonies have a stage in their lifecycle called swarming, where half the colony leaves the hive, and then they have to find a new nest cavity. And so he takes them to this island, and he provides his own nest cavities, artificial, and which can alter the quality of the nest cavities, and then he could actually see how the honeybee swarms, make a decision about which cavity to choose. They're house hunting, just like you might be house hunting in New York City.

And what he's shown is that the colony has an amazing ability to detect the best houses. They attend to the size of the colony, its orientation, the location of the hole, six or seven factors they factor in in making this very intelligent decision, but no bee, no single bee visits more than one cavity, and so no bee is in a position to make the decision. Instead there's a group level process in which bees visiting the different cavities come back to the surface of the swarm, and they dance, and the intensity of their dance is proportional to the quality of the hive, and then there's a competitive process whereby one faction of bees silences the other faction of bees, and then there's a phase transition, and then the swarm is aroused, and they all fly to the best cavity. It is the most wonderful example of natural selection causing a group of organisms to behave like a single superorganism.

So now that we understand multilevel selection and major evolutionary transitions, we're in a position to understand human evolution as a major evolutionary transition. In most primate societies, members of a group cooperate to a degree, but are also each other's main rivals. What makes us so different from all other primate species is that our ancestors managed to suppress disruptive self-serving behaviors within groups to such a degree that the group became the primary unit of selection. Teamwork became the signature human adaptation, and teamwork includes not only physical activities, such as cooperative hunting and childcare, but mental activities, such as language and other forms of symbolic thought.

Just about everything that sets us apart from other species, such as our ability to cooperate with non-relatives, our capacity for symbolic thought, and our ability to transmit learned information across generations can be regarded as a kind of teamwork made possible by a major evolutionary transition. Our ability to transmit

learned information across generations, much of it encoded in symbolic belief systems, became an evolutionary process in its own right, enabling our ancestors to adapt to their environments much faster than by genetic evolution. This process of rapid cultural evolution enabled our ancestors to spread out of Africa and occupy the entire globe, including every climatic zone and hundreds of ecological niches. Various tribes of people out there eat everything from seeds to whales.

If you examine an indigenous culture in detail, especially one that inhabits an extreme environment, such as the Arctic or desert, you will be amazed at the amount of knowledge that must be passed from generation to generation. It can be likened to an entire library shelf of how-to books, how to build a kayak, how to build an igloo, how to hunt caribou, how to manage your social relations, which somehow is transmitted without any books at all. A well-adapted human culture is an extraordinarily complex system that receives environmental information as input, and results in coordinated action as output. And I love this definition of culture, because it's the same word for word as the definition of a brain. A brain receives environmental information as input, and results in individual action as output. So culture is a kind of a brain, and it is also a kind of a body, an inherent system for creating bodies from other bodies. Like a beehive, we're physically separated from each other, but qualify as a single organism, to a remarkable degree. The concept of society as an organism is an ancient pedigree, but it's been eclipsed during the last half century by individualistic and reductionistic perspectives, which attempt to explain everything in terms of individual self-interest. A scientifically authoritative concept of human society is like an organism, is, therefore, an intellectual development of the first rank.

Now let's zoom in and consider cultural evolution and symbolic systems in a bit more detail. A symbolic belief system is a set of mental representations that includes objects, agents, and their relationships with each other. These mental representations might or might not bear resemblance to the real world, but either way they motivate a suite of behaviors that takes place in the real world. If we call a particular set of mental representations a symbotype, then there is a symbotype-phenotype relationship similar to the genotype-phenotype relationship in genetic evolution. Symbotypes and genotypes have something else in common: combinatorial diversity. If 100 genetic loci are polymorphic, with two alleles each locus, then there are literally trillions of genotypes, each potentially with a different phenotype for selection to act upon. Similarly, varying and recombining the elements of a symbolic belief system results in an infinitude of symbotypes, each potentially motivating a different suite of behaviors. This is why human cultural change is truly an open-ended evolutionary process, complete with its own inherent system that bears comparison with a genetic evolutionary process.

The idea of a symbotype-phenotype relationship has foundational consequences for epistemology, the branch of philosophy concerned with the nature and scope of knowledge. Two types of knowledge must be distinguished, the kind that accurately describes the features of the world that we associate with scientific knowledge, called as factual knowledge, and the kind of knowledge that enables us to survive and reproduce, called practical knowledge. Cultural evolution favors symbotypes that increase practical knowledge, and is insensitive to factual knowledge, per se. Our ability to function as realists depends on the relationship between factual and practical knowledge, and this relationship turns out to be complex. Sometimes knowing the world as it really is helps us to survive and reproduce in that world, but sometimes even massive distortions of factual knowledge can have immense survival value. As a simple example, believing that my enemy is an inhuman monster is much more motivating than thinking of him as much like myself. People in the grip of conflict find it almost impossible to think clearly in a factual sense about their opponents, but they are thinking very clearly in terms of the actions motivated by their factual incorrect beliefs. This is exactly what can be expected from an evolutionary perspective.

The concept of an adaptive fiction reveals a certain naiveté in people who are puzzled by religion. How can people believe in all that stuff that's not out there, their reasoning goes, and weird beliefs must result in weird behaviors. The implicit assumption is that human beings evolve to apprehend factual reality, and that only factually correct beliefs lead to adaptive behaviors. This position is extraordinarily naïve from an evolutionary perspective. In addition, adaptive fictions are by no means confined to religion. Secular life is awash with adaptive fictions, such as homoeconomucus, the fictional conception of human nature that drives much of our economic behavior. Nearly everyone should refrain from casting the first stone when it comes to adaptive fictions.

Well, let's take stock of our progress so far. We are a highly groupish species, with an exceptional ability to suppress self-serving behaviors within groups. Most of our evolutionary history was spent in small groups. Large groups of thousands and millions of individuals didn't exist until a scant few thousand years ago. Our lives are organized by symbolic belief systems that co-evolve with a genetically evolved psychological architecture. Our symbolic belief systems rapidly evolve, adapting people to their current environments. The elements of symbolic belief systems need to bear no relationship with the real world in a factual sense, other than to motivate behaviors that are adaptive in the real world. And evolution is a multilevel process, so adaptations that qualify as morally good at one level easily qualify as evil at higher levels.

So this provides a theoretical framework and a panoramic background for studying

human history as a fossil of record of multilevel cultural evolution, including the increasing scale of society, made possible by the advent of agriculture, the rise of empires by between group selection, the fall of empires by within group selection, the advent of the major religious traditions, Christianity as a mutated form of Judaism, accessible to people from all ethnic groups, selection among early forms of Christianity adapting them to their local environments, and favoring those best for forming communities, as ably documented by religious scholars, such as Elaine Pagels, the adaptive radiation of forms of Christianity as it spread over the globe, adapting itself to local circumstances, to a group of people from a particular branch of this bushy tree, the Episcopal faith, gathered together on November 21, 2013, to contemplate how to adapt its faith to the challenges of the present and future.

I'd like to end by describing some of my ideal symbotypes for the future, the kind of belief system that I'm working for. First, it must be oriented toward the welfare of the highest rung of the multitier hierarchy, the entire planet. Anything less runs the risk of good turning into evil that is inherent in the process of multilevel selection. Second, it must work at the level of small groups, and all levels in between. It is part of our genetic legacy to feel most at home in small groups, where we're known as individuals and can be judged by our actions. This is also the scale at which teamwork functions most effortlessly. In biological terms, large-scale human society needs to be multi-cellular. In just the same way that we are multi-cellular, we're large bodies, but we consist of many small cells. And I think that religions actually lead the way in some novel forms of social organization, multi-cellular social organization, including the concept of a cell ministry, which includes a large congregation that meets weekly, but then many small groups that meet in people's homes, basically, and get that great fellowship that's associated with small groups. I would like to see more things like the cell ministry inside and outside of religion.

Third, Durkheim's definition of religion – “a unified system of beliefs and practices relative to sacred things, which unite in one single moral community called a church, all those adhere to them – identifies some of the necessary ingredients of the symbotype of the future, especially the need for individuals to subordinate their interests to something that is regarded as larger and more important than themselves, and the need for shared norms that define right and wrong. These ingredients are relatively easy to establish at the scale of small groups, and they become progressively harder with every rung of the multitier hierarchy. Nevertheless, they might still be necessary, as hard as it is, we still might need to establish these things.

At the same time factual knowledge is needed to solve the problems of human existence more than ever before. Respect for factual knowledge and avoiding the use of adaptive fictions is, therefore, a cardinal virtue in my ideal symbotype for the future. His holiness, the Dalai Lama, leads the way when he says, “Anyone who

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defies the authority of empirical evidence is unworthy of critical engagement in a dialogue.” In other words, if you think you can just make stuff up to serve your purposes, you're not worth talking to.

I hope that these reflections from an evolutionary scientist add some fodder to the theme of our conference, *Evolving with the Gospel of Jesus*, and I look forward to being part of the conversation during the next three days, and also in the question and answer period that follows. So thank you very much.