On October 6–8, UC Berkeley will host a large conference celebrating Charles Townes' 90th birthday. Many of the world's leading physicists will be present. Also present will be neuroscientists, philosophers and leading thinkers on the science/religion dialog. Biologists will not be represented and that is a shame, given the high profile controversy over evolution taking place in the United States at present. Several of us in the Bay Area thought it would be useful to have a symposium on evolution, involving biologists and theologians, before the Townes Symposium to see how the destructive controversy over evolution can be defused. This document is my first at developing a document that could be discussed at the evolution symposium and then presented to participants of the Townes Symposium for their consideration.

Stan

This document has four parts:

**Part 1** is a copy of an open letter urging "school board members to preserve the integrity of the science curriculum by affirming the teaching of the theory of evolution". It was circulated earlier this year, and signed by more than 5,000 Christian clergy from all denominations. There are two problems with this open letter. First, a number of thoughtful, progressive clergy refused to sign it because the "theory of evolution" was not spelled out in sufficient detail and there exist atheistic interpretations of evolution that are not compatible with religion. Second, the open letter with statements like "God’s loving plan of salvation for humanity" will not make sense to many non-believers. It is the purpose of Parts 2 and 3 to clarify the meaning of some of the words used in the open letter and in the science/religion debates concerning evolution.

**Part 2** is an attempt to provide translations of the open letter (Part 1) for secularists who are not familiar with God language as metaphor, symbol and myth. The goal here is to prepare for Part 3 where specific words like purpose, design and free will are used in dialogs concerning evolution.

**Part 3**, the heart of this document, shows how the words purpose, direction, design, free will, mystery and "we are special" can be understood from a scientific perspective. The goal here is to educate science teachers that it is okay to use these words when teaching evolution as long as they are appropriately defined. It is our hope that by allowing these words to be used when appropriate, dangerous consequences to science education, science funding and scientific input to policy making can be avoided.

**Part 4** discusses two caveats specifying limits to the science/religion harmony.

---

**Part 1. An Open Letter Concerning Religion and Science**

Within the community of Christian believers there are areas of dispute and disagreement, including the proper way to interpret Holy Scripture. While virtually
all Christians take the Bible seriously and hold it to be authoritative in matters of faith and practice, the overwhelming majority do not read the Bible literally, as they would a science textbook. Many of the beloved stories found in the Bible - the Creation, Adam and Eve, Noah and the ark - convey timeless truths about God, human beings, and the proper relationship between Creator and creation expressed in the only form capable of transmitting these truths from generation to generation. Religious truth is of a different order from scientific truth. Its purpose is not to convey scientific information but to transform hearts.

We the undersigned, Christian clergy from many different traditions, believe that the timeless truths of the Bible and the discoveries of modern science may comfortably coexist. We believe that the theory of evolution is a foundational scientific truth, one that has stood up to rigorous scrutiny and upon which much of human knowledge and achievement rests. To reject this truth or to treat it as one theory among others is to deliberately embrace scientific ignorance and transmit such ignorance to our children. We believe that among God’s good gifts are human minds capable of critical thought and that the failure to fully employ this gift is a rejection of the will of our Creator. To argue that God’s loving plan of salvation for humanity precludes the full employment of the God-given faculty of reason is to attempt to limit God, an act of hubris. We urge school board members to preserve the integrity of the science curriculum by affirming the teaching of the theory of evolution as a core component of human knowledge. We ask that science remain science and that religion remain religion, two very different, but complementary, forms of truth.

Part 2  The God language of Part 1 offends many non-theistic scientists and creates a barrier for deeper communication on the topic of evolution. Part of the problem is that scientists spend most of their time dealing with literal texts and they work hard in attempting to remove ambiguities from their writing. Religion is different. In order for the science/religion wars to calm down, it would be helpful for secularists to gain a deeper understanding of religion. A good place to start is Michael Gazzaniga's new book "The Ethical Brain". Gazzaniga is the only neuroscientist on the President's Council on Bioethics. Upon reading his book, especially the chapter on "The Believing Brain", secularists should realize that religions will be with us for many more years, and greater understanding is needed. Gazzaniga cites a passage in David Sloan Wilson's book Darwin's cathedral: Evolution, Religion and the Nature of Society: "Something as elaborate--as time-, energy-, and thought-consuming--as religion would not exist if it didn't have secular utility. Religions exist primarily for people to achieve together what they cannot achieve alone. The mechanisms that enable religious groups to function as adaptive units include the very beliefs and practices that make religion appear enigmatic to so many people who stand outside of them."

The purpose of this section is to decrease the enigmatic nature of Part 1. The first paragraph of Part 1 points out that religious language should not be taken literally. It is helpful to start at the beginning with the two full creation stories in Genesis.
2.1) The first Genesis story is the familiar 6 day creation myth, using Elohim as the name of God (in Part 1 the name "Creator" is used for this face of God). God, the creator, language is familiar to physicists who have read Einstein, Davies, Dyson, Spinoza and many others. The beauty and elegance of the presently known fundamental Laws of Nature, as well as our present understanding of the creation of the universe is so awesome to many physicists that God language comes forth easily. The Creator face of God can be applied to evolution as well as to the Big Bang. The amazing achievements wrought by hundreds of millions of years of neoDarwinian evolution is sufficiently awesome in the minds of many that God language seems appropriate in the evolutionary story as well as for the Big Bang story.

2.2) The second creation story of Genesis, using the name YHVH (sometimes translated as Lord, or Jehovah) is the personal God who walked, talked and empathized with Adam. This is the face of God being used when Part 1 mentions "God’s loving plan of salvation for humanity". What might be the secularist translation of what this personal God has in store for us? Judaism and progressive Christian theologians use salvation language by saying that the messiah will arrive or that we will arrive in heaven when all peoples of the world learn to live in harmony and equality with ourselves and with Nature. Many scientists would read Part 1 literally and would reject it as meaningless. Seeing the deeper meaning in the language is a first step in bringing people together.

Part 3 discusses a number of contentious words that occur in the evolution/intelligent design debates. The goal here is to show how the words purpose, direction, design, free will, mystery and "we are special" can be understood from a scientific perspective. We hope these translations will allow scientists to not get upset when these words are used in a metaphoric way by clergy and other people of faith. In addition by allowing these words to be used in the context of discussing evolution theory, we hope that more theologians and clergy will feel comfortable in signing the open letter. Finally, we hope that as a result of greater understanding among people of faith and people of science will gain a better appreciation of each other's worldviews.

Before examining how purpose and design may be present in neoDarwinian evolution it is useful to first examine a simpler situation, namely the bending of light when a light ray enters water (Descartes' Law or Snell's Law). A mechanistic explanation of this law can be given in term of the electric field of the light causing the electric charges in the water molecules to oscillate. The oscillating charges emit secondary light rays that interfere with the primary rays causing the bending. An alternative explanation is called Fermat's Principle of Least Time. In going from point A in air to point B in water, the light ray follows a path of least time. This purposive principle has been extended to derive all of the basic quantum laws of nature. Just as one can look at Descartes'(Snell's) Law in both a mechanistic and a purposive manner, one can do the same for evolution.

3.1) Direction. There is general agreement that life started with small, simple creatures possessing very limited information processing capabilities. From that fact alone there
must be a direction in evolution towards larger, more complex creatures with increasing information processing capability. Evolution seeks to fill niches, giving evolution a direction. Make a niche and they will come.

3.2) **Purpose** is similar to direction, but it has an added attribute of agency. Agency, luckily, is ambiguous. One example is the notion of niche construction. For example, once beavers developed rudimentary dam building, genetic variations for building better dams and adaptations for better life in water will be selected. For some, the notion of agency requires consciousness. Beaver consciousness can be seen as agency and the beaver's action in filling its niche can be considered purposive in the process of natural selection. Other purposive factors that affect evolution are epigenetic factors whereby some behaviors can modify heritable material (not just the DNA information).

3.3) **Design.** It can take many millions of generations for a niche to be filled. As noted in Section 2.1 metaphoric God design language can help us express our awe for these millions of generations that are otherwise difficult to appreciate and honor. The use of metaphor does not depreciate God, just as the metaphoric nature of the multiple interpretations of quantum mechanics does not depreciate quantum mechanics.

3.4) **Free will.** A powerful compatibilist argument can be made that free will and determinism are compatible. Many philosophers in fact argue that the desirable type of free will requires determinism. At a deeper level, quantum mechanics provides an even stronger basis for free will, with multiple possibilities being present before each event is actualized.

3.5) **Mystery.** The ontology of present physics is at least as mysterious as the ontology of the world's religions. Physicists are aware that quantum mechanics has totally changed the way we understand the world. There are at least 6 (Copenhagen, von Neumann, Bohm, Many Worlds, Transaction, Decoherence) interpretations or myths that are used to describe the ontology underlying the quantum rules. Each ontology makes identical predictions for events in our universe, yet they bear no relationship to each other. Each has a dualistic aspect that has to do with the connection between observer and observed. The more one tries to understand the inner workings of quantum mechanics, the more mysterious it becomes. Science is often accused of suppressing the mysterious aspects of the universe. That is far from true when one probes deep enough.

3.6) **We are special.** There are many ways in which we are special. The anthropic principle shows we live in a very special universe, optimized for life. Also, there is a good possibility that life (DNA, RNA, proteins) is extremely unlikely to arise on an Earthlike planet. We may be the rare or only lucky planet. That fits in nicely with the biblical myths of Genesis. Furthermore, the multiple levels of emergence found on earth of novel life forms and of intelligence have a quality of being special. Our increasing ability to understand the universe and ourselves gives us a special purpose, and sacred language can be appropriate for this rare ability. There have been many science fiction novels written about how outer space and the whole universe is an open niche for the descendents of humanity. This gives us a responsibility of biblical proportions.
**Part 4.** The bridge goes only so far. The above six items show that a strong bridge can be built connecting the visions of theists and the understanding of scientists on sticky aspects of evolution. However, the bridge has limited scope in two aspects.

4.1) **Problems with literal interpretations.** It has difficulty connecting the understandings of science with worldviews that are based on a literal reading of the bible with its miracles. Especially difficult are worldviews that eagerly anticipate the Armageddon destruction of the earth in preparation for the messiah's arrival. As stated above, secularists prefer to say the messiah will arrive when the peoples of the world learn to live in harmony and equality with themselves and with Nature. We believe science and religion need to work together to achieve that harmony. As Einstein said: "Religion without science is blind. Science without religion is lame."

4.2) **Dealing with measurable events.** There is a danger when dealing with metaphor and myth because people are tempted to take things literally. The Sokal Hoax (try Google if this isn't familiar) and the "What the Bleep" movie (try Google again) provide evidence of the dangers of what can happen if one simply takes some of the language and metaphors of quantum mechanics and forgets that the quantum laws of nature also make predictions for the likelihood of events. The presently understood laws of nature do not support remote prayer and other paranormal phenomena. Until there is better experimental evidence for these phenomena, it would help the science/religion dialog to remove them from any discussions.