



Science and Worldviews

What is a worldview?

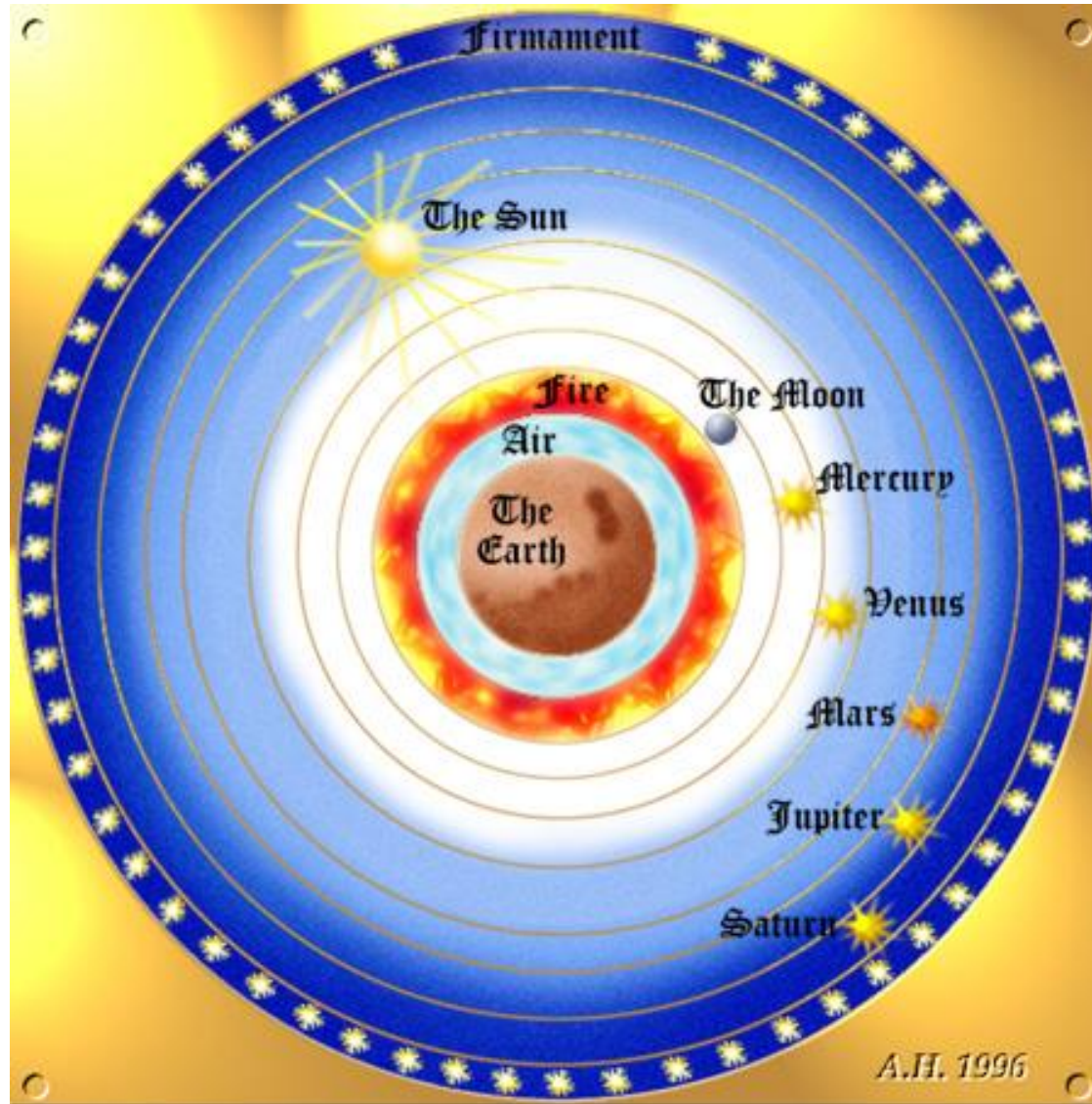
- A worldview is an *interlocking system* of beliefs about the world.
- A worldview provides a conceptual framework, or set of “background assumptions”, that is needed for science.
- The notion of ‘worldview’ that DeWitt uses roughly matches what Thomas Kuhn calls a *paradigm*.

The first scientific worldview

The first scientific worldview was developed by Aristotle. Here are some “truths” in this worldview:

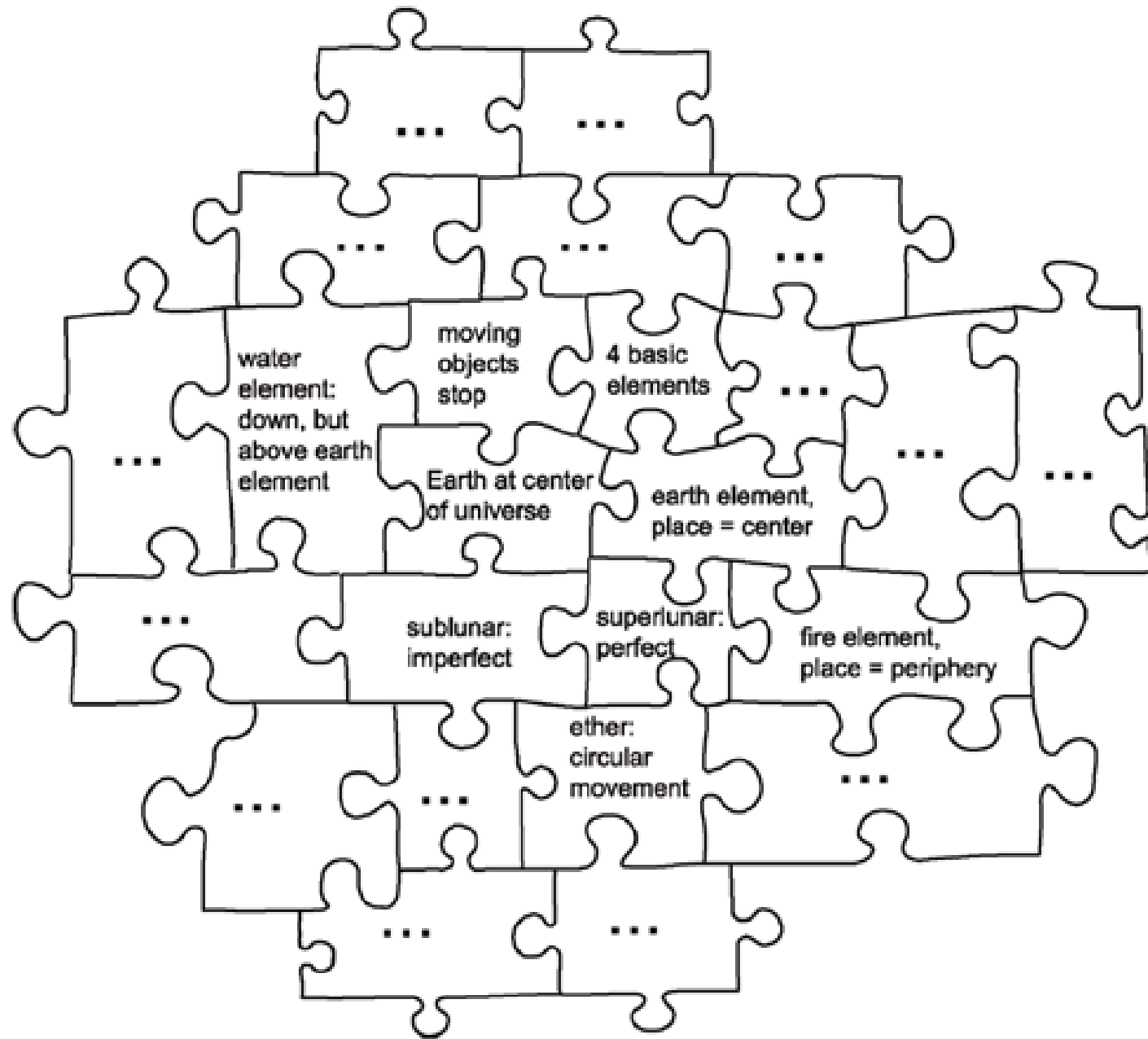
- (a) The Earth is located at the center of the universe.
- (b) The Earth is stationary, that is, it neither orbits any other body such as the sun, nor spins on its axis.
- (c) The moon, the planets, and the sun revolve around the Earth, completing a revolution about every 24 hours.
- (d) Below the moon there are four basic elements, these being earth, water, air, and fire.
- (e) Everything from the moon up is composed of a fifth basic element, ether.

Aristotle's layered universe (not to scale)

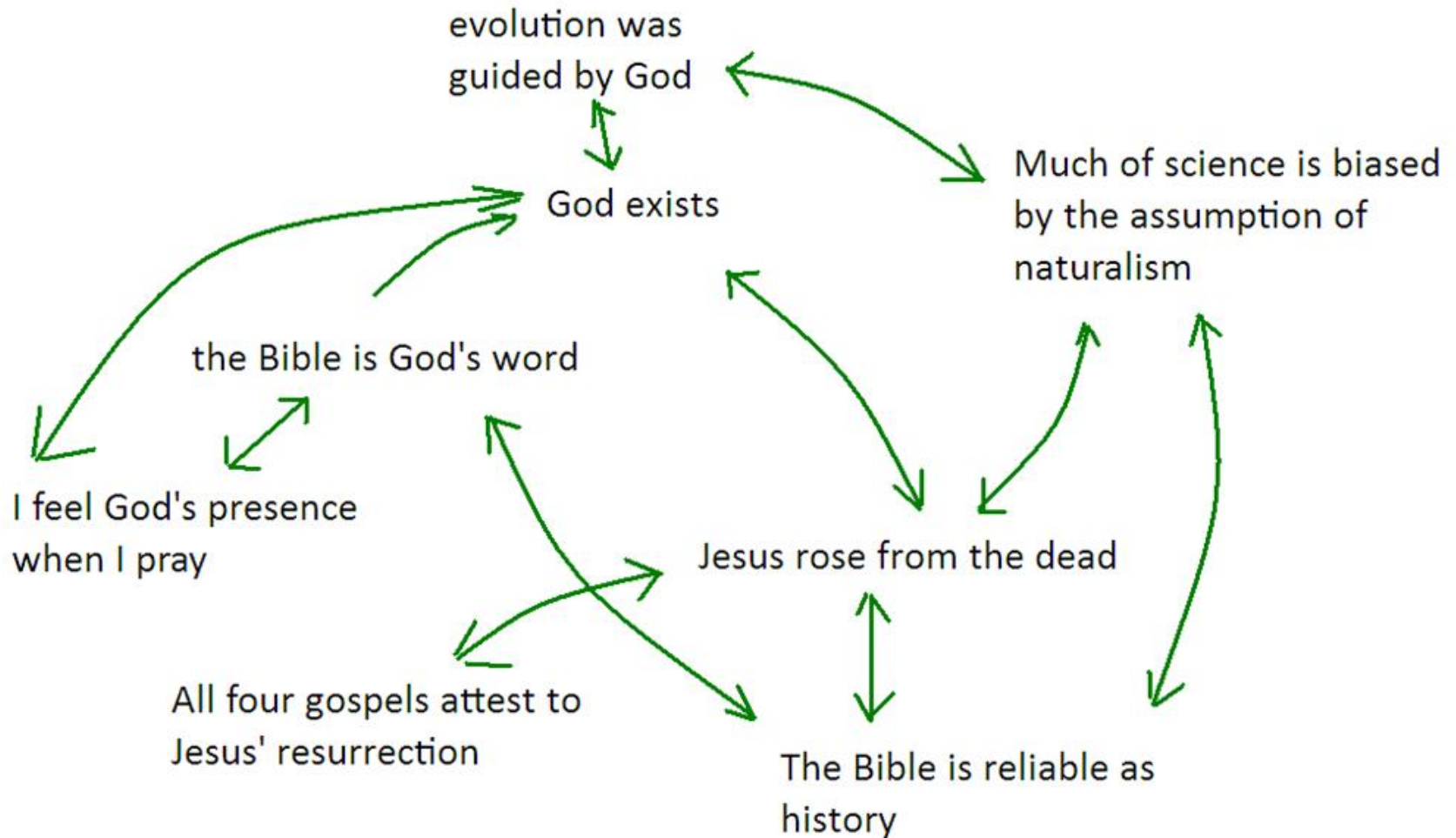


An interlocking system

- The different beliefs in a worldview cannot be separated from one another too easily. Each belief in a worldview tends to make sense of, and give support to, the others.
- Changing one belief in a worldview often requires many others to be changed as well.
- (Like a jigsaw puzzle, or a crossword puzzle.)



Another interlocking system



Common Sense

- The worldview we are presently “in” strongly influences our thinking. It dictates certain beliefs as being “obvious”, common sense, and so on.
- “from within the perspective of any worldview, the beliefs of that worldview will appear to be the obviously correct ones.” (DeWitt, p. 16)
- Many things that seemed obvious to Aristotelians now seem crazy or weird to us!

Kuhn's 'gestalt shift' metaphor for paradigm change

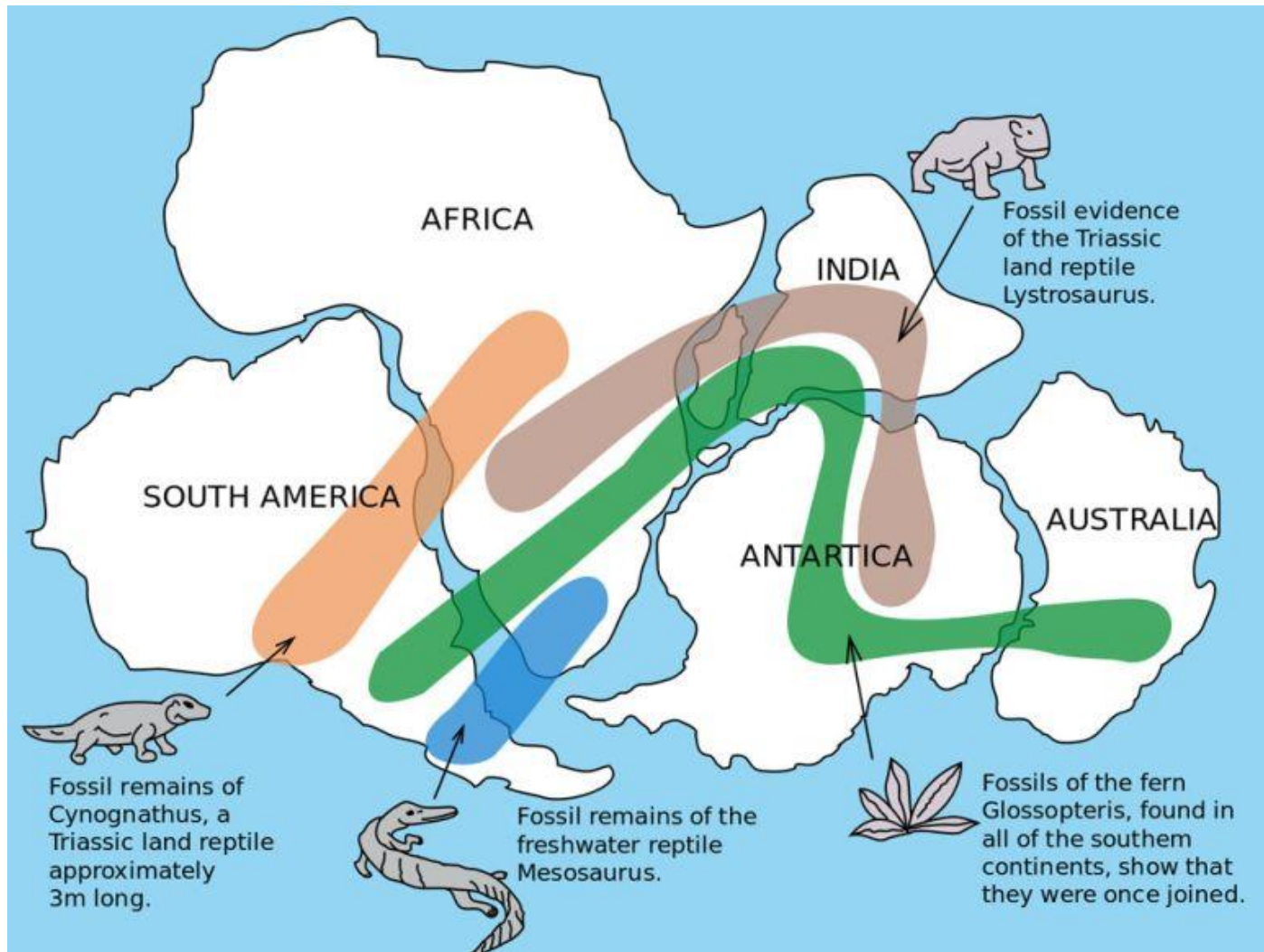
e.g. the duck-rabbit



The Case of Continental Drift

- Until as recently as 1960, mainstream science was adamant that the continents are fixed in place and never move, even though good argument for drift were made by Wegener as early as 1912.
- Drift was dismissed as “Germanic pseudo-science”, a “fairy tale”, etc.

Early evidence for Drift

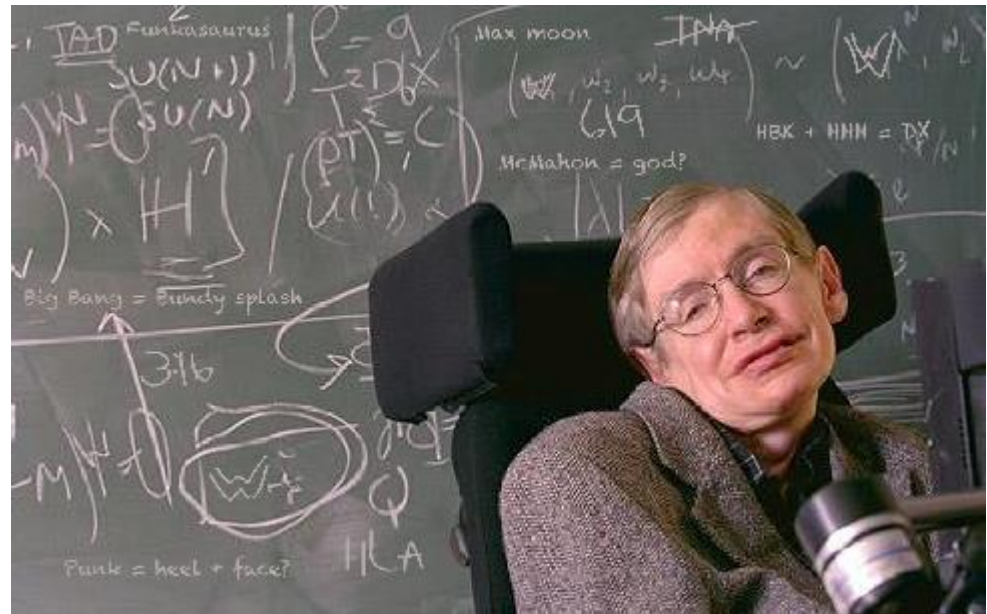


Do scientists think for themselves?

- Or do they have to stick to the worldview that they were taught, and which the scientific community accepts?

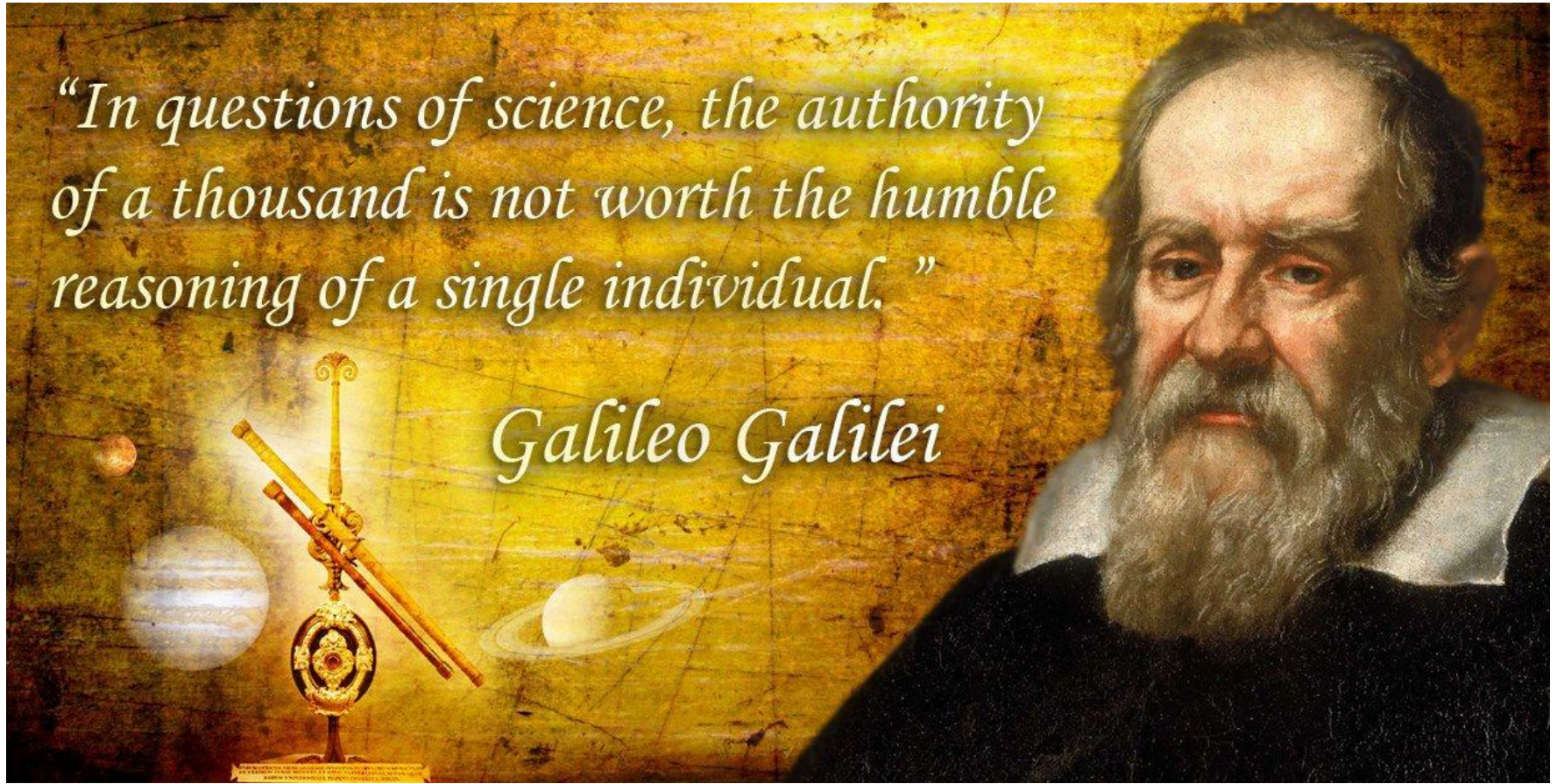
“There is a fundamental difference between religion, which is based on authority, and science, which is based on observation and reason.”

Stephen Hawking



*“In questions of science, the authority
of a thousand is not worth the humble
reasoning of a single individual.”*

Galileo Galilei



Kuhn on whether scientists think for themselves

“At least in the mature sciences, [the paradigm is] firmly embedded in the educational initiation that prepares and licenses the student for professional practice. Because that education is both rigorous and rigid, **[the paradigm comes] to exert a deep hold on the scientific mind.** ... we shall want finally to describe that research as a strenuous and devoted attempt to **force nature into the conceptual boxes** supplied by professional education”

(Kuhn, *Structure*, pp. 4-5)

“Normal science, the activity in which most scientists inevitably spend almost all their time, is predicated on the assumption that the scientific community knows what the world is like. Much of the success of the enterprise derives from the community’s willingness to defend that assumption, if necessary at considerable cost. **Normal science, for example, often suppresses fundamental novelties because they are necessarily subversive of its basic commitments.**”

(Kuhn, *Structure*, p. 5. Kuhn goes on to say that such novelties cannot be suppressed for very long, and they can lead to a scientific revolution or paradigm shift.)

E.g.

The geosynclinal theory is one of the great unifying principles of geology. In many ways its role in geology is similar to that of evolution that serves to integrate the many branches of biological sciences. ... Just as the doctrine of organic evolution is universally accepted among thinking biologists, so also the geosynclinal origin of the major mountain ranges is an established principle in geology.

Thomas Clark and Colin Stearn, *The Geological Evolution of North America: A Regional Approach to Historical Geology*, p.43 (Ronald Press, 1960)

“Might our jigsaw puzzle, our worldview, turn out to be equally incorrect, even though our system of beliefs is consistent and seems to us to be obviously correct and commonsensical?”

(DeWitt, p. 16)