Evolution
On the Nature of Things
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1. A Human Perspective: On the Nature of Things

Dean Richard Barth is upset about the direction taken by liberal arts colleges. Departments have become too isolated and specialized for faculty to discuss subjects in common and issues in the public interest. There is a disappearance of religious studies and a decline in the humanities. He believes the faculty needs to see where they are going and change direction.
He calls together the chairs of all his departments for a discussion of evolution.

Evolution, he says, is a subject held in common among all disciplines. A semester of weekly discussions among faculties should lead toward a new direction for this university. “I see a breakdown of communication between the sciences and the humanities. Departments are cut off from one another and faculties have developed obscure languages. They can no longer talk together on matters of public concern.”

The Dean wants to have interdepartmental meetings of chairs to find a new mission for the university. In this experiment he will ask honor students to participate and learn along with faculty. The subject of Evolution should give everyone greater insight into the nature of things. Everything is evolving, he says, including universities. He starts the class with an overview.

The Course of Evolution: Our History

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Dean: Class, is everything in the universe “physical”? Or is it all based on our “mind” and our experience? Does everything take place through human consciousness?

Physicist: Scientists do not see stars or stones as “conscious”.

Human consciousness

Dean: Everything we know comes through our consciousness.

Direction

Dean: Evolution is a process in which things become more complex over time. Everything depends on what evolved in the past. What about a tree?

Biologist: Yes, a tree. Magnesium had to evolve to help generate green chlorophyll. Calcium had to evolve to give the tree rigidity for its cell walls. Potassium provides regulatory functions in the tree. Nitrogen, phosphorus and sulfur provide proteins. The acorn of the tree had a lot of predecessors in evolution. They are part of its “family history”.

Anthropologist: Yes, more complex. The five-million-year transition from primates to Homo sapiens produced a threefold increase in brain capacity and a six-fold increase in the prefrontal cortex.

The Anthropic Principle.

Physicist: An astrophysicist by the name of Brandon Carter proposed that the universe is structured just right to support life here on earth. Gravity for example, is roughly 1039 times weaker than electromagnetism. If gravity
had been 1033 times weaker than electromagnetism, the “stars would be a billion times less massive and would burn a million times faster.”

Dean: The sciences emphasize “reason and sense” to get at the truth, that is, theory and empirical research. But faculties in the humanities emphasize, “knowing” through intuition and insight. How do we talk together?

The Method of Participant Observation

Anthropologist: I think the method of “participant observation” is essential to the very construction of knowledge. Our fieldworkers become skilled in learning how people speak, feel, think, and act in the culture under their study. As participants, they have to look at the subjective side of people’s lives, that is, how people view their world. And then as professionals they must look at the objective side of their organization and collective life — their norms, customs, folkways, and laws. Fieldworkers must balance “intimacy” (closeness) and “distance” (detachment) to understand what people feel and know about their field.

Philosopher: In philosophy, pairs of opposites are studied — like Mind-Body, Matter-Spirit, Freedom-Order, Inner-Outer, and so on. Each member of the pair can be considered opposite to the other but paradoxically they are also mutually involved. All this becomes known through human consciousness. Let us look at this in more detail. (The Dean writes on the board:)

Polarities

Dean: Unity/Plurality, Creation/Destruction, Attraction/Repulsion, Integration/Separation, Symmetry/Asymmetry, Continuity/Discontinuity, Inner/Outer, Complexity/Simplicity, Linearity/Cyclicality, Equality/Hierarchy, Community/Individual, Subject/Object, Freedom/Order, Abstract/Concrete. I am saying that “natural history” and “human history” invoke a process of creation and destruction. We also see that there is a synthesis (that involves a “joining”) and a separation (that requires a differentiation) of things. Nature is transforming and going beyond itself slowly stage by stage.

Physicist: Attraction-repulsion is evident in our data right from the beginning of time. It still exists in humans. In physics it is a physical alignment of atoms. An electric charge has a polarity of either positive or negative. Also a voltage has a polarity, in that it could be positive or negative, with respect to some other voltage, such as the one at the other end of a battery or electric circuit. Symmetry is one of the most powerful concepts in particle physics. Practically all laws of nature originate in symmetries. And all new things that evolve (e.g., atoms, molecules, cells,
organisms) show a relative independence within a larger interdependent universe of things. That includes humans. It’s called autonomy.

**Dean:** Furthermore, each new thing appears to be relatively self-organizing and self-directing while linked to other energies in the universe. These concepts are all substantive, that is to say, found equally in all fields. What do you think? What about attraction and repulsion?

**Physicist:** Atoms with different “electronegativity” show attraction. They bond “covalently”– to make “polar molecules.” The degree of “polarity” in a molecule affects how strongly it is attracted to other molecules in a substance.”

**Biologist:** Here is a case of attraction-repulsion in my field. A pheromone is a chemical that attracts members of the same species. It’s like a perfume. It also has the capacity in some cases to repel, that is, to release a “volatile substance” -- when some animals are under attack by a predator. So a pheromone can attract or repel.

**Dean:** So animals attract and repel, like humans do, and like nations do.

**Neurologist:** In neurology, axons show this force of attraction-and-repulsion. Axons are extensions of nerve cells that transmit impulses outward from the cell’s body. They respond to signals provided by extracellular cues. They are “transduced.” This means one type of energy is transformed into another.

**Dean:** These paired concepts mean the same thing but are also in different in the context of departments from astronomy to zoology.

**Musicologist:** In music, this polarity might be expressed as “harmony” and “disharmony” or concord and discord. We hear harmonious (attractive) chords and dissonant (repelling) chords by feeling them. This musical “feeling” is not rational like science.

**Dean:** Ah! The principle is not lodged in reason alone, not just in your head. We shall see later that this kind of knowing -- by feeling -- is also evolving. “Synthesis” means “combining separate things to form a more coherent whole.” The dictionary would say it is “a creative mixing of different types of elements.”

**Chemist:** Physicians in research hospitals study how wounds heal, they look at a synthesizing process -- how protein metabolism is necessary for the repair of collagen.

**Philosopher:** In philosophy, synthesis refers to creating a more complete view of things. The idea goes back to Lao Tzu in Ancient China and forward in time to ancient Greece with Plato and finally through modern philosophers like G. W. F. Hegel and Karl Marx in the 19th century.
**Musicologist:** In *music technology*, FM *synthesis* is a technique for generating the sounds of musical instruments for MIDI playback.

**Poet:** In *poetry*, “synthesis” is expressed in rhetorical devices like “metaphors.” “A *sea of troubles*”; and “All the *world's a stage*.” Metaphors bring images together that would otherwise have nothing to do with each other.

**Physicist:** But in science a new substance (not an image) is created. We spoke of water. When molecular hydrogen (H\textsubscript{2}) and oxygen (O) are combined and allowed to react together, energy is released and the molecules of hydrogen and oxygen synthesize to form water. Atoms *separate* and evolve by *attraction* and *repulsion*. Then by *synthesis* they produce molecules. In turn, molecules *attract* and by synthesizing, they produce cells. Cells emerged at least four billion years ago.

**Biologist:** Animals have sexual attraction and create a synthesis of different chromosomes. We are attracted to somebody and we marry; we go to bed together and have children. Another synthesis occurs with the newborn baby.

**Dean:** You can look at a person’s body on the outside but on the inside you find much more, including a brain. A surgeon can see the brain outside but there is also a mind inside with feelings.

### The Direction of Change

**Dean:** I mentioned greater and greater *complexity* as evolution advances. But I can also see increasing growth of the inner *subject*. I see an increasing development of the *inner* side of things, greater interiority within the brain and consciousness over time. New images develop inwardly -- along with feelings -- that go with the mind’s images. In this inner-outer relationship, over time, more inner space evolves. People, for example, find a deeper sense of who they are. It is a constant *synthesis*.

**Biologist:** Synthesizing” is used in different settings: *fusing*, *blending*, *combining*, *joining together*, *mixing*, *merging*, *uniting*, and *amalgamating*. Each has a similar meaning depending on its context. In the process there is a *transformation*.

**Physicist:** Galaxies interact during collisions. Atomic elements transform at different timescales and stages. They are studied as “deep multi-band imaging.” A transformation in this case takes about a billion years to happen.

**Sociologist:** In my field, “transformation” refers to a big structural change in society. The American colonies transformed with their constitution.
**Psychologist:** In *psychology*, transformation occurs when a person alters basic aspects of personality. Old emotions separate out from the old, and the person transcends bad habits and attitudes. The person finds a new self-identity.

**Dean:** This is radical change. Ask this: Is stasis discussable? (*Everyone looks puzzled.*) It refers to a condition of stability, relatively unchanged, a state of standing, or stopping, a condition of balance or equilibrium. How about biology? Is “stasis” evident there?

**Biologist:** Stephen J. Gould and Eldredge studied “punctuated equilibrium,” a period of little or no change.

**Physician:** In medicine, “stasis” is a condition in which the normal flow of body liquid stops.

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**Transcendence**

**Dean:** How about the word “transcendence”? Is it “substantive”?

**Physicist:** No! No! That word is not in science anywhere.

**Dean:** By “transcendence” I do not mean something religious or supernatural. The word *transcendence* represents something surpassing (or exceeding) the past. It adds a new potential to evolve within itself.

**Perry:** Something is transcendent when it converts into a new energy that is evolving - atom to cell. *Each individual in a molecule has a greater value than it did without the molecule.* Atomic fusion adds value to the atom because it gives it greater potential to evolve. *It has a greater “evolvability,”* as they say, a greater capacity to develop beyond itself.

**Dean:** Each stage in the evolution of animals transcends the other by adding a new structure that has a new function. Am I right?

**Biologist:** The first fossils with eyes date from the lower Cambrian period about 540 million years ago. The eye is the receptor cell, which contains the opsin proteins and responds to light by initiating a nerve impulse. Then the eye evolves by adding new structures to its earlier formation. And each structure has a new function. It has a purpose with a small “p”, not *telos.* Evolution is not shaped like a tree. Stephen Jay Gould said it looks more like a bush. I agree. Birds are one branch of the bush. Birds themselves kept differentiating.

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**Continuity and Discontinuity**

**Biologist:** The Cambrian Explosion occurred in one geological moment… geological abruptness of this formative event."

**Dean:** So there is both continuity and discontinuity in the data. Not all species survive. Is it the same in society?
Sociologist: The Inca suddenly disappeared. Many different societies evolved around the world; some were in stasis for long periods of time, like the Eskimos.

Biologist: Gould argues; there are breaks, retrogressions, and stasis…

Sociologist: But Herbert Spencer in the late 1880s supported continuity over the long haul. For example, Spencer saw human evolution in the succession of the family, clan, tribe, and state over time.

Dean: Could we say that over time a greater “freedom” develops in the evolution of society?

Sociologist: Early social scientists saw a progression toward greater freedom. Karl Marx saw the lower class evolving first as slaves under empires, and then over time developing into Feudalism to become serfs under kings with more freedom. Feudalism evolved into capitalism and the lower class evolved to become freer as wage earners. They could not be killed at random and could quit their jobs at any time.

Political Scientist: Democracy is uneven, not perfectly linear. We see some measure of democracy in Ancient Greece with adult men; women and foreigners were not included. Later, in the 13th century, English nobles demanded that their king sign the Magna Carta. It required the King to renounce certain rights he acquired by tradition. It specified legal procedures for the King to be bound by law. The “structures” of democracy evolved more quickly in time than it took for land animals to get wing structures. The stages of evolution over time are accelerating. Evolution is quickening.

Dean: Do you think democracy” is still evolving?

Sociologist: Society today is evolving through the Third Sector -- beyond government as the single institutional authority of society. In addition to the state we now have science, the church, the arts, and all kinds of civil associations. This could be a process of transcendence from strict hierarchy in the state toward more equality for people in society.

Anthropologist: Yes. Transcendence. I believe that human consciousness transcends (exceeds) animal consciousness. The human brain goes beyond the animal brain. Human consciousness is linked to the human brain but it has also begun to transcend it. The meaning of “wisdom” cannot be located in the brain.

Dean: Human consciousness has transcended the brain with its own rules not explainable in the circuits of neurons. The new rules have evolved as a symbolic order -- like grammar – not a physical order. Grammar has evolved its meaning beyond the brain. Think of Robert’s Rules of Order. They are the “made up” rules to keep members together as a group. That’s a psychological and cultural, not neurological phenomenon.
Dean: I think that these attributes of transformation ("fundamental change") and transcendence ("surpassing the past by adding new structures and functions") operate all the way through evolution. These ideas of transcendence and transformation are “substantive” because we can connect them with the humanities.

Community

Artist: Who are we? What are we part of?
Dean: We are human beings, a part of humanity but we are also part of the universe.

Physicist: The whole universe is composed of vibrations and each stage with different frequencies.

Perry: The body itself is a string symphony. Our cells, organs and tissues vibrate. Billions upon billions of frequencies interact with each other and resonate within us.

Musicologist: We are creating our new vibrations from primitive drums to Bach to Mahler. Music is evolving new rhythms and complexities of sound over the millennia.

Biologist: Vibrations are cycles. We had been talking about the nature of things as linear. Is the “cycle” a substantive concept? Does it apply across all disciplines? It applies in my field. (The Dean writes on the blackboard:)

Cycles

Dean: In astronomy, cycles are studied in the orbits of planets, in moon phases, and tides. Geologist: The cycle is studied in rock formations and the climate. Psychologist: The cycle is seen in the extremes of alternating moods, like sad and happy, like manic depression. In medicine, it is seen in the periodicity of diseases. Economist: In economics, cycles are studied in stock prices, inflations and recessions.

Jack: Look at the engine of a car – those pistons are like frequencies.

Artist: Last night I watched Yo Yo Ma playing a Bach Suite for Cello. He swings his bow back and forth ever so subtly and carefully. This back and forward movement is cyclic.

Biologist: “There is the 28-day cycle of menstruation, the 90-minute REM cycle of brain activity during sleep, the rhythms of the individual brain waves, the cycles of heartbeats and breathing and digestion, the 12-day cycle in the muscles' proteins, the 128-day life cycle of red blood cells, etc.” There are "circadian" rhythms in a 24-hour cycle in the liver, in blood pressure, kidneys, and other organs and bodily processes. There are tree rings, floods, rainfall, animal migrations, water levels in lakes and rivers, barometric pressure, animal populations (among all types of animals --
mammals, insects, fishes, birds, etc., and even microorganisms), and the 24-hour (circadian) rhythms of sleep and activity.

**Physicist:** In *physics*, cycles are in electromagnetic fields. The solar system has cycles, in the planets' path around the sun, the planets' rotations into their own days and nights, the rotation of the Milky Way galaxy. Galaxies show a spiral pattern. Each galaxy is composed of a rotating thin disk over which spiral arms extend. They are filled with gas and dust and have an inner ring-like set of tightly wound arms surrounded by outer arms that may be split into branches. They are very complex curves that constantly increase or decrease in size while moving around a central point.

**Biologist:** The DNA is a spiral. The double helix is a right-handed spiral. The DNA strands wind around each other, and leave gaps between each set of phosphate backbones. This subject is intricate. It requires technical terms.

**Hierarchy**

**Biologist:** There is a system of ranking in all things. It is in our taxonomy, our classification. An animal is classified at a higher level than a bird, which is higher (abstractly) than a raptor, which is higher still than an eagle, which is higher than a golden eagle. Each higher rank designates some feature of a previous entry. It exists in the organization of animals from insects to bees to lions.

**Sociologist:** We have studied how religious denominations rank by wealth, numbers, and social class. We rank business corporations based on their assets. People are ranked in systems of power, status, class, age, seniority, etc.

**Chemist:** Chemical elements are ranked according to special properties. Look at the Periodic Table of the Elements.

**Dean:** Class is over.

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Chapter 2. **Physics and Chemistry**

Professors Adams, Hawking, Kornberg and Adams

Dean: We know evolution began over **13 billion years ago when the Big Bang exploded**; then, **4.5 billion years ago, our Sun and Earth appeared**; then, **3.4 billion years ago, life appeared**; then, **450 million years ago, there were the first Fishes**; then, **300 million years ago, the first Reptiles**; then, **200 million years ago, the first mammals**; then, **120 thousand years ago, Homo Sapiens appeared**.
Professor Hawking, is everything in the universe composed of vibrations?
Do you have a theory of evolution in physics?

Physicist: No. The process goes something like this: \textit{hydrogen, helium, lithium, beryllium, boron, carbon, nitrogen, oxygen, fluorine, neon}. Most of the human body is made up of \textit{water}, H2O, with cells composed of 65-90\% water by weight. Most of a body's mass is \textit{oxygen}. \textit{Carbon}, the basic unit for organic molecules, comes in second. 99\% of the mass of the human body is made up of just \textbf{six elements}: \textit{oxygen, carbon, hydrogen, nitrogen, calcium, and phosphorus}. I can write this on the blackboard. \textit{Oxygen (65\%), Carbon (18\%), Hydrogen (10\%), Nitrogen (3\%), Calcium (1.5\%), Phosphorus (1.0\%), Potassium (0.35\%), Sulfur (0.25\%), Sodium (0.15\%), Magnesium (0.05\%), Copper, Zinc, Selenium, Molybdenum, Fluorine, Chlorine, Iodine, Manganese, Cobalt, Iron (0.70\%), Lithium, Strontium, Aluminum, Silicon, Lead, Vanadium, Arsenic, Bromine (trace amounts)}

Dean: Professor Kornberg: Can you trace the sequence in time that molecules evolved in the evolution?

Chemist: The evolution means that molecules are differentiating and moving toward greater complexity: \textit{(on the blackboard)}

1. Monatomic (metals); 2. Ionic compounds (salts, most acids, and bases); 3. Nonfunctional compounds (the paraffin series); 4. Functional compounds (compounds of compounds); 5. Nonfunctional polymers (chains 100,000 units long); 6. Functional polymers (proteins); 7. DNA and viruses (Double helix, self replicating).

We create molecules now for their usefulness.

Dean: Are they destructive?

Chemist: Science is based on truth and facts, not on ethics.

Philosopher: Science has a framework with rules that guide its work. Let’s see if I can think of them: \textit{control… predictability… objectivity… causation… rationality… impersonality … manipulation… exteriority}. Their opposites are missing. There is no feeling or \textit{compassion} in physics. This creates a problem with your findings that tell us about the nature of things.

Chemist: We intend to be objective. In science there are rules of \textit{causation} but no overall purpose to molecular changes. There is no \textit{telos} for scientists who study evolution. We study \textit{objects}, not \textit{subjects}. There is no purpose to evolution.

Nanotechnology

Physicist: So nanotechnology is about working at a scale between a hundred thousand times and a thousand times thinner than one of your hairs. It's everywhere.

Dean: But how safe is it?
Mirror Neurons

Chemist: A mirror neuron is a neuron that fires both when an animal acts and when the animal observes the same action performed by another. Thus, the neuron "mirrors" the behavior of the other, as though the observer were itself acting. Such neurons have been observed in primate and other species including birds. In humans, brain activity consistent with that of mirror neurons has been found in the premotor cortex, the supplementary motor area as well as the other parts of the brain.

Biologist: Mirror neurons have been found in the frontal lobes of monkeys. They show how monkeys re-enact the behavior of others. This means that the capacity to identify others is written into the brain.

Anthropologist: The human brain keeps growing in complexity. It reached its present size about 250,000 years ago. Self-consciousness is a result of invention -- moving from animal signs to human symbols. It was a process of comparison and abstraction, based on the principle of the metaphor, a constant synthesis.

Bisociation

Arthur Koestler wrote a book called The Act of Creation in 1964. Koestler concludes that all inventions and discoveries share a common pattern that he calls "bisociation." It is a blending of elements drawn from of two previously unrelated matrices of thought into a new matrix of meaning by way of a process involving comparison, abstraction and categorization with analogies and metaphors. Creativity involves bringing different things together into a “new whole,” something that is greater and more complex than the sum of its parts. What is a whole on one level of a hierarchy is part of a larger whole on another level of hierarchy. The letters in a word are parts of the whole word. Then the word is part of a whole sentence. Then sentences are parts of whole paragraphs, and so on.

Biologist: A lot of scientists speak of making discoveries in their dreams.

Dean: Do you mean not all discoveries are based on theory, hypothesis, and empirical research? Science relies on intuition?

Biologist: Yes. Pasteur said his discovery of immunology took place in a sudden flash of intuition, without his thinking through the problem. W. B. Cannon’s theory of the “fight-flight syndrome” occurred to him in a sleepless night.

Physicist: Friedrich Gauss said he discovered the law of induction at 7:00 A.M., half-asleep “before rising.” Enrico Fermi said he arrived at the method for producing thermal neutrons -- “without any advance warning or prior reasoning.” August Kekule formulated the ring structure of the
benzene molecule in a “sudden visual imaging of a snake grasping its tail.”
He was half sleep. Invention is in the deep recesses of the brain.

Chemist: The hologram allows a recorded scene to be viewed from a wide range of angles --But if a holographic film is cut into pieces, each piece produces an image of the whole object. It means that the form and structure of the entire object are encoded within each region of the photographic record.

Physicist: The quantum physicist David Bohm argued that there is an explicate order and implicit order to the universe. The explicit is a projection from higher dimensional levels of reality. There is a ceaseless enfoldment and unfoldment that generates the look of solidity among the entities composing it. Subatomic particles are constantly dissolving into the implicate order and then re-crystallizing. Bohm sees life enfolded deep in this generative order.

The Tension of Opposites

Dean: The universe cannot be explained by a root metaphor, like Mind or Matter. It is not just a Mechanism or an Organism. Root metaphors do not work here. The universe is a constant search for a “union of opposites”; Jung referred to it as enantiodromia. That’s the superabundance of any force that inevitably produces its opposite. Every creative act involves bisociation – the combination of previously unrelated ideas.

Dean: Right. All new fields of knowledge evolved from past-unrelated fields. What does that mean?

Science/Religion

Chemist: People tend to forget that science and religion are mutually involved. Chemistry evolved from alchemy. Alchemy was rooted in religion and theology. Newton learned how to do experiments in alchemy. For thirty years he was seriously involved in alchemy but after his death in 1727, England’s Royal Society rejected his alchemical writings.

Psychologist: The psychoanalyst Carl Jung looked at Newton’s break with religion. He felt that science had forgotten its original values, goals and ethics. Science no was longer organized to work for the common good. He had a nervous breakdown. He had been working in the context of the ancient Hermetic tradition, which was born in the “Emerald Tablet.” The Tablet was written around 3000 B.C. Now Newton broke from that ancient wisdom and began to build a secular field of thought. Jantsch’s principle on the self-organization of atoms also applies to the self-organization of society.

Self-Organization
Sociologist: Chemistry associations are self-organizing in society, like chemicals in a laboratory test tube. Do they mean the same thing?
Dean: These are substantive ideas that cross all disciplines. Add bonding and separating, attraction and repulsion, along with self-organizing. These processes apply to both human and physical organization. What does this mean in chemistry?
Chemist: Self-organizing systems display emergent properties on their own: a new system appears without pressure from the outside. In other words, the drive to overcome stress or solve problems comes within the system itself.
Biologist: It is the same in biology. Living organisms have been called autopoietic systems. Autopoiesis refers to a self-creating system, that is, a system of self-constructing, self-maintaining, energy-transducing autocatalytic entities.
Economist: The economist Paul Krugman claims that, “the link between the study of embryos and hurricanes, magnetic materials and collections of neurons, is their self-organizing capacity. The ants in a colony, the neurons in the brain, and the investors in a market are all self-organizing systems, all self-directing, so to speak.
Biologist: Lima-de-Faria says that the chemical elements in animals are the explanation for self-organization. Chemicals are in a self-assembly process. This explains how the same process occurs at higher levels, not anthropomorphism. Self-assembly at the chemical level is the basis for explaining evolution at more complex levels. Evolution in chemistry is not based on the process of Natural Selection.
Dean: Tell us how natural selection does not apply to animals.
Biologist: “Flight” for birds cannot be explained by natural selection. It appears first in insects but in none of the other invertebrate groups. Then it appears in pterosaurs (flying reptiles) that are unrelated to insects.
Dean: What else.
Biologist: Look. The penis structure has appeared at different times in evolution, not sequentially in time. It is well developed in snails, barnacles, and mammals.
Dean: This means that the recurrence of similar structures and functions is not due to forces in the environment or the stage of complexity of the organism. It is autonomously created.
Physicist: Synthesis is behind this whole process. Quarks and anti-quarks united into mesons and other particles and then protons, neutrons, and electrons grew—we say “self-assembled”—into atoms. Then atoms are
“self-assembled” into crystals. At the protein level, the different units of aspartase transcarbamoylase assemble and reconstitute the active enzyme.

Dean: Does synthesis and self-assembly apply in other disciplines?
Artist: An artist combines paints to assemble a portrait. Pure chance and “self-assembly” will take place in a painting. Various elements are parts within the whole that interact in an unseen order.

A composer combines notes to assemble a symphony. A synthetic chemist combines chemical maneuvers to make a molecule. They all work like metaphors and reflectaphors.

Dean: What are reflectaphors? (He writes on the blackboard.)

Reflectaphors

Literature Professor: Reflectaphors are similarities that occur in the interactions of elements of something. The brain craves establish a patterned order and it is satisfied by the constant display of similar items. These variations unfold in unpredictable ways that is, by the law of comparison/contrast which makes each figure (even after repeated encounters) dissimilar from the last. In literature they appear in irony, pun, motif, symbol and metaphor. Reflectaphors are the hidden order in a work of art. John Briggs sees reflectaphors in physics, especially in the studies of David Bohm.²

Dean: Give me a good example of how this works in a novel.

Literature Professor: In Joseph Conrads’ novel Typhoon, you can see how reflectaphors are working in the interaction among the characters, their setting, the environment, and the plot. The whole has a higher order than any of its parts.

Biologist: How does it happen?

English Professor: The novel is about a sea captain who guides his ship through a tropical typhoon. The story is full of reflecting metaphors—mirrors, we might say. You are constantly comparing the elements that made the story so powerful.

Dean: In what way?

Mary: The ship’s captain is named MacWhirr. He is a simple, easygoing guy, but he has “fiery gleams” on his cheeks. You know intuitively that he possesses some hidden power. Reading on, you realize that those “fiery gleams” are, metaphorically speaking, a reflection of the fire in the ship’s boilers. The boilers keep the ship heading steadily into the wind, as steady and powerful as the Captain shows himself to be.

The ship carries Chinese coolies, who seem to be pretty easygoing like MacWhirr, but during a storm their footlockers are battered open by the pitching of the ship, and the silver dollars they have saved start...
flying around everywhere. Inside, the ship becomes as wild and confusing
as the typhoon outside. The coolies begin thrashing each other in frenzy.
Their circular dollars roll with the ship and the rolling sea. The Chinese
chase them, all reflecting the “spiraling storm” in the sea.
Dean: Interesting: the storm on board the ship and the internal emotions of
the sailors reflect the storm outside.
English Professor: Yes. Conrad creates interlocking images. One image or
event reflects with another. Mirroring metaphors go back and forth
between the Chinese and the storm: the dollars to the storm; the ship
boilers to the captain, the storm to the rolling ship, and so on.
Dean: The whole is greater than its parts. It cannot exist without the
coincidence of events that seem related. It’s all a whirr.
Biologist: I see it in my field. The whole cannot exist without the
synchronicity of its parts. The monarch ant, the queen, does not direct
an army of drones. Drones take their direction from a small set of
signals released by other drones. A drone collecting food emits a scent,
and other drones that pick it up will follow that path to the food source.
No single drone knows where the food is, or has a map of the terrain.
Nor does the queen have a map.

The whole (system) is more than the individual members of the
colony. It acts as the decision-maker in this process of change. Changes
emerge from within the system itself. So Prof. Parsons is right. The system
is based on sociality and is self-directing. It is in the larger community --
where the action is.
Sociologist: Right. The stock market is a system more complex than its
individual players. It is a group of associations in which no one person has
the whole answer to where it is going. Even the queen bee – the Securities
and Exchange Commission – does not have the answer. Millions of
investors are acting on their own as they all converge at one point in the
exchange market. They look for money in the way that ants look for food.
Biologist: An individual ant alters its behavior based on the behavior of
other ants that it encounters by chance. So out of all those chance
encounters, a social order emerges. These individuals are independent within
the larger community.
Dean: Could socially “interacting systems” be descriptive of evolution?
Neuroscientist: I think so. A neuron in the human brain decides to fire (or
not to fire) based on the input from other neurons to which it is connected.
All of these neurons (like ants and investors) follow simple rules, but they
are all “interacting agents,” with billions of other agents in the brain.
enough interactions, something new will happen. It is all internally determined: self-determined.

Dean: The ants in the colony, the neurons in the brain, and the investors in a market are all self-organizing systems, all self-directing. That’s it for today. See you tomorrow.

3. The Field of Biology

Dean: Professor Wilson, would you define evolution for us?
Wilson: Evolution is the way inheritable favorable traits become more common in successive generations of a population while unfavorable traits become less common. Biologists support this view but the details are complex. One big question has been “What is the “unit” of selection”?

Dean: What is this debate?
Wilson: A unit of selection is an entity within a hierarchy of organization that is subject to change. For decades there has been debate among biologists about the unit. Is this “unit” a gene, an organism, a species, a group, a cell, a population, a climate, or what? The answer can make a big difference. A few changes in the temperate of the water can keep the salmon from swimming up stream and that will eliminate the source of food for the Alaskan population of bears. That few degrees in climate will stop the salmon; eliminate the bears, and more.

Dean: It looks like we must move across disciplines to answer this question. What did Darwin think?
Wilson: Darwin saw natural selection as an adaptation at the level of the individual organism. He found exceptions in the colonies of social insects where a group of individuals (like ants) worked together, but he dismissed “groups,” saying it was an exception. He figured that “entire colonies” of insects act as if they were one organism.

Dean: These “units” are in stages of increasing complexity, like before, in other fields -- particle, atom, and molecule. They are subunits within higher units. Each unit is autonomous and yet interdependent within the whole.

Wilson: And there is a principle (force) of attraction and repulsion and a state of equilibrium within each unit. But there are no forces between levels of organization. For example, an atom does not attract-repel in regard to a molecule of which it is a part. It happens among different atoms at the same stage-level -- like atom-to-atom and molecule-to-molecule. It is a continuing synthesis of differences at each stage of evolution.

Tom: So the idea of repulsion now exists at the level of the organism as it does in physics at the atomic level. Animals become frightened and repelled when sensing an enemy. But principle of attraction and repulsion is
elevated into a different quality through the cellular system. The attraction and repulsion of cells and organisms is different from atoms. The principle of attraction in physics remains but evolves into the attraction of animals of like kind (schools of fish) and sexual activity. Repulsion remains but also innovates into a new process called competition among animals.

Wilson: Repulsion and attraction still exists as a principle among animals but a new activity called “competition” and cooperation” become a more evolved type of relationship among animals.

Tom: Did the idea of cooperation fit Darwin’s picture of individual struggle?

Wilson: Insect colonies -- where workers labor for others -- did not fit his theory. Cooperation for the common good did not help document his theory about fighting for survival. The idea that ants would work for the “good” of their community was for him an anomaly.

Dean: The individual and the society are both important to understand change and evolution. But the idea of society came to include institutions like the family, the church or a fraternal organization as part of it. This was when social Darwinism became a movement in the 19th century.

The Group

Wilson: In 1962, a Scottish ecologist by the name of V. C. Wynne-Edwards decided that the “unit” was the “group.” He began looking at red grouse and found that these birds worked as a group. They sacrificed opportunities to reproduce – just to keep their flock from starvation. The grouse gauged the amount of food the moors could provide each year. Then they adjusted their foraging behavior to the available food. They would delay breeding when supplies of food looked scarce. They would even become abstinent waiting for the stock of food to come back. So Wynne-Edwards was convinced that the interests of the group overrode those of the individual animal.

Tom: Some biologists emphasize the group as the proper unit because the interaction of its members affects their survival. Social interactions are critical to group development.

Dean: Then there is the unit of Dawkins. Tom, you have read Dawkins. Tell us about his “unit of selection.”

The Gene

Tom: In 1976 Richard Dawkins published The Selfish Gene. He argued that the only unit of selection that matters is the gene. If you take the gene as the unit, you couldn’t accept the organism or the group as the unit.
Dean: Why is that important?
Tom: Because genes cause phenotypes and a gene is “judged” by its phenotypic effects.
Dean: (Interrupts). Explain what “phenotype” means to the class.
Tom: The word “phenotype” refers to the visible characteristics of an organism. Genes are invisible.
Dean: Dawkins argued that genes survive beyond the life of an organism.
Wilson. He called genes “replicators” as opposed to “vehicles,” the term used for organisms. Organisms have a less permanent existence. Ernst Mayr at Harvard University called Dawkins’ preference for the gene “reductionism.” He said this gene “unit” fit geneticists because it was the subject of their field.

Eco-system
Tom: The eco-system came later as the “driver” of evolution. Ecologists started to focus on climate change. And this has had political implications - like “global warming.” Should the government’s conservation efforts try to preserve the species or the ecosystem? Particular species may be threatened by extinction, but the ecosystem preserves other species in a network of interdependence and biodiversity.
Dean: So, is evolution a social process?
Prof. Wilson: Elin Whitney-Smith says that we should be thinking of how the species and ecosystem evolve together (reading from notes):

When Chicago’s first human inhabitants arrived at the end of the last Ice Age, they encountered a landscape much different from what the Europeans observed 11,000 years later. Mastodons and woolly mammoths inhabited an evergreen spruce forest similar to what can be found in Alaska today.

A major climate change will wipe out a species no matter how fit it may be in its environment. Natural Selection no longer applies.
Dean: What else beyond Natural Selection?

The Epigenome
Wilson: The epigenome is a layer of biochemical reactions that turns genes on and off. It can change according to an individual's environment, and is passed from generation to generation. It's part of the reason why "identical" twins can be so different, and it's also why not only the children but the grandchildren of women who suffered malnutrition during pregnancy are likely to weigh less at birth.
Dean: Is this concept new?
Wilson: Yes. It suggests a revival of Lamarck’s theory of acquired characteristics. Epigenetic inheritance adds another dimension to evolution. The genome changes slowly, through the processes of random mutation and natural selection but the epigenome can change rapidly in response to
signals from the environment. And epigenetic changes can happen in many individuals at once. Through epigenetic inheritance, some of the experiences of the parents may pass to future generations. At the same time, the epigenome remains flexible as environmental conditions continue to change. Epigenetic inheritance may allow an organism to continually adjust its gene expression to fit its environment - without changing its DNA code.

Co-evolution in Sociobiology
The idea of co-evolution began with Paul Ehrlich and Peter Raven. They coined the term when they were studying butterflies and plants in the 1960s. The idea is that all living things are socially interactive. We learned long ago how bacteria communicate with one another, but in the 20th century, biologists began to realize that communications were taking place between species of animals and plants.

Biologists began to study how flowers take advantage of the sensory abilities of pollinating insects to attract them by their color. Orb-web spiders take advantage of the sensory interests of their prey to attract them through ultraviolet rays as they construct webs at artificially lit sites. Crab spiders ambush insects as those insects are attracted by flower odors. Bees evolve interactively with flowers. They evolve together.

Certain types of flowers have a nectar chemistry associated with a hummingbird’s diet. Their color and their morphology coincide with the bird’s morphology and vision. The blooming times of (Ornithophilous) flowers coincide with the hummingbird’s breeding seasons. These are the kinds of studies that become the subject of sociobiology.

Physicists talk about “attraction” through gravity, but in biology we see this force acting in the drive of animals to mate and plants to pollinate. Biologists acknowledge the power of attraction in the sex drive and the food drive. But this attraction has a lot more complexity in biological life than in physical matter. Birds of Paradise dance and develop great “adornments” to attract their mates. Mating looks like an art in this case; attraction is a serious business. Sex is rooted in nature, beyond reason. Mating is based on social attraction, and sex is a “fusion,” so to speak, at this biological stage of evolution. It is a synthesis in the final count that produces something entirely new. Adult males, produce thousands of spermatozoa each second. Each spermatozoon contains DNA and looks like a living organism. Each has the sole purpose of fusing with an ovum. Some animals mate by the season, others according to the moon and rain. Male toads call out for a partner during the full moon. The Grunion has
sex by the moon. Marine worms rise to the surface with the moon and synchronize their breeding by the moon before daylight.

Wilson: In biology our word for this is *symbiosis*. The birds and flowers -- like preys and predators -- are in a symbiotic relationship to one another: if one dies, the other could also die. They are co-dependent.

Wilson: Co-evolution is complex. *Lions* use social hunting strategies that produce carcasses, but unintentionally, not to benefit themselves alone; their strategies also help *vultures, hyenas and other scavengers*. There is *no competition* between the lions and the scavengers. The scavengers concentrate on pieces that are too small or too difficult for the lions to reach, such as bone marrow. So different types of animals evolve unintentionally together. They are networked. *Vultures need the lions.*

Parsons: Sociality -- the broad term -- includes networking, interaction, *competition, cooperation, accommodation, adjustment, adaptation, rivalry, and exchange* -- all sorts of processes that have developed over time. You could propose that the “individual” is evolving socially at all stages of evolution.

Parsons: Nations cooperate, accommodate, negotiate, and network with one another, when they battle other nations that have different identities. In my field, business corporations are not the highest unit or force. They *compete with self-interest as an end, but at a higher level they cooperate in trade associations, again a joint interest*. And beyond them looms a “higher force:” the government. *(Pauses.)* Still there is higher field of society and a constant call for a larger community.

Wilson: When an amoeba is in danger, it calls for “friends” to collaborate with for protection; it “circles the wagons,” so to speak. Then comes the repulsion, joining together to fight the external enemies.

Dean: Amoebas, like nations, circle their wagons to fight “terrorists.”

Prof. Wilson: Ground squirrels stand on their hind legs and make loud calls to warn their friends about predators so that they can head to safety. The “alarm squirrel” takes a huge risk. It makes itself obvious to the predator, standing on its hind legs, screaming. It alerts others of danger but draws attention to itself, at high peril of being killed.

Dean: So “identity” -- individual and communal -- is fundamental to the process of evolution of both animals and humans. It applies all the way from bacteria to society.

Parsons: Common identity. It is a major characteristic of social evolution. That identity in society expands over time from the earliest primitive
families that evolve into clans; then into tribes and governments. Common identities are established at all stages of social evolution.

Dean: You mean: identity with humanity. Let’s stay with plants and animals. All disciplines are interdependent. All stages of evolution are interdependent. I have to think about that.

Wilson: *Without bacteria*, humans could not live. *Without pollinators*, we could not survive. We exist as one family.

Dean: Are we the most powerful creature?

Wilson: Look at the smallest creatures. Remember the bubonic plague in the 14th century? It cut human populations by nearly 40 percent. The rapid spread of microbes today could make the killing fields of Cambodia look like a minor event. Tuberculosis claims three million lives annually. Malaria kills another 180 million.

Dean: How can we stop the killing?

Biologist: Peter Kropotkin wrote about his trips to Eastern Siberia and Northern Manchuria. In *1902* he did not see competition as superior. For him, it was cooperation; the basic force of evolution was “mutual aid”.

Progress vs. Evolution

Dean: Biologists don’t put the two ideas together?

Wilson: We have no basis for claiming for “better” or “worse.” Biologists speak of things being “older” and “younger,” or sometimes “earlier” and “later” in their evolution. Gould argued that the notion of progress requires taking into account “the full house of variation of a system.” Only by a complete study of a system’s total potential for variation could we distinguish where a change is a result of “an explicit mechanism of directionality,” as opposed to being random. It is impossible to determine an explicit mechanism for the increase of complexity.

Dean: We are proposing a “full house of departments” that could help us discuss the directionality.

James: Could you say the direction is to evolve into human beings? Aren’t we the highest stage of evolution?

Wilson: Lynn Margulis says people cannot live without these tiny creatures. Symbiosis is everywhere. The smallest creatures in the world support our digestive tracts and live in our eyelashes. We are “festooned all over,” she says, with bacterial and animal *symbionts*. We are built as one world moving through another in a great system of networking and community.

Dean: We are part of a larger community on earth?

Prof. Wilson: The term “symbiosis” refers to the *practice of different species living together*. There is another term called “endosymbiosis.”. Two great classes of eukaryotic cell organelles, plastids and mitochondria,
evolved symbiogenetically, as we say. Symbiogenesis is the merging of two separate organisms to form a single new organism. Two billion years ago, the interactions of bacteria created a new kind of cell called the first “proctotists,” or nucleated cells. They formed when different bacteria merged together. (Proctocists include about 250,000 species, such as the amoebas, diatoms, giant kelps and red seaweed. Those that consist of a single cell are called “protists.”) Margulis proposes that the common ancestor of all eukaryotes originated by a genome fusion of several different prokaryotes, which became a new organism by symbiogenesis. These were “metabolically dependent consorting bacteria that led to this genetic fusion.”

The Human Body

Wilson: One quadrillion cells exist in the human body and 90 percent of them are bacteria, yeasts, and other microbes that keep us alive. Paul Hawken describes how our bodies are the outcome of the earth’s evolution, with all its elemental compounds, all its salty fluids that not only wash our eyes, say, but surround our cells. Our body is a “work in progress.” (He reads from a note to enliven the story:)

A single bacterium cell, Escherichia coli, contains 2.4 million protein molecules of nearly 4,000 different types, 280 million small metabolite and ion molecules, 22 million lipids, a genome consisting of 4.6 million base pairs of nucleotides, and 40 billion water molecules all packed into a cell whose diameter is one hundredth the width of a strand of hair.

Those first cells are everywhere on earth, on our tongues, in leaves, three miles deep down in the ocean, and in all the deserts of the world. The total amount of cellular activity in our body is unbelievable -- one septillion changes take place at any one moment. In one second, our body has undergone ten times more processes than the number of stars in the universe. Each human body is a micro-universe of activity.

Prof. Wilson: Humans are not too different from a sunflower or a seal. We are all self-replicating, self-directing, and innovating.

Tom: The “cooperation” of proteins, monocytes, macrophages -- body of cells working in harmony are working for us, we would become rotten fruit.

Wilson: These thymus cells (we say “T- cells”) are white blood cells called “lymphocytes,” and hundreds of billions of them meander throughout the body with a memory of who we are. T-cells identify all diseases, past and present. They have a library of pathogens. They move from the bloodstream to the tissues and back again.
Wilson: Paul Hawkins compares the human body and its physical movements with the rise of social movements in countries where people are organizing to save the body of humankind. This notion of “cooperation” is operating in all stages of evolution. He hopes that “people movements” will save the environment. So, we could say they are like an immune system.

**Pheromones and Morphic Fields**

Tom: A pheromone is a chemical that triggers a response in another member of the same species. There are different kinds of them, such as alarm pheromones, food trail pheromones, sex pheromones, and a lot of others that affect animal and human relations. Pheromones are a communication system, a substantive principle in evolution.

Rupert Sheldrake describes nature as composed of morphic units. Units include atoms, molecules, crystals, cells, tissues, organs, and organisms. He says they are organized by electromagnetic fields, which contain a memory. Each unit inherits a memory from previous things of their kind by a morphic resonance. There is an electromagnetic field within and around a morphic unit that organizes its structure and pattern of activity.

Wilson: Sheldrake is saying that the nature of life’s energy contains information modulated in electrical fields, magnetic fields, and quantum fields. These fields interact in resonant patterns and harmonics. Information is a vital part of the process of self-organization. I feel like we are entering an exciting new age. Sheldrake is in tune with string theory.

Dean: What do others think about this?

Jane: I have read about the akashic records. They describe all knowledge and human experience since the beginning of time. It is a history of the cosmos...

**The Brain**

Prof. Wilson: The brain has evolved to become the most complex object in the universe. It weighs between three and four pounds, contains over 11 billion specialized nerve cells called neurons; it is capable of receiving, processing, and relaying the electrochemical pulses. It begins in a jellyfish with no differentiated cells; a jellyfish’s cells just “coordinate” swimming. Later, we see worms evolve with a central nervous system and a small brain; this brain connects to neurons running along the length of the worm’s body. But it has not yet evolved into the sole “commander” of the animal because -- if this brain is removed, worms can still mate, burrow, feed, and learn things in a maze. These brain changes build from “within” the creature. The animal is increasing its interior potential for power over its environment.
Further along in time, **insects evolve with more complexity inside their nervous systems.** Giant fiber systems develop for the conduction of nerve impulses. Insects connect parts of the brain to specific muscles in **legs or wings.** The brain breaks into segments—the proto-cerebrum, the deuto-cerebrum, and the trito-cerebrum. The brain becomes larger. “We” evolve into vertebrates: fish, amphibians, and reptiles. The spinal cord becomes a servant of the brain. Now there is a busy two-way interstate of communication, with fibers segregated into *descending* motor pathways and *ascending* sensory ones. Gradually we develop our hindbrain, midbrain, and forebrain. From the hindbrain, biologists see a distinctive structure emerging called the “cerebellum.” With the evolution of mammals, the brain adds two new structures. The neo-cerebellum is added to the cerebellum, and the neo-cortex grows out of the front of the forebrain. Eventually brains in primates grow still larger, from within, responding to the environment; they are now so large that the original brain stem is virtually hidden by this large convoluted mass of grey neural matter.

**Dean:** The animal has **more control over its environment. It has more freedom to get around. We see a greater interior development**

**Prof. Wilson:** Directionality. Look at our human transportation systems, and our jet planes. We keep getting more control over our environment every day. This brain has gone from a tiny cerebrum to a complex organ of about 1350 grams. **Notice. We have caused more changes on earth in 10,000 years than all other living things in 3 billion years.**

**Tom:** The Gaia hypothesis. James Lovelock found how -- different combinations of chemicals (like oxygen and methane) remain stable in the Earth’s atmosphere. He says that **the Earth evolved into a self-regulating living system.** The Gaia Hypothesis is supported by scientific experiments.

Life on Earth provides a cybernetic, homeostatic feedback system that operates automatically by the biota. Lovelock argues that “life forms” *control the Earth’s chemistry.*

**Tom:** The Earth’s biosphere acts like a self-organizing system. It keeps the earth chemistry systems in “equilibrium.” This helps to sustain life on earth. Hey, “life” controls its “chemicals.” Life has transcended its chemicals!

**Prof. Wilson:** It is a new brand of co-evolution. **Biota influences the abiota (that’s the nonliving systems in the environment)** and the latter in turn influence the biota.

**Dean:** You mean that **forms of life regulate their predecessor chemicals that evolved before life began?**

**Tom:** It is like: “consciousness” influences the chemistry in the body;
Wilson: Lovelock assumes that the biomass “self-regulates” the conditions on the planet. This makes its physical environment (that’s the temperature and chemistry of the atmosphere) more hospitable to life.

Dean: So Lovelock says that life is influencing the chemistry. Life has transcended chemicals and now regulates them? It challenges Natural Selection

Tom: Antonio Lima-de-Faria says we do not need Natural Selection to explain evolution. Bacterial colonies generate what he calls a “creative web,” like a social network. It carries trillions of “microprocessors” as he puts it. In a physics journal called Physica A, he gives “proof” of how a bacterial colony can reengineer its own genome. It can invent solutions to problems that no previous colony ever encountered before.

Dean: Whew. That’s right down our alley. That sounds like self-determination. That’s self-creation!

Tom: Yes. (excited) He says that his studies of bacteria call for a radical change in Darwinian theory.

Wilson: Ben-Jacob at Tel Aviv University and James Shapiro at the University of Chicago view bacteria as being in a social relationship. Bacteria work together to keep their particular colony alive. When food runs low, they do not just replicate themselves but rather create children of a different kind to set out in new directions for food. First, they invent external whips that twirl them through water. They swim across smooth surfaces and slime until they find new food.

Dean: In one sentence, what do you mean by “self-assembly”?

Tom: Things transform without any external influence.

Prof. Wilson: “Self-assembly” is hard to explain in one sentence. First, there is a system of components that appears to be in disorder. Second, this system moves into an organized structure because of specific interactions among the components themselves -- without external influence.

4. The Field of Anthropology


Benedict: Let me tell you the early stages. The Paleolithic Age goes back two and a half million years to when stone tools were used. The Mesolithic Age evolved with the invention of more sophisticated tools and lasted until about 8,000 B.C. At this point people began planting crops to supply their own food, but they still worked stone to make tools for farming. The Neolithic Age developed when people began trading implements with one
another. In about 3,500 B.C. tribal leaders encouraged people to erect ritual structures - stone monuments (Stonehenge, for example), burial chambers, and communal houses. Culture refers to anything produced by human beings -- language, technology, ideas, philosophy and methods of housing, food production, music, literature, painting, and sculpture.

Dean: What do you think causes this cultural evolution?

Benedict: Leslie White would say “invention.” White’s book (1959) says it evolves by creative invention.

Benedict: People begin "harnessing and controlling energy" in some combination. Cultures are changed by the way people capture, combine and utilize natural energy. New ways of life are created by the combination and synthesis of different technologies.

Dean: Interesting. Invention involves some sort of synthesis. It means that someone combines different things together and gets something more complex. The liver synthesizes vitamins. The key invention for harnessing energy in biology is “photosynthesis.” Photosynthesis is a natural method for capturing and transforming sunlight. Leslie White proposes “material inventions” as the basis for the evolution of culture.

Benedict: For him, evolution is about how people harvest energy for use. For example, in the first stage of culture, people stood erect for the first time, using the energy of their own body and muscles to get around better and more efficiently. In the second stage, they were able to use the energy of domesticated animals. In the third stage, they developed the energy of plants, which initiated the agricultural revolution. In the fourth stage, they used the energy of natural resources, like coal, oil, and gas. In the fifth stage people began to harness sources of energy from the sun, the ocean, and wind. In the 1950s, White saw “alternative energies” as the beginning of a new age of culture.

Dean: Go back to the beginning of the universe --- here was a “harnessing of energy” in the formation of particles, atoms, molecules, and cells. …And now there is a harnessing of energy in culture. These stage fit together on invention. The invention of the printing press -- and steam -- gasoline engines -- and jet airplanes -- and the Internet is changing our way of life today.

Atoms invent molecules; molecules invent cells; birds invent nests. This invention process appears to be present throughout evolution. Professor Benedict, how do you see languages evolve?

Signs to Symbols

Benedict: Animals invented signs and signals, and then humans transformed them into symbols. Symbols are different from signs and
signals because they take on “meaning.” Meaning transcends a specific
time or place.
Dean: What does that mean?
Benedict: Animal signs and signals – like a dog’s bark or a bird’s
screech – point to an immediate place and moment. The sound may
signal danger. But symbols have meaning that go beyond an individual
moment in time. Symbols start with words. Words started to have
meaning when anthropoids pointed to a specific thing, like a rock, and made
a sound to indicate that thing. “Rock,” in the singular, is a name for a thing
that you can see in the moment. The word points to a specific thing, that one
rock. But later it becomes abstracted to refer to “rocks,” in the plural. It
moves in meaning from denotation to connotation. So the word “rock,”
referring to a specific rock visible to the eyes, becomes abstractly “rocks,”
and soon advances further with associated meanings. A rock becomes linked
with references to “solidity” or “foundation.” Associated meanings require
more abstraction and feeling, and the word moves from concreteness into
abstractness and ambiguity, as in poetry. Jerry: Do symbols become the
units of language – like units of selection in biology? (The Dean is amazed
at his quick parallel.)
Benedict: Yes, but these “units of selection” in language work at a more
complex level. They are transmitted socially. This happens more quickly
than genetic inheritance, in fact, and more efficiently. This is social
inheritance, not genetic inheritance. Humans were building an inner
space of thought through words that could be passed on to new generations.
This step into “meaning” was a transcendent moment. It meant
cultivating an inner life, much different from that of animals. Animal signs
point outward toward the danger of a predator but symbols point
inward, toward thought.
Benedict: Then, people begin to generalize the word “chair” – something
for sitting – into a symbol. It turns into a metaphor with an entirely new
sense. We speak of a “chair” to represent the head of a committee or a
university department.”
Dean: Evolvability. In this case, you mean a greater capacity for the mind to
evolve in light of the new complexity of symbols.
Benedict: Yes. Early words became connected into a language. Words
differentiated into nouns, adjectives, pronouns, adverbs, verbs as sentences
were invented. Single words joined into sentences, and sentences joined into
paragraphs, in which ideas were developed. Ideas gave people the power to
think about the past and the future. Philosophers in ancient times were able
to develop ideas at a very abstract level. Humans became more *self-determined*, more animals.

**Dean:** Whooa. “Self-determined.” Humans have more “choice,” and free will.

**Benedict:** Ideas, such as “alternative” and “option,” developed.

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### The Evolution of Writing

Language evolves in stages of writing -- from *pictograms*: a picture of the sun in a religious ritual; to *ideographic*: a graphic symbol that represents an idea rather than letters; to *hieroglyphs*, which are arbitrary symbols in a writing system, to an *alphabet*, a set of letters in a fixed and arbitrary way that represents speech sounds.

**Dean:** Are these progressions all documented?

**Benedict:** Around 3,000 B.C., Sumerians were drawing pictograms onto clay tablets. Over time, these pictograms – symbols themselves – became more and more stylized...They developed at a more abstract level into cuneiform writing.

**Benedict:** Speed increased from Australopithecus walking on two feet -- to wheels to chariots -- from bicycles to cars -- from the first “flying machines” to jet planes and rockets. Each new form of technology is faster. Each one shortens the time needed to get from one place to another.

Then Egyptians developed a special system of hieroglyphics. By around 2700 B.C., they had a set of “glyphs,” or written symbols, each of which represented an idea. The hieroglyphic script developed into alphabet subsystems...and language took off. The alphabet was actually a continuation of the Canaanite alphabet that developed just after 1000 B.C. We call the Phoenician script a "trunk" in the evolving “alphabet tree.” A lot of scripts can be traced through it. Arabic, Hebrew, Latin, and the Phoenician letter-shapes were more abstract in comparison to the "pictographic" shape of Proto-Sinaitic signs. Greek scripts also are all descended from the Phoenician. It was continuity, building from the past -- like oxygen and hydrogen building water. It was synthesized from the Phoenician.

**Dean:** So the idea of “synthesis” -- I mean, of putting together different things to create something new -- is the basis for the evolution of language.

**Benedict:** Yes. And it is “social,” all accomplished by “symbolic interaction.”

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### Human Consciousness

**Benedict:** The psychologist Julian Jaynes studied ancient history. He put it together with his knowledge of neurology. Jaynes the left half of the brain...
evolved with logic - the language-using half; it generated ideas and commands, which the right brain obeyed. Language becomes an “organ of perception” through the expression of an “I.”

Benedict: Jaynes says that the human brain in this early stage was “bicameral.” The left and right sides of the brain were physically “not integrated.” They were not "unicameral" as they are today. The Iliad is an example of bicameral mentality. It accents behavioral and objective events of the past. But in the Odyssey, which was written several centuries later, you see how the power of the "gods" could be overcome by human will and initiative.

Dean: Intention. Freedom is increasing.

Benedict: We see the bicameral breakdown as “time” acquires a new dimension. People now have a sense of the past, present, and future. Odysseus has a new consciousness. The Odyssey could be the first appearance of a “self.”

Benedict: Jaynes says that Hebrew history -- recorded in the Old Testament -- moves from bicameral prophets who proclaimed "thus spake the Lord" to the self-reflective contemplations found in books written much later, such as Ecclesiastes. The New Testament, written still later, shows so much more subjectivity. Subjectivity – I mean, the nature and character of an “inner life” -- is well on its way, rapidly evolving at the time of the New Testament.

Alice: Plato had trouble with emotions and poetry.

Benedict: Yes. His was a time of rationality and high abstraction: “Reason” prevailed. Poetry was put down as "divine madness." Music and poetry took “second place” to “ideas.” But Plato was wrong. Art and feeling are evolving with the same importance as reason and logic. The inner life is evolving.

Music Evolves

Benedict: In music, synthesis refers to integrating differences in styles. This happens all the time. It happened in the invention of music in a movement from African drumbeats to mixed Indian songs. It happened with classical music, from Bach to Beethoven to Mahler.

Benedict: Derek Gatherer, a social biologist in London, proposed that “syntheses” keep taking place in the evolution of musical styles. You may recognize some philosophy in this account. Here is a summary of his idea.

(She reads as copies circulated.)

(a) Swing Music is a synthesis that came out of the opposition of New
Orleans styles (thesis) and Chicago styles (antithesis) in the 1920s; (b) Swing (thesis) was opposed by the more traditional Blues-oriented Jump style (antithesis) in the 1930s from which emerged Bebop (synthesis); (c) in the late 1950s and early 1960s Hard Bop (thesis) was opposed by Free Jazz (antithesis); producing Freebop (synthesis); (d) in the late 1960s Freebop (thesis) was opposed by Rock/Soul (antithesis) resulting in Fusion (synthesis); (e) in the early 1980s Fusion (thesis) was opposed by Post-Bop (antithesis), producing M-base (synthesis).³

Physical Anthropology

Benedict: In 100,000 years, anatomical trends toward smaller molars and less bone mass are in the fossil record. Contemporary humans in Europe and Asia have bones that are 20 to 30 percent thinner and lighter than those of upper Paleolithic humans dating from about 30,000 years ago. About 40,000 years ago, Cro-Magnon tools became more sophisticated. Over the next 20,000 years, artwork began to appear in the decorated tools, beads, ivory carvings of animals, clay figurines, musical instruments, and cave paintings. So in a period of 100,000 years, Homo sapiens moved from making animal sounds and gestures to creating symbols, new art forms, tombs, pyramids, clothing, and so much more.

The idea of “invention” applies to an inner and an outer activity, all based on combination and synthesis. “Iron” had to be separated from its impurities by heating, pounding, and reheating. What the ironworkers were doing outside was a reflection of what they were doing inside, while they were in the process of evolving language and self-consciousness. Inside, early people were developing a feeling of choice and inner freedom as they became more self-conscious in the early stages of inner development. A sense of choice came into play with the invention of how to domesticate crops, outside. People could stay in one place and raise grain. They had to have said to themselves at some point, “We have a choice to domesticate seeds and animals.” We do not know exactly what they said all those millennia ago, but we know that they had to think and plan for the future. In effect, evolution is about self-determination.

Dean: Self-determination!

Benedict: Civilization started with horticulture and then evolved into agriculture, and then into a greater division of labor.

Kornberg: Do you think “choice” could appear in animals?

Benedict: Yes. It is a matter of perspective. Chemists have a deterministic view when they look at an amoeba. Everything the amoeba does is
determined by the cause and effect of light and food outside itself. But imagine yourself inside the amoeba. You are choosing light and food. To see choice evolving you must consider the situation from inside the lion and not just observe its outside behavior. We see the beginning of choice in the animal we call “self.”

Kornberg: “Self” means the essential nature of something. It refers to something having the same character throughout. It is the union of all the elements inside a thing; and that constitutes its identity. In the laboratory we see elements of a molecule developing a unique self-identity. That idea of self is evolving. The female animal may choose certain properties of color and strength in a male animal.

Mary: The Dean told us on the first day of class to ask, “Who are we?” Can you answer that question?

Benedict: You are a symbol-making animal. A symbol is something that represents something else. The word “tree” stands for a physical tree outside us but the word “tree” that is now sounded, is not the tree. Chimpanzees are close to this capacity to “abstract” from signs and to “feel” as humans do, but scientific studies show a limit to their brain capacity. They cannot symbolize and do not experience feelings at the level of some humans.

Dean: Prof. Kornberg, can you give us an example of your language in chemistry that transcends our understanding?

Kornberg: Hmmm. In chemistry, Abegg’s rule states that the difference between the maximum positive and negative valence of an element is frequently “eight.” Anti-bonding molecular orbits are normally higher in energy than bonding orbits. Do you understand? (Big smile, mischievous.)

Benedict: Now there is more to the meaning of transcendence than meets the eye. It is not just an intellectual matter. Emotional maturity is linked with the capacity to identify with others. There is an evolution of emotions, a whole study in itself. It also has to do with “who we are.”

Junk DNA

Prof. Kornberg: We are close to the apes but there is also something unusual going on here called “junk DNA.” There are three billion genetic letters that spell the human genome; we have identified only a handful that may have contributed to evolution. Human evolution may have been driven by parts of the genome called “junk DNA.” “Junk” refers to portions of the DNA sequence for which there is no function. About 95% of the human genome has been called "junk." I think the “preservation” of junk DNA over many millions of years of evolution suggests it has a function. This “junk DNA” could be a key to human evolution. 10
There is growing evidence that this “junk” – we now call it the “non-coding DNA” -- plays a vital role in regulating gene expression during development. Non-coding DNA regulates the development of photoreceptor cells, the reproductive tract, and the central nervous system. (Like Dark Matter.)

Ancient Beliefs

Benedict: Early religions say that we all began from a higher consciousness. It is possible for a shaman see beyond his body and go into a higher level of consciousness. Shamans in primitive tribes can see chakras. Chakras are written into the earliest Vedas. I am talking about the oldest written tradition in India dating back to around 2,000 B.C.E. Sages saw chakras as “wheels of energy.” The hidden wheels rotate within the physical body.

Mary: Chakras are centers of consciousness in the Upanishads (beginning around A.D. 600) and in the yogic Sutras of Patanjali (around 200 B.C.) The chakras and the Kundalini are an integral part of yogic philosophy today.

Mary: Kundalini?

Benedict: The word Kundalini means "coiled"; literally, like a snake ready to strike. It’s energy in the body that is condensed and unconscious, a primal force. Hindus call it Shakti. Shakti is a goddess and also a sleeping serpent. She is seen coiled at the base of the spine and rises -- with proper discipline and right action. It is a hidden energetic force, a part of your subtle body. Shakti works through what Hindus call nadis or subtle channels going through your body. This Kundalini force keeps evolving through the body. Ancient thinkers said that the energy is "awakened" by guided breathing, fasting, visualization, chanting. It is part of our personal evolution – to return to the Source. The energy rises up a channel through the spine called Sushumna and goes toward the head. This brings you back into this higher path of evolution. Through this process, you gain a greater understanding of “who you are.” The energy rises slowly through your spine and eventually unites with a Supreme Being or, they say, with Lord Shiva. You become enveloped by infinite bliss.¹¹

Kornberg: (upset.) Do well-educated people believe in this stuff?

Benedict: In the 19th and early 20th centuries, they became part of a new movement called “Theosophy,” and you find this again in the “Anthroposophy” of Rudolf Steiner. Then, Sri Aurobindo in Integral Yoga, and Meher Baba in his teachings. Then Transcendentalists Ralph Waldo Emerson and Henry David Thoreau,
I should mention a scientist Arthur Young. He was inventor of the Bell helicopter. Young proposed a scientific version of “involution-evolution” that fits with ancient thought. In physics, you trace the path of light that begins in high-energy photons and transforms into matter. At each successive level, the "uncertainty" of light becomes more bounded – less free, that is – in ways that can be stated precisely in terms of physics. His theories paralleled the Hindu tradition. The Rigveda and Brahmanda Purana describe a universe that is cyclical – or oscillating – and infinite in time. The universe is like a cosmic egg that cycles between expansion and total collapse. It expanded from a concentrated form — a point called a Bindu. This universe is a living entity, bound to the perpetual cycle of birth, death, and rebirth. Evolution is about the development of consciousness, about self-realization, moving from lower states to higher ones. The ancients see an “increasing depth” in the human spirit.12

Dean: So in Hindu thought, the cosmos itself undergoes an infinite number of cycles, deaths, and rebirths. How do these beliefs connect with a human perspective?

Benedict: The Hindu view is about an “unfolding,” from the Source. Each successive level does not reject the previous level; it embraces and includes it. Integration occurs.

Prof. Benedict: Scientists in the Jewish tradition today explain Hindu teaching in terms of the Kabbalah. There is a scientific model for Kabbalistic cosmology based on the Tree of Life, related to Hindu thought. This model is all about transcendence.

See you all next week.

5. The Field of Sociology

Dean Barth: Today we have with us Professor Amitai Parsons to speak on sociology. He told me that sociologists began to study evolution in the 19th century, but then “pretty much” dropped the subject. New disciplines are invented. What is sociology?

Parsons: Sociology is a field of knowledge that stands between science and the humanities. It has data that is both subjective and objective. As a science, sociologists look objectively at an aggregate of people living together with organizations, institutions, customs and traditions. Members have a history, a common interest, and a way of life based on consensus. At the same time, sociologists are interested in what people feel and think, personally and collectively. They gather this information
through qualitative studies that include fieldwork in live settings taking the roles of other and more objectively through opinion polls.

**Dean:** A synthesis! When did the idea of society evolve?

**Parsons:** The idea of society began with Social Contract philosophers like Thomas Hobbes, Jean Jacques Rousseau, Montesquieu, John Locke, and Adam Smith. They wrote about how people live by consensus, apart from the state. They began to see “society” as people living in associations and bound by an unwritten agreement. Society was an assemblage of people who had families, and lived in an economy with associations. It was different from the state.

**Dean:** When did “sociology” develop as a field?

**Parsons:** Auguste Comte, who thought about how to study society in the scientific tradition, created the word in 1838. He wanted to call this discipline “social physics” at first, but gave up on that name in favor of the word “sociology.” The new name was a synthesis.

Comte joined the Latin *socius* (meaning “companion” or “associate”) with the Greek word *logia* (meaning “knowledge”) to refer to how people live among different groups and organizations by consensus. The field of sociology took off as a science in the middle of the nineteenth century. It was created through the work of writers like Herbert Spencer in England, Emile Durkheim in France, Max Weber in Germany, Lester Ward in the United States, and many others. Sociology became an academic field in universities during the 1890s. John Commons taught a sociology course at Oberlin in 1891. The first department of sociology was at the University of Chicago in 1892.

**Dean:** What did sociologists say about evolution?

**Parsons:** He saw society evolving in what he called the “Law of Three Stages.” Society, Comte said, passed through stages he called theological, metaphysical, and positive. The Theological Stage was when people were making supernatural explanations about their environment from fetishism into polytheism, and then to monotheism. The Metaphysical Stage replaced fetishism and polytheism with abstract thinking.

“Positivism,” the third stage, came with the birth of scientific thought. Comte saw a sequence in the evolution of sciences. He wrote about them evolving from mathematics to astronomy, to physics, to chemistry, biology, and sociology. Sociology for him was the last (and most) synthetic form of knowledge.
Alchemy was the background from which chemistry was to develop. Karl Marx saw freedom evolving in stages through new forces of production. As we saw before, they saw *slaves, serfs, wage earners.*

Marx believed society should become more evolved in the cause for freedom.

Spencer proposed back in the 1850s, before Darwin,

All structures in the universe develop from a **simple**, **undifferentiated, homogeneity to a complex, differentiated, heterogeneity**, while being accompanied by a **process of greater integration of the differentiated parts.**

Spencer wrote an article in 1852 defending the idea of biological evolution. This was a full seven years before Darwin published *Origin of Species.*

Spencer’s own biological model then became the basis for interpreting changes in society. Spencer used terms such as "system," "function," and "structure" to describe societal forms. He wrote about how **cells combine to create organisms, and organisms combine to create "superorganisms"**—by which he meant societies.

He saw three tendencies that were alike between **societies and organisms: increasing size, complexity of structure, and differentiation of function.** The uniqueness of society—as opposed to organisms in evolution—should be seen for its own sake.¹³

**Parsons: Emile Durkheim** lived from 1858 to 1917 evolved from “mechanical” to “organic” solidarity. The **law in those first primitive societies** carried severe penalties—death and torture—for many offenses, but gradually the law became differentiated and more specific. People who begin writing laws in organic societies start to prescribe “compensation” to the offended, and “rehabilitation” of the offender. A softer and kinder criminal law evolved, so to speak. A body of civil law evolved with new modes of restitution, and it grew in size at the expense of criminal laws and severe penal sanctions. Durkheim saw an increasing complexity and humaneness evolving in law over time.

**Parsons**: Sorokin proposed three. First, people see “reality” as accessible through the human senses; he called that master theme *Sensate Culture.*

Second, people see “reality” transcending the senses, like a vision of something Eternal, which is a kind of Platonic idealism he called *Ideational Culture.* Third, people see “reality” through an intermediate form that synthesizes the other two in a dialectical balance, which he called *Idealistic Culture.* These mentalities represented irreducible forms of truth. They were like great epistemologies: *sensory, spiritual, and rational.*
Sorokin found that, at different periods of history, one of the three would become dominant in society. 

A Social Universe

**Parsons:** I would interpret evolution as a social process of self-organizing. My point is that bacteria are social.

**Wilson:** Yes. They live in societies with trillions of members with their own systems of communication. Each colony sends out macromolecules over the span of continents and seas. They invented communication long before we did. Atoms are social. Iron evolved by synthesis and social interaction and went into the oceans and came into our body and our blood. We cannot live without iron, totally interdependent. Iron helps keep plants and animals alive. It helps in the creation of chlorophyll, a part of hemoglobin that carries oxygen in red blood cells. It is part of the human community. Iron is in our brain, and linked to our earth, our roads, bridges, and society. What does this tell us about the nature of things? I agree with Sorokin. We live in a culture with a “sensate mentality.” I think it’s time for a regime change.

**Sociality**

**Parsons:** The word “sociality” originated in the 16th century. It referred to “being in companionship with others.” Today it refers to being “social”—or “friendly” in its popular sense, -- but in my field, it has an analytical meaning. It refers abstractly to the way people form groups and talk with one another. People communicate, cooperate, compete, contend, contest, and conflict with one another. They accommodate, adapt, adjust, and are in accord with one another by some degree. Now notice. All these terms have both an objective and a subjective meaning. We can look at how people engage one another from the outside, or we can feel what it is like to do so ourselves from the inside. The objective meanings refer to objects outside us. Physicists in effect describe atoms in terms of their “sociality.” They say atoms are interdependent: interacting, interrelating, conflicting, joining together, and so on.

**Dean:** Hmm, You are saying that we apply these social terms to the physical world!

**Parsons:** Yes, when scientists use these terms to describe the action of atoms and molecules, they are attributing the character of human relations to their data. But they are also seeing what we hold in common. It is the sociality of nature. And at the human level, sociologists are examining more complex forms of those same ways of relating. That is why we -- in the cosmos -- are in a community in a very deep sense.
Benedict: People will think your argument is anthropomorphic. Anthropomorphism means that someone attributes human characteristics to inanimate objects.

Parsons: Listen further. The term “sociality” should be understood in two ways: objectively as an expression of what is common about society and the nature of all things in the universe. And subjectively about what we experience inside ourselves. The term “sociality” can range in meaning from the way chemists see atoms in action, to the way that sociologists see people in action relating with one another. You can feel the tension in conflict and the harmony in agreement. It stands for what we see as natural in both our physical and human condition.

Kornberg: You know that poem by Lucretius called De Rerum Natura?. Lucretius was a materialist, the first scientist.

Parsons: He could not imagine that sociality has a subjective side. The idea was not in his vocabulary.

Dean: Hmmm. Kant said that we couldn’t see “things in themselves,” apart from the mind and its workings.

Parsons: Kant could not know that “elements” in the universe are now inside our bodies—in our brains and in our blood. We are both the subject and the object of all things known. “Sociality” gives us a basis to assess that common fact. It is “sociality” all the way from atoms to humans.

The first eyes evolved among animals, maybe 540 million years ago. We referred to that evolution.

Tom: At the beginning there was the “pit eye” picking up angles of light. Then there was the pinhole eye, a little more advanced. It kept evolving into more advanced types of "eye" among the vertebrates. Now the eye begins to let light to project onto a panel of cells, the retina, at the rear of the eye. Rods and cones evolved. So, there is more ahead.

Benedict: Could there be a third eye evolving (pointing to the middle of her forehead)—as is believed in Indian and East Asian traditions? There is more to evolving than meets the eye.

The earliest species to develop photosensitivity were aquatic. Only two ranges of radiation can travel through water. This same light-filtering water then also caused the photosensitivity of plants.

Dean: Does the shape of the eye cause what we think to be reality? Our eye is latent, evolving in consciousness.

Benedict: I’ll put it another way. Evolution is a constant synthesis between subject and object, indeed, what is real and ideal. The complementary but opposing sides of these universals -- the Real-and-
Ideal, Mind-Matter, Inner-Outer -- are being concretized in some material way. Then synthesized, based on the attributes we can know about things.

**Parsons:** That objective model was in tune with the times. There was also a movement in psychology in the twenties and thirties called “behaviorism.”

**Parsons:** Yes. At the turn of the century Emile Durkheim moved sociology down this path. He saw social actions as objective “things” to be studied. He documented acts of suicide in patterns. He studied rates and variations of social “deviation,” comparing its frequency of occurrence to degrees of social integration in groups. He would never have imagined looking “inside” the lives of people who commit suicide. He developed categories -- like altruism, egoism, and anomie -- but he never looked inside the emotional life of people whom he counted as statistics. Durkheim outlined his *Rules of Sociological Method*. It was the dominant trend in sociology. Sociologists like George Lundberg, George Homans, Richard Emerson, and so many others laid out “principles of social behavior.” They never developed rules for to develop the accuracy of subjective data.17

**Kornberg:** So how did sociology move into studying the subjective?

**Parsons:** Herbert Blumer's critique of *The Polish Peasant*, published in 1939, played a big role in opening the doors to a study of “the subjective.”

**Benedict:** I read those accounts, I could identify with them personally. Blumer’s study of *The Polish Peasant* is a virtual opposite of Émile Durkheim’s *Rules of Sociological Method*.

**Dean:** How do these two methods come together, I mean synthesize? Make it as simple as possible for students. *(He writes on the board.)*

**Verstehen**

For Max Weber it means an accurate interpretation of a subjective fact. The meaning of the word *Verstehen* was part of a German debate about *Geisteswissenschaft*, a branch of learning that includes the arts, classics, philosophy, and history. Germans were asking: Where does sociology fit into the academic courses of study? Is it in the humanities? Is it in the sciences? Where does it belong in the university? At the end of the 19th century there was a big dispute around this new branch of learning. Where could they place a “science of society”? It sounded like an oxymoron: a science of the subjective?

**Jerry:** (eager.) What happened? Invention?

**Parsons:** Yes. A German philosopher by the name of Wilhelm Dilthey advanced the notion of “Verstehen” as a “participatory perspective” in social science. This concept became a key to the development of different methods in sociology. It required finding a way to interpret
subjective data. Other fields, such as hermeneutics, were already forming around this idea.

How could sociologists interpret the subjective meanings of people and translate it into an objective form? Max Weber had advanced this notion of \textit{Verstehen} into the study of society as the “interpretive understanding” of social data. He wrote about “ideal types” of meanings that develop in society. Sociologists need to be trained, he said, to interpret the subjective views of people and build ideal types, Weber looked at the beliefs of religious reformers in what he called the Protestant Ethic. Sociologists, he argued, document what people \textit{feel and believe}—that’s subjective data—and then they construct it into a type. It must be \textit{rooted in} accurate interpretations of these feelings. Sociologists then check what they see, feel, and hear from people —against their model. So the “type” tends to be \textit{constructed from the bottom-up, done through subjective meanings}.

\textbf{Dean: (Confirming.)} So the traits begin with what people believe and feel. Knowledge comes from the subjective world and moves into the objective world of the scientist. This was now the synthesis.

\textbf{Professor Benedict:} And so it was with anthropology.

\textbf{Parsons:} Max Weber believed it was impossible to justify “ultimate values” in science. He said that ultimate values have metaphysical commitments. They define a general outlook, like an ethos or a religion.

\textbf{Dean:} Yes. This is what Professor Benedict proposed in our last class: Chemistry has a value-oriented scientific perspective. Scientists “value” \textit{impartiality, rationality, detachment, and disinterest} and so on as a profession. Chemists do not value \textit{subjectivity, irrationality, emotionality, and intimacy}. These values are in the domain of art, for example, as exemplified in great novels, paintings, and poetry.

\textbf{Kornberg:} Okay. An ideal type in sociology is like a vacuum in chemistry. You can approach a vacuum but never reach it. A vacuum is that condition \textit{without matter in it}, and we can never produce it perfectly.\textsuperscript{18}

\textbf{Dean:} Now I see how your field was invented. Sociology is synthesizing the accuracy and objectivity in science with the feelings and subjectivity expressed in the humanities.

Students, you are free to go! Have a great day.

\section*{6. The Field of Literature}

\textbf{Dean:} Professor \textbf{Richard Hughes} was asked by the English Department to represent their faculty. We also have with us Professor Albert Hawking from our physics department. He holds fast to scientific facts and will speak out if he sees too much “fiction” in our discussion of nature. (Smiles.) I asked
Mary, who is majoring in literature, to talk about how “rhetoric” could connect with the subject of evolution. Professor Hughes and I talked about how evolution started with the Big Bang and continued forward into civilization. Professor Hughes, would you begin our discussion from the standpoint of literature? But let me ask: “What is literature?”

**Prof. Hughes:** Literature is a big subject. I will try to condense it in a few words. I would say that “literature” refers to **written works in fiction, poetry, and drama, which have some permanent value for people.** The term does not refer to writings in the sciences or mathematics in their technical sense, but rather to **works of taste and sentiment that have a degree of eloquence, beauty, and literary value.**

**Prof. Hughes:** Creative writing bears directly on this subject -- novels, poems, and plays -- but literary criticism is relevant. Literary criticism is a field in which **critics search for principles that help us understand great works.** They ask questions like, “Is the author’s intention responsible for the meanings in a text? Can readers arrive at an objective understanding of those meanings? In what setting did a writer work? Is a writer’s setting be important to an understanding of his or her work? And so on.

**Dean:** How could these critics help us understand evolution? How did literary criticism evolve?

**Prof. Hughes:** That would be a long story. We could begin with Plato’s dialogue *Cratylus* and with Aristotle’s *Poetics*, but to trace that history would take us beyond class time.¹⁹

**Dean:** What is literary theory? *(He writes on the board:)*

**Literary Theory**

**Prof. Hughes:** Literary theory can be traced to the ancient Greeks but today it is a description of the underlying principles and tools by which we try to understand literature. What is called “Literary Theory” today began in the 1950s, based on the work of Ferdinand de Saussure. It became popular in the 1960s and 1980s, and by the 1990s it had reached a peak. Two movements would be post-structuralism²⁰ and deconstructionism.²¹

**Dean:** What could they tell us about our study of evolution?

**Prof. Hughes:** Leaders in these movements would **reject the idea that science can claim any absolute truth about nature.** A “Theory of Everything” in physics is nonsense.

Jacques Derrida coined the term “Deconstruction” in the 1960s. He was curious about how people construct “meaning.” He recommended that students read books in light of their “hidden assumptions.” **He suggested they think about what was absent in a text and ask how “facts” are constructed.**
Dean: Scientific facts?
Prof. Hughes: Some students in this class have read the work of Friedrich Nietzsche who asked: “What are facts?” He said that “facts” are not facts until they have been interpreted.
Prof. Hawking: Do you mean that cells evolved on Earth in an atmosphere that eventually evolved into our physical senses? And this in turn shapes what we call facts?
Prof. Hughes: Exactly. Our physical senses interpret only a small part of what is “out there.” So we must inquire into how our senses determine what is valid.
Dean: So the scientist is biased by the structure of his own body?
Prof. Hughes: Correct. Derrida wrote about a matrix of binary relations that for me applies to theoretical physics. He said words have meaning, not just because they correspond to something real but also because they are in a network of oppositions. Terms such as black and white, hot and cold, matter and mind, have meaning only when they are seen in relation to one another.
Dean: So binaries like matter and mind can only be understood in relation to one another.
Prof. Hughes: Yes. Now if you hold one side to be superior to the other one, you are in trouble. Matter cannot be superior to mind.
Dean: A scientist cannot answer, “who we are” any more than a novelist? One side of a binary cannot be superior to its opposite. Speech cannot be superior over writing.

Binaries
Prof. Hughes: Derrida says we privilege one side of a binary over another, like presence over absence, identity over difference, fullness over emptiness, meaning over meaninglessness, mastery over submission, light over dark, immediacy over delay, origin over supplement, correspondence over arbitrariness, truth over untruth, reason over unreason. These hierarchical binary distinctions have been at work in Western thought throughout its history. The first word in these pairs is considered superior to the other in our culture. Not true.
Prof. Hawking: If we think one side is superior to the other, we have a problem understanding nature?
Prof. Hughes: The second is secondary, a derivative of the first. But this is not true. To overcome the bias, Derrida says we should think of ourselves in "rapport to the Other." That is, any “meaning” that comes to us is always connected with other meanings. These terms have a history of development through time. Look at it in this way: all binaries can be reversed. In other words, either side can be taken as superior. So a “fact” is conditioned by
a particular culture. The idea that one side is superior over the other -- is not true. I would say the same for the scientific assumption that matter is superior to mind.

Prof. Hawking: In my opinion “matter” is the reality. THE MIND EVOLVED FROM THE BRAIN.

Prof. Hughes: The two sides are inter-connected, intricately woven together; you would have no science without a mind that works by its own mind-rules. What does this say to us about our real nature?

Frequencies

Dean: Matter and Mind are working at different frequencies. We need to research them. It would help us resolve this difference.

The polar forces of attraction-and-repulsion in physics have gone through a long evolution, changing frequencies and transforming in new contexts. In physics we see this polarity (attraction-repulsion) in magnetic forces but they found in later stages of evolution -- they are transformed as they appear in a new context among animals. Repulsion and attraction evolved into animal impulses of fear and hunger and in prey-predator relations, now at different frequencies. Among animals, the force of attraction has been converted into sexual appeal in mating patterns and in caring for their young babies. In humans I propose that emotions based on these physical (polar) forces have higher frequencies, now more refined and differentiated. The principle of repulsion evolved and differentiated into feelings of hate, disgust, repugnance, odium, loathing, abhorrence, etc. The principle of attraction developed into new frequencies like, affection, fondness, liking, friendliness, caring, and deep forms of love. They evolved into a higher level of existence at the level of human beings.

The Tension of Differences

Prof. Hughes: No, there is no way to avoid this “interplay” of binaries – life/death, absence/presence, matter/mind. The difference is what keeps evolution going. Everything is evolving the tension of opposites. We cannot let one side trap us as The Truth – as in ideal versus material, or mind versus matter.

Prof. Hughes: Big versus small, day versus night, old versus young. One side cannot be known without the other. They are opposites and can’t be joined, but they are dependent on each other.

Dean: Wait. Your examples invoke an “either/or” dichotomy in the physical world. They point to the logic of sensation, not the logic of symbolic life. We need to think through Aristotle’s law on the excluded middle.
Prof. Hughes: Yes. When we think at the symbolic level, these references shade into one another. They can become more abstract by metaphors. The images “old versus young” are relative and can join. A physically old man can be young at heart. “A dark night,” with St. John, can last a long time.

Jane: What about life versus death? Who wins?

Read Dostoevsky’s The Idiot.

Prof. Hawking: What do you mean?

Prof. Hughes: Dostoevsky gives us a sense of how they can be reversed: of how good can be bad and bad can be good. The reader is not always sure who is right and who is wrong. The author keeps you thinking about all sides. Typically, parents assign the hierarchy that Derrida talks about: GOOD is better than EVIL. LIGHT is better than DARK. But Life is more complex. They are mutually involved.

Prof. Hawking: What this has to do with physics and evolution?

Prof. Hughes: Derrida’s theory is like David Bohm’s theory in physics.

Bohm, a great physicist, described pairs of opposites, such as explicit versus implicit, and particle versus wave. He talked about the instability of the quantum world as against the stability of Newton’s universe.

Physicists talk about the indeterminacy of quanta versus the determinacy of the everyday world.

Prof. Hawking: Okay, but physics is an entirely different field of thought. It is too big a jump to go from Derrida to Bohm.

Hughes writes:

Diffrance

Prof. Hughes: Derrida creates a neologism written as différenciation – opposed to the word difference, spelled the same both in his French and our English -- to emphasize the possibility of its mystery. He is showing the instability of human language. Language is like quantum physics and, I would say, close to Bohm.

Dean: What does that new word mean?

Prof. Hughes: Différenciation points to the “arbitrary” way that we create hierarchies -- like light is better than dark. If you took a survey, most people would prefer light to dark, freedom over order, determinacy over indeterminacy. Derrida invented the word différenciation so the word can only be
identified through a visual text, the eye not the ear. He was showing how writing could be superior to speech on occasion. (You can’t hear the difference; you must see the word.) But the real "meaning" of différance is no more present in the written form than in the spoken form. In the final count, différance is neither a word nor a concept. Derrida points to something more that remains unseen in a text. The idea that something exists that is unseen is as bad as string theory in physics. String theory points to what is beyond our ken; you don’t know what it is. Nature remains a mystery. Something always lies beyond our grasp.

Perry: How about Gödel's incompleteness theorem? It proves that any attempt to construct a Theory of Everything is bound to fail. Gödel's theorem proves that any formal theory of elementary arithmetical facts is either inconsistent or incomplete. There is a true statement about natural numbers that can't be derived in the formal theory. Both a statement and its denial can be derived from its axioms.

Hughes: This is like the “liar’s paradox.” (Students look puzzled.) Consider the statement: THIS SENTENCE IS FALSE. If we say this statement is true, it leads to a contradiction. If "this sentence is false" is true, then the sentence is false, which would mean that it is actually true, but this would mean that it is false. This circle is unending and leads nowhere. But evolution is based on the unending synthesis of things.

The Unending Synthesis of Things

Hughes: Derrida sees the unending combination of texts and contexts, endlessly reshuffled to produce meaning. Words are assembled by our nature in ways that require something to be hidden. Derrida uses the word "assemblage" to refer to the web-like character of things.

Mary: But, could the evolution of language be as a mirror to what happens in physical evolution: An unending differentiation and synthesis?

Dean: That’s the big question. Are we imitating physical nature does by inventing new words and languages? The evolution of language looks like the way in which nature is constantly inventing new things. Do we, endlessly, constantly, like nature, transcend the past at the level of human consciousness?

Prof. Hughes (looks toward Prof. Hawking): You speak of black holes-and-white holes… particle-and-wave… implicate-and-explicate… alive-and-dead. Scientists are constantly working with binaries. Right?

Prof. Hawking: Yes. A white hole is the opposite of a black hole.

Transcendence
Prof. Hawking: That word “transcendence” is not used anywhere in science.
Dean: It comes from Latin—transcendere—by way of 14th century Middle English. It first meant, “to climb over, or go across.” It evolved to become a transitive verb to mean, “to rise above” something; and came to mean, “to go beyond the limits” of its past. Then it developed the connotation of “outdoing” something. It can mean to “outstrip” or “exceed” the past. It’s a secular word, not religious.
Prof. Hawking: So why do we want to use it?
Dean: We want to bring this word into the vocabulary of science to build conversations across departments. We need an environment for interdisciplinary thought, like animals adapting to a new climate. Our university is evolving. We want to create a new setting for thought among faculty and students on campus. But, transcendence does not refer to something supernatural.
Prof. Hawking: Well, what does it mean? I’m an atheist.
Dean: Transcendence means something exceeds its past in complexity. This new thing has key elements from its earlier period and shows greater involvedness. And thus it has more potential to evolve further. It exists as interdependent with something else and has its own being.
Prof. Hawking: The word “being” is not in our vocabulary.
Dean: A being is the state of some thing that exists. It can be animate or inanimate. A “thing” is a fact of existence. It remains part of the larger web of things around it. It has its own state of existence.
Prof. Hawking: Scientists do not use the word. Atoms have no “being.”
Dean: “Being” is just the fact that the atom exists.
Prof. Hawking: Okay for now. Let’s see where you go with it.

Rhetoric
Mary: Rhetoric is the way people are able to be convincing and artful in communication. It’s the art of persuasion. It’s the way we use symbols to produce what we want to happen. Kenneth Burke defined rhetoric as “symbolic action” -- writing, speaking and acting through symbols.
Dean: Why is this important to the nature of things in evolution?
Mary: Historians argue that all “facts” are rooted in tropes. It is not simply that facts are conditioned by our presence in an electromagnetic field; we do not know for sure what’s out there. It is not that a “fact” depends upon our original premise. It is because all facts are based in the subjective realm. They are based on tropes.
Dean: Tell us more.
Mary: Haydn White talks about going behind the assumptions that give any type of inquiry its creditability. People think that history is judged by its correspondence to reality -- as opposed to literature often depicted as fiction. (History is based on facts and literature is based on fiction.) People think that these fields are diametrically opposed, activities. But White argues because history is in the field of language, the historian uses the devices of rhetoric.

Kornberg: I don’t get it.

Mary: White identifies four different types of plots in writing history: tragic, comic, romantic, and ironic. He identifies four master tropes – metaphor, metonymy, synecdoche, and irony- that correspond to the four types of plots. Tropes and plots are impossible to remove from writing history. Thus history proposes to represent reality but cannot do so. Historians have been ignoring the deep structures that produce those narratives. The dominant trope in writing history is determined by the dominant trope of their language.

Dean: History is not an accurate and objective representation of the past but it is a creative text. Narrative and rhetorical devices shape the reality.


Dean: Interesting. Subjectivity is always there to shape the facts of story.

Mary: The power of these different modes of rhetoric emphasizes the non-scientific nature of the discipline of history. White says that the kind of history one chooses to tell is based on moral and aesthetic values that are in sharp contrast to some “objective” and “neutral” understanding of historical evidence alone. Tropes are “figurative language” as opposed to a “literal language.” They are different ways to use language -- to speak and write with more drama. The allow you to be more forceful and eloquent. I am thinking of alliteration, synecdoche, metonymy, onomatopoeia, chiasmus, irony, allegory, and more. This chart below is helpful. There is a second list with “schemes” that also apply to this study. Adding a second list would give more much information than we need right now. Prof. Hughes: Your proposition really is: the evolution of language carries all the principles of physical evolution that preceded it. And then it acts back on consciousness to further develop reality.

Mary: Let’s take your perspective on “synthesis” from the Big Bang. That’s the same principle as the metaphor. Metaphor is device that puts together very different images to create a new image.
It is a metaphor when we say, “She is a star.” Two different images (a woman and a bright light in the sky) are identified together as one. They are connected by the word “is.” Joining these different images produces a new image.

Prof. Hughes: When we go further and formally compare these same two images, the metaphor becomes a simile; we say she is like “a star.” Then, if we elaborate on the comparison, the figure becomes an analogy. Dean: Herbert Spencer’s theory of evolution was based on analogy. He compared a society with an organism. By this analogy he proposed principles like differentiation and integration.

Mary: Darwin’s writing was filled with metaphors that shaped our understanding of evolution. In *The Origin of Species* he said the intimate connections of life are “a tangled bank.” Consider that image. At first Darwin said that he was using the term “Struggle for Existence” in “a large and metaphorical sense” but in the fourth and fifth editions this phrase was elevated to a subtitle. Now the metaphor becomes fact.

Dean: Professor Hawking, do you agree that tropes help explain evolution?

Prof. Hawking: Tropes are not the same as chemistry. Metaphors, for example, take place in the mind. It is not the same as synthesizing hydrogen and oxygen to make water.

Mary: I am proposing that the same principle operates inside as well as outside in nature -- from atoms to molecules to cells to organisms and to humans. The evolution of language shapes our sense of physical reality. “Language” is a later stage of human evolution on earth – beyond all atoms and animals!

Prof. Hawking: Are you saying that the principles explaining how language evolves -- could explain all previous stages of evolution?

Mary: Yes. The ability for some thing to identify and distinguish others of like kind, like schools of fish is found in tropes. The ability for replication in the DNA is found in these tropes.

Look at onomatopoeia. It refers to how humans built a language by identifying with the outside world. Language has words like “hiss” for snakes or “buzz” for insects. This involves identity and replication. We use such words when we teach children to speak. This could be the way early human beings began to talk. It is based on identity, imitation, and replication.

Look at bathos. This word points to mocking something. This is visible among animals that try to fool each other. My cat plays tricks on me, pretending one thing and doing another. She tricks herself, batting
a ball of yarn with one paw, pretending that it has actually moved by itself so she can run after it.

Mary: I was going to say that alliteration refers to the repetition (or replication) of the same consonant sounds in a sentence, such as d’s and s’s in “Dusk demands daylight,” or d’s in “Dewdrops dwell delicately” and “drawing dazzling delight.”

I have a question to Professor Hawking: Is alliteration a principle that is in the nature of things? Is there replication in chemistry? Could this same principle of replication be at work in stages of evolution?


Prof. Hughes: Does this principle of replication exist in other disciplines to explain evolution? Students?

Tom: In biology, Richard Dawkins coined the term meme. He called it a “replicator.” He applied it to both genetic and cultural evolution.

Prof. Hughes: What is a meme?

Tom: Dawkins said a meme is an “information pattern” held in a person’s memory. It is “replicated” and copied to another individual's memory. This explains the replication of all items in culture, such as tunes, catch phrases, beliefs, clothing fashions, ways of making pots, and the technology of building arches.

Prof. Benedict: The “meme” idea is okay in its place for cultural evolution. But it is not sufficient. The evolution of culture is far more complex than the principles of evolution in biology.

Mary: Here is another trope: Metonymy. Metonymy is a figure of speech in which the attribute for something is used to stand for the thing itself, like “a man of the cloth” to mean a clergyman; or, “the brass,” which stands for military officers. It is the substitution of a word (or phrase) for another.

Prof. Hawking: Yes. Scientists study the differences in substitution rates among nucleotides in mitochondrial protein-coding genes of vertebrates. But “substitution” is a very generalized term.

Mary: Yet scientists’ use generalized terms.

Prof. Hughes: You are projecting the devices of language onto your physical world. (Retaliating.)

Prof. Hawking: Buckminster Fuller acknowledged that language is the structure by which we define the world. We cannot help but apply these terms. He was searching for the principles governing the universe.
Perry: Nobel Prize winning physicist Werner Heisenberg said: “All of our methods of interrogating nature depend on language—and it is the very nature of language to refer to things. We therefore think in terms of things. How can we possibly think of “nonthings”, nothings, nothing? In our very forms of thought we divide the world into subjects and objects, thinkers and things, mind and matter. This division is presumed a basic maxim of objective science.”

Dean: The outside and inside are mutually involved. The outside shapes language as well as language shaping what we see outside. Tropes are part of understanding nature outside. Mary, right?

Mary: One study showed English speakers producing an average of 3000 novel metaphors per week. Neologisms are giving our consciousness a new space to see the world.

Prof. Hughes: The work of the literary theorist Roland Barthes is relevant here. He said that no sooner is a new form seen than it must resemble something. Humanity, he said, is doomed to analogy. It could be the basis for explaining evolution. (Katherine thinks of the parables of Jesus are analogies. “Heaven is like finding a treasure hidden in the earth.”)

Dean: We are “doomed” to evolve by metaphor and invention. We are defining our human nature right now. We begin with our senses….

Mary: Gunther Kress and Theo van Leeuwen say that the way we understand everything is based on a metaphor of our senses. Let me quote:

Seeing has, in our culture, become synonymous with understanding. We 'look' at a problem. We 'see' the point. We adopt a 'viewpoint'. We 'focus' on an issue. We 'see things in perspective'. The world 'as we see it' (rather than 'as we know it' and certainly not 'as we hear it' or 'as we feel it') has become the measure for what is 'real' and 'true'.

Prof. Hughes: Hermes Trismegistus said as much. He said heaven and earth are counterparts. “That which is Below corresponds to that which is Above and that which is Above, corresponds to that which is below, to accomplish the miracles of the One.” This is an allegory built on a correspondence between two realities.

Prof. Hughes: Is language an allegory of nature? (Long pause.) Or is it the reverse? Mary is saying that the principles of language correspond with those in nature. It is the subjective side of nature. (Perry thinks: Since everything is composed of frequencies, heaven corresponds on a higher level of frequency.)

Dean: We spoke of the evolving polarities of subject and object, freedom and order, complexity and simplicity but now we see one side is stronger
in the long run. In the terms of philosophy, we are moving toward the inner side of evolution on a higher level. Is there a higher level of freedom in the afterlife?

Prof. Hughes: Remember Plato’s allegory of the Cave. We cannot see things beyond the grasp of the mind. Thomas Mann’s Magic Mountain.

Dean: How would it apply to our study of evolution? (He writes).

The Novel

Prof. Hughes: Readers say that The Magic Mountain is an allegory for our time.

Hans Castorp is a young man who goes to a sanitarium on a mountaintop for a vacation. He meets an Italian scholar by the name of Settembrini and then a German pedagogue named Naphta. Settembrini is a humanist and methodical. Naphta is the reverse, like a volatile, flammable liquid. Here we see polarities personalized in a great play of opposites. He must put them together and find a new perspective.

Prof. Hughes: Science and the humanities are virtual opposites. We are working through contradictions and principles that clash. We have to bring them together and find as best we can a new vision for the university.

He is between the unstoppable "cold" rationality of science and the inescapable passions of literature.

Prof. Hawking: Passion is not my subject.

Dean: Passion had to be hidden in that Big Bang. Passion is part of this long story of evolution. He must put together all sorts of contradictory ideas and resolve emotional differences to reach a higher level of life. In the course of the novel and telling the story, he grows up.

Mary: Castrop is synthesizing the opposing features of Truth, comparing and putting those differences together. That’s what we are doing!

This novel by Thomas Mann is a bildungsroman. In German, Bildungsroman means “a novel of personal development.” Personal development is about the growth of an individual. He falls in love with a woman, romantically, fantastically. He is bubbling over with his youthful feelings, kneeling at her feet. But she is repelled by his antics. He is like an adolescent in love. She ignores him. He learns, painfully, over time, to see her more objectively. He matures.

Prof. Hughes: Yes, He matured as far as he could go.

Dean: We are past time.
**Prof. Hughes:** All these notions you brought up like, “Evolution shows increasing degrees of freedom, complexity and subjectivity.” This happened with Hans Castorp in becoming a man.

**Dean:** Yes. We are learning how to talk across the Sciences and the Humanities. We are at a new level, keeping our specialized past, and going beyond it to a new place. Students will have more potential to innovate and broaden their thinking -- invent new ways of life-- even as this subject of evolution becomes more complex -- as we shall see next time.

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### 7. The Field of Art

**Dean:** Welcome everyone. Today we have Dr. Andy Matisse to talk on art. He is a specialist in art history and will be our lead speaker. Professor Matisse and I have discussed what the class has been learning about evolution. Prof. Matisse, Could you start off our class on the history of art?

**Professor Matisse:** We have a subject called art history -- not “art evolution.” The whole field of Art is too broad to consider here. I cannot talk about the history of dance, theater, sculpture, or poetry, but I can speak about painting. And I cannot review all the types of painting that have developed around the world since the beginning of civilization! But some historical periods in art could be a place for you to start thinking about its evolution. *(He goes to the blackboard and writes.)*

**The History of Art**

Jane is handing you a sheet of paper that provides you with an outline of this history. Then we will look at the text you have by H. W. Janson.

**Chart: Evolution of Art**

<table>
<thead>
<tr>
<th>ANCIENT CIVILIZATIONS 3000 BC – 331 BC (BCE)</th>
<th>Benedict:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egyptian Art 3200 – 1070 BC</td>
<td>The oldest known</td>
</tr>
<tr>
<td>Amarna Art 1370 – 1340 BC</td>
<td>pigments and</td>
</tr>
<tr>
<td>Mesopotamian Art 3500 – 331 BC</td>
<td>paint grinding equipment that was between 350,000 and 400,000 years old. We are still learning when art began.</td>
</tr>
</tbody>
</table>

paintings could have begun anywhere from 35,000 to 100,000 years ago. Indeed, I saw that some archaeologists in Zambia have uncovered evidence that humans were painting even earlier. This team found pigments and paint grinding equipment that was between 350,000 and 400,000 years old. We are still learning when art began.

**Matisse:** Let’s follow the text by H. W. Janson. Janson will tell you something about the beginning of art with fine illustrations and photographs. You will see bison, deer, and horses drawn on cave walls. No one really knows the purpose of these drawings. They were made deep inside
caves. They are what observers call “mimetic”; people were copying
what they saw externally.

The Dean might call this “the principle of identity and
replication” that began after the Big Bang. But the pictures also look as
though they might be decorations; they might have been used in religious
ritual in 10,000 B.C. Look now on page 34 for cave art. What are your
thoughts? Anyone?

Barbara: How does Mr. Janson know that this is “art”?

Jane: The paintings are dated sometime between 15,000 and 10,000
B.C. Janson writes that they were “incised into the rock with quick and
sure lines; figures have dance-like movements.” This tells you that
something new has been invented. These images are not just imitative or
accidental. They are purposeful. They are by intention, not by chance.
There is some sort of desire or a “will” to design these dancing figures.
The figures look graceful. Look at the sureness and refinement in those
horses painted on the cave wall. And again: graceful curves of running.
We need to see how art evolves to become more complex and free, not
just simple and rigid.

There is the Venus of Willendorf from the Paleolithic era. She is a woman
carved in stone with “exaggerated female attributes.”
It is “remarkable by its roundness” as opposed to flatness. She also
represents a breakthrough. We see a new dimension of space in art. The
Venus of Willendorf is a sculpture, not a flat low relief depiction. The
sculpture has three dimensions, not two.

Janson shows us a plastered skull found in Jericho around 7,000 BC. It
is done with -- I quote him -- “subtlety, precision, and graded edges.”
Here we see more interior complexity. You can see the skill it took to
produce this skull. More discipline and concentration: the work is much
more developed.

“Elegance.” The word appeared in English a little before A.D. 1500. It
starts by referring to a style of dressing and to “meter in speech.” Then,
in art it becomes associated with words like purity, precision, and
correctness. Now I see it associated with other qualities in literature,
synonymous with tastefulness and harmonious simplicity. So this word
had many associated words evolving along with it. The appearance of other
words then helped to create its meaning.

Dean: Ah. Put these associated words together and Voila: you get a new
vision of the object. Notice how the metaphor and synthesis play into
this new word. It’s called “elegance”: a new word with a new feeling.
Jane: The word “elegance” could not have existed among the cave people in Lascaux. It was not likely available for the early Persians. You can see the picture of the “Charioteer” from the sanctuary of Apollo at Delphi in 470 BC. It makes a difference when you look at these with your own eyes. The book shows emotions on the faces and bodies. You can see feeling like pain and stoic calm written on different faces. This is a new way of representing feeling.

The Hellenistic era ended when the Romans conquered Greece in 146 BC.

They began building temples in the same style as that of the Greeks, but added something more. They were inventing from the past.

Jerry: It tells me that art evolved like nature, by synthesis, complexity, and continuity. Artists added something new onto a past Greek form, like molecules were built from atoms.

Matisse: The Romans added Etruscan elements: “The high podium, the deep porch and the wide cella, engaging the columns of the peristyle.” You can see the continuity along with the innovation.

Jerry: Art evolved like the universe. Artists were adding new elements just like in chemistry. Evolution went from Metals to Ionic compounds to Functional compounds to polymers to proteins, to DNA and the virus.

See A Roman Patrician with Busts of His Ancestors done in the first century BC, adding complexity. The “Temple of Fortuna Virilis” is a cross-cultural synthesis—a integration of Etruscan and Greek elements.

Mary: What does that mean: “symbolic complexity”?

Matisse: Look at the work called Mithras Slaying the Sacred Bull on page 211. This was created around A.D. 150–200. The work is in limestone and depicts the myth of a cult: the god Mithras capturing and sacrificing a bull. The bull is a symbol of the spring season, releasing its forces to a snake, which is a symbol of the earth. This is a fight between Good and Evil, Life and Death. This is symbolic complexity.

Benedict: This symbolic idea, carved in stone, began around the sixth century B.C. with Zoroaster.

Carl Jung believed there is a “collective unconscious” that contains a repository of images of the human race, which he called “archetypes.” He studied art from around the world and found similar figures and themes—of Mother and Child, the Wise Old Man, underworld demons and heavenly angels, plants and creatures from the natural world, and so on.

Matisse: The Late Gothic was a period of rediscovering the classical world. It altered the European world of art. By the year 1500, say, painters all over Europe—not just in Italy where the rediscovery began—were
reviving ancient principles. Ancient principles of “harmonious proportion,” “realistic expression,” and “rational postures” were brought back into practice. But now they are advanced with greater skill. The work of Italian High Renaissance artists adhered to an ideal of “harmony and balance”—of colors and proportions, effects of light and shade, spatial harmony, perspective and anatomy—like never before in history. Look at some of the work of Leonardo da Vinci and Michelangelo.

Now look at examples of paintings by these Venetian masters—Titian, Tintoretto, and Veronese. Together they created a body of work called the “Venetian style.” They had a “looser technique” than you find in earlier Italian painting, rich coloring, and often a pastoral or sensual subject.

Matisse: Yes. The art of the Baroque was shaped by those religious tensions. Baroque develops every human emotion in this grand movement. Consider Caravaggio.

Matisse: Romanticism developed in the 1800s, and then Realism developed, pushed by the advent of science.

Dean: We talked about evolution moving between extremes, through antinomies, differentiating, separating and blending differences.

Matisse: Yes. Realism differentiates from Romanticism; science differentiates from religion as institutions and art is part of this shift toward realism.

Dean: Let’s jump into contemporary art.

Matisse: We go past Impressionism…and Expressionism. (Ruefully.) Past Cubism, and Dadaism, and Surrealism and move ahead to Abstract Expressionism.

Benedict: Abstract Expression. We talked about how Homo sapiens learned to speak by abstraction. Abstract words came to represent—stand for particular things—the word for “stone,” for example, went from the particular to the general. The word “Stone” evolved with more ambiguity to represent “hardness.” More complex images were born. Metaphors brought less precision but more richness to the way we see the world.

Emotions are developing toward greater abstraction with ambiguity, but this is different than the evolution of ideas. Emotions are going into a deeper range of what the Dean calls—interiority.

Dean: Deeper interior—shape, color, and line. Art calls up some new feeling in each stage.

Benedict: You remind me of Thomas Berry and Bernard Lonergan.
Kornberg: Good. These art styles are like ocean currents: the Gulf Stream current is strong, warm, deep, fast, and salty. The California current is broad, slow, cool, and shallow.  

Matisse: Now look at Action Painting with Jackson Pollock, Franz Kline, and Willem de Kooning. They show currents of life energy coming out into a broad canvass ... a whole theater of forces at work. Critics said their style was irrational, instinctive, and impulsive, “a moment of existence,” “split-second action.” Then there was Hard-Edge Painting – colorful geometric abstracts, imprecise shapes with defined edges and great precision.  
The (inside) “interior” tells more about the (outside) “exterior.” (Mary remembers the Gospel of John saying: “You will know the outside by that which is inside.”)  

Alice: What would Aristotle say about this?  
Matisse: The elements of art are like atoms. They are the "building blocks" of a painting. You know that hydrogen and oxygen make water but if you integrate carbon they might form something more complex, like a molecule of sucrose. When the elements of art are combined you've dealing with line, shape, form, space, texture, value and color. Artists use these elements, and mix them in with principles of design. This field is complex.  

Jane: I agree. Green has at least 84,000 tints and tones.  
Dean: There is always an interaction between matter and mind, the real and ideal, the abstract and the concrete. This is why we need historians to inform us about the interaction in different periods of evolution.  

Benedict: Music begins with drums and flutes and the singing voice. But the invention of new instruments widened the possibility of expressing emotions. We see greater freedom by way of these new instruments to express what lies within.  

Matisse: The material invention of each instrument -- the percussions, the keyboards, the stringed instruments and so many more types around the world evolved -- and opened the mind and the emotions to new ranges. People could feel more deeply and sensitively than before. They had a greater freedom to evolve.  
Dean: Look at the beauty of peacock tails. It could have been the force of Beauty that created those tails. Those peacock tails have no “survival value.” But, Dean, biologists would never claim that peacock tails are the expression of some “force for beauty”!  

Benedict: Or, is our brain evolving to the point that we can now see “the force of beauty”? Are we just beginning to see the art in nature?
Tom: Darwin knew those peacock tails should not be there. Stephen Gould said the peacock tails could be a **spandrel**. Spandrels are facts that cannot be explained by natural selection. Darwin’s theory of “selection” cannot explain them. The tails are too extravagant. They are a handicap to males:

Dean: I remember that Albert Einstein said: **Big problems are not solved at the same level of consciousness that created them. I say: you cannot explain all of evolution in the framework of biology.** *(Professors Benedict Alice: (Answering Kornberg.)*) You don’t know. The forces of evolution could be based on great ideas, like Truth, Beauty and Goodness. The drive to evolve may not be just about “survival.” The purpose of evolution could be to produce a “greater life”!

Tom: Another big idea: I think symmetry is in art. It is in our DNA.

Matisse: Interesting. **Nature has a propensity to create symmetry.** Look at how seashells, flowers, faces, and fish – all show symmetry. A prime theme in nature is symmetry and we see it in art. Its opposite, asymmetry, is present. But now the artist must find “proportion.” Both principles are there: **symmetry** is dominant, and **asymmetry** is subdominant.

Dean: What do you mean?

Matisse: **The binary needs resolution in a larger picture.** In music the subdominant and the dominant are about the function of a given harmony. It has to do with the function of a chord and where it wants to resolve. These two chords create a harmonic tension that resolves into the tonic chord.

Dean: Evolution is a quest to maximize “unity with plurality.”

Matisse: Heavens! **Art is not philosophy!**

Jane: I agree. Art cannot be *explained* by philosophy. Art is concrete and rooted in feeling. But there are principles in aesthetics that tell you how feeling is evoked.

Matisse: Ma Yuan was a Chinese landscape painter of the 12th century. He developed a **style said to be “lyrical, evocative, and restrained.”** The most striking character of Ma Yuan’s ink paintings was their “asymmetrical composition.” His painting of trees, rocks, and human figures expressed what critics call a “balanced asymmetry.”

Dean: It is clear: the principles of art began in nature.

Benedict: Yes. Then evolved. Think of Noam Chomsky’s theory on the origins of language. Language was built from within the structure of our brain. Chomsky said the brain lays the foundation for language. And notice. Our body has symmetry; a right arm, left arm; a right brain and a left-brain. Our body is a work of art.
Matisse: Okay. Karin Albert says, “The principles of art are born in nature.” She makes her case with the art of Chinese bonsai, or penjing. Have you heard of it? Bonsai is a 3000-year old tradition of art. It connects directly with nature and then builds its own way and purpose. It is an art for creating miniature expressions of nature, in trees and rock landscapes. Any students hear of that?

Here is a summary of principles taken from Chinese masters. Notice how these principles are close to what the Dean has been talking about: for example, “opposition, subtlety, and the unconscious” are listed among these principles.

### Chinese Principles of Art

**Implicitness.** A good work of art both conceals and reveals. Suggestiveness evokes associations and stimulates the mind. It also allows us to look at a piece over and over again with fresh eyes, always discovering a new aspect, never feeling fully satiated. The higher the level of implicitness in a penjing, the vaster the depicted scene actually appears to be, and the richer the artistic content.

**Ingenious use of opposites.** This principle includes contraries—like largeness and smallness, lightness and darkness, bright and subdued colors, verticality and horizontality. All such contrasts are produced in penjing. Opposing characteristics are carefully orchestrated to complement each other and give rise to a dynamic composition. “The majestic pine tree assumes a softer posture when a curved trunk and branches display a gentle quality amid imposing grandeur.” The soft, elegant willow tree “is most appealing when trained in an upright style, adding firmness to its inherent suppleness.”

**Movement.** All major ingredients in a penjing—whether trees or rocks—must display qi, an invisible energy force so familiar to Chinese painting and calligraphy. Good planning and coordination are essential so that “this energy force not only becomes noticeable to the perceptive eye but can travel unhampered.”

**Void and Substance as complimentary forces.** This artistic principle in the Chinese tradition in penjing can also be found in music, theater, painting, and cinema. It is often the empty part in a composition that stirs the imagination. Void creates and sustains qi. Therefore, the resourceful handling of empty spaces is as crucial as the creative use of substance. As is true for the opposing elements employed in artistic design in general, one should contain the other, void should reside in substance, and vice versa, as symbolized by the well-known Daoist emblem of the Tai Chi.

**Balance and harmony.** Despite the complex pattern of interwoven contrasts, a Chinese masterpiece always conveys a sense of profound harmony. Opposing forces create variation and a strong dynamic quality, and the artist's ultimate challenge consists in the task of balancing these various forces against each other to attain equilibrium.

**Interconnectedness.** Not one element in a penjing, regardless how remote from the main parts of the composition, should be completely isolated. Throughout the scene, a clear sense of connection and interdependence should be evident. The direction of a tree's slant and the pattern in a rock's grain often play major roles in the artist's effort to join the various components together.

Dean: This principle of “interconnectedness” is applicable from ancient philosophy to modern physics. Professor Parsons called it “sociality.” It starts with the Big Bang and persists in civilizations, from Lao Tse to Albert Einstein.

Matisse: See ingenious use of opposites on chart.

Think of all the elements that are at work here: their combinations and permutations are endless. While basic elements in painting include line,
shape, space, value, color, and texture, these are significant by their absence as by their presence in a work. Aestheticians point to other “principles”: emphasis, balance, rhythm, contrast, movement and harmony, dynamics and symmetry. And each of these has subcategories. Indeed, scientists should study synaesthesia. 27

Dean: Synaesthesia? What’s that?
Mattise: Synaesthesia is the crossing of different sense experiences. People with this condition see colors and numbers together. Some combine a simultaneous interplay of music and colors. The stimulation of one sense leads to the stimulation of another sense as well.

Matisse: Wassily Kandinsky was among the first artists to paint abstractions in the 20th century. In 1889 he wrote about traveling north of Moscow and suddenly seeing houses and churches decorated with shimmering colors that went beyond what was normal. He had a sense of color that was independent of the objects themselves. He said that artists are “at the tip of an upward moving triangle progressing and penetrating into tomorrow.” Kandinsky could apprehend sounds and colors simultaneously. Could that capacity be part of our future? 28

Matisse: Kandinsky heard tones and chords when he painted. When he thought the color “yellow,” the tone he heard was middle-C on a piano. Combinations of colors would produce vibration frequencies linked to chords played on an instrument. “Black” was the color of closure. Kandinsky believed that the universe was filled with auras and "thought-forms."

Dean: Have scientists also experienced synaesthesia?
Kornberg: The Nobel Prize winning physicist Richard Feynman had synaesthesia. When he saw equations he also saw colors.

Dean: What can painters tell us about evolution? Painters have a purpose—don’t they? Scientists say evolution happens by chance. It has no purpose.

Matisse: Hold on. Strindberg believed that chance was a part of nature and art. Strindberg’s work anticipated the appearance of Surrealism and Expressionism. Chance and purpose are not mutually exclusive; they can go together. Strindberg laid paint on the canvas in thick gobbets; some fell accidentally from his brush. The accidents lead him to seascapes of rare beauty and power.

Aesthetics
Jane: The field of aesthetics began as a theory of beauty, and it developed from there. In the eighteenth century, philosophers began to see art as an expression of both beauty and the sublime. Edmund Burke wrote that the sublime could connect with pain. There could be “delightful horror,” Words like taste, sensitivity, and perfection were discussed.

Dean: Do you see and purpose in this evolution?

Matisse: I see evolution as the way art increases human sensitivities and emotional intelligence. You can see this in art history as Jane and I have been presenting it. Art elevates the mind; it transforms bodily impulses, some say, and the body’s base emotions. Some would also claim that it advances a new feeling of appreciation. It stimulates a sense of life, and gives vitality to the soul. Art gives freedom to the human spirit to wander and wonder. It’s my real joy.

Benedict: (nodding) Australopithecus had the experience of fear and rage, but he could not have understood Picasso’s painting. Pithecanthropus could not have understood the feelings of Shakespeare. Neanderthal was too early in evolution to know the compassion of Buddha or Jesus. Cro-Magnon could not have appreciated Beethoven’s Ninth Symphony. Yes, there is an evolution of emotions. (She pauses.)

Conclusion

Matisse: The next stage will combine science with art. There are new studies on how science is seeking integrative frameworks.

Mattise: Artists and scientists have worked together since the Reformation. When artists wanted to perfect their craft, they studied the human anatomy. Not much was known about the body’s anatomy in the time of Michelangelo. Michelangelo broke all the norms to study the human body in detail. He dissected corpses and learned so much about the body that his work became a part of medical history. Geographers and mapmakers worked with artists to create mathematical grids and accurate maps. Painters discovered the principles of optics; they studied how the eye plays “tricks” with their images. And art is linked with the history of psychology.

Benedict: We talked about Carl Jung and his theory of the collective unconscious. Jung also speaks of the principle of opposites. To have a concept of “good” you must have a concept of “bad”; to have a concept of “up” you must have a concept of “down.” And so it is in art: A strong contrast in color gives strong energy, and a weak contrast gives weak energy. Surrealists wanted to see a link between the inner and outer world, the spiritual and the material

First, art has evolved by an inner/outer process, I mean looking outside at things and then seeing and feeling them inside. Also, it evolved through
a constant interaction between the artist as a subject and the object created.

Second, art involves comparing different things and putting them together in new ways, yes, a synthesis, whether among pigments for painting or the expression of new ideas with feelings.

Third, art evolved from straightforward down-to-earth drawings on the caves of Lascaux and early pictorial art to increasingly complex art -- all around, sculptures, architecture and painting -- without losing the principle of simplicity.

Fourth, art evolved by differentiating into many styles in every artistic endeavor around the world. Each work of art had to find some unity, or harmony and balance in their expression.

Fifth, art has been constructed through the interface of other polarities, like mind and matter and freedom and order. It has evolved through creative minds interacting with tools, invented materials and physical technologies. Artists are constantly breaking free of the old order of styles, paints, materials, and indeed, the purpose for their work.

Sixth, artists have been creating a larger and larger inner space for human consciousness, from Australopithecus and Cro-Magnon to Titian and Rembrandt. We have seen a greater power for interior life and consciousness.

Seventh, art has shown how symmetry and asymmetry play a role in its construction. It is the same as in science.

Eighth, I see a search for harmony within disharmony and diversity within unity in each work of art... (He looks at the Dean.) I could go on.

8. The Field of Music

Dean: We have with us Professor Johannes Britten who teaches music history on campus.

Britten: Let’s start off with the composer Johann Sebastian Bach. “What is a fugue? Does it have anything to do with evolution?” I said that a fugue is a type of music in which several melodies develop independently and soon they each overlap -- and may even play simultaneously. Each section is called a "voice."

Bach and the Principles

Britten: There are many individual variations that play against the main theme -- or what we call the “subject.” The individual themes give the music a greater richness as they stand both with and over against the subject.
Dean: Well! In philosophy we are all subjects in this natural world. We are evolving in nature with what we call differentiation and integration.

Britten: I had not thought of that connection.

Dean: The astrophysicist Carl Sagan has said that the UNIVERSE IS LIKE A FUGUE. Each voice plays variations on a key theme. So, does the fugue duplicate this principle behind evolution? Could we say, for example, that there is one Subject buried in the Big Bang, which kept becoming more complex with quadrillions of variations that play in counterpoint with the Subject.

Britten: Interesting.

Dean: Carl Sagan also said that you could not think about the universe as though you were outside of it. You are always inside the universe. So whatever music you compose is done from the inside. We, each of us consist of voices with variations within the Subject.

Britten: For the composer, music comes from inside. The listener is then resonating inwardly with the music of the composer. But you have to have the ears to appreciate great music. Not everyone can hear the power and the beauty of a Bach fugue.

Britten: A fugue begins with a tune called “the subject.” It’s played alone as one “voice” and can be played by any instrument. Then another "voice" strikes up, while the original voice continues in counterpoint to it; this second “voice” may also create a recurring tune called the counter-subject. The fugue keeps going in two to five or more voices, with the subject entering along with new melodies woven freely around it. It’s a fabulous invention.

Dean: Tell us more about this invention.

Britten: Bach uses the word inventiones, as the title for 15 pieces of his work. This concept “invention” referred to a stage in composition, but the notion originated with Marcus Cicero's rhetoric… (to the Dean) You know, the Roman orator.²⁹

So the subject in Bach’s music alternates with episodes of free counterpoint in which the subject gets a rest. The subject is like a character that keeps turning up in a friendly conversation. There has to be unity. The fugue transcends.

Bach transforms his subject many times through a cycle. The subject is varied by slight rhythmic or melodic alterations, which increase and decrease in complexity, so that when the final subject arrives, it is not immediately heard as related to the first. Some 24 of these gradients link the "new" subject to its “ancestor.”
Dean: Students. I hope you can hear the key words of evolution in what he is saying without thinking: subject, invention, unity, variation, cycle.

The Evolution of Music

Professor Benedict: I will be brief. The human voice singing is an instrument that we cannot date archaeologically. Pithecanthropus could have been humming, whistling, yawning, and clicking in rhythm, and we will never know. The oldest Neanderthal bone is dated at 60,000 years old. It predates the oldest bone flute by 10,000 years. Musical instruments date back to the Paleolithic. The oldest song was recorded in cuneiform around 4,000 years ago in Ur, a coastal city in ancient Sumer.

Dean: What about in other parts of the world?

Benedict: Indian classical music (marga) can be found in the Vedas in the Hindu tradition. Samaveda is one of the four Vedas that describes music. You can also find music in Persia (Iran today) back in the prehistoric era. I think music goes back to the days of the Elamite Empire there between 2,500 and 644 B.C.E. Another early source of music can be found in Africa... maybe 50 to 100,000 years ago.

Our knowledge of music before A.D. 200 is limited. A dig in the Ukraine uncovered musical instruments made from the bones of a wooly mammoth dating back to 18,000 B.C.E. Music probably developed among hunter-gatherer groups as a way to communicate with one another. I know that they used drums and horns made from shells. Hunter-gatherer groups then developed agrarian cultures, and music began to have a place in religious ceremonies.

Historical records of Chinese music date back to the Shang dynasty around 1600–1000 B.C.E. Confucius lived between 500 and 400 B.C.E. and said that music was essential to maintain order.

Table I: Evolution of Music
The Evolution of Harmony

From the 6th to 9th centuries A.D., a dozen scale patterns of tones and semi-tones were invented). In the 9th century, only the simplest "perfect" harmonic ratios were accepted, which were the fourth and fifth octave. But this allowed for the addition of one or two voices. Later these voices began to acquire independence, moving contrary to the original melody. Now...from the 12th to the 15th centuries, “intervals, thirds and sixths,” were included, and in some cases, seconds and sevenths. This helped enrich the harmony of voices.

In the 15th century, came the introduction of additional notes that began to foreshadow the major/minor mode system. In the 16th century,
the tonic (or keynote) triad became the point of departure and the conclusion in a composition.

In the 17th century, a greater emphasis was placed on a melodic line that was harmonically supported by a base line. In the 19th century, there was a more deliberate use of unresolved harmonies and ambiguous chords. I must skip the details.

In the 20th century, the use of chords began to get resolved in unexpected directions. And there was the appearance of atonality -- which abandoned the traditional duality of consonance and dissonance. There was a break from traditional scales in recognition of a *continuum* between consonance and dissonance. There was also a new emphasis on *performer improvisation and interpretation*. You can see the *inventions*. Should I go on?

**Music History:** Periods of European music.

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<thead>
<tr>
<th>Period</th>
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<tr>
<td>Medieval</td>
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<td>Renaissance</td>
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<td>Baroque</td>
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<td>Classical</td>
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<td>Romantic</td>
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<td>Modern and contemporary</td>
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<td>20th century</td>
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<td>Contemporary</td>
<td>(1975 – present)</td>
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Music in the West begins around AD 500. The music that survived in Europe before AD 800 to the present day is liturgical music, which originated from the Roman Catholic Church.

I know you have talked in class about “replication” in evolution. **Listen to this Chant:** *(He presses a button to start a CD sounding a chant for 40 seconds.)*

It could lull you to sleep. Many of you look mesmerized. It is called the “Gregorian Chant” after Pope Gregory the First, who gave his name to the repertory. *Repetition.* Yes. Now help me think how this evolves. I will lead you through these stages of change.

We begin in the 9th century, when there were three important developments with this Gregorian chant. *(He looks to the Dean.)* I see a quest both for “unity” and “diversity” in what transpired here. **First, the Church wanted to unify different chant traditions; but they also rejected some of them in favor of the Gregorian. Second, the earliest polyphonic music began as a form of parallel singing known as *organum*. That was a key invention.**
Third, after a lapse of about five hundred years or more, music “notation” developed. That was a still greater invention. Most of us now take notation for granted, but it was many centuries before a system of pitch and rhythm notation developed with precision and flexibility. 

Tom: This should mean more **differentiation and complexity**. 
Later in the 14th century, we see the development of the *ars nova*, the “New Art.” This music has a lot of rhythmic complexity. ("Resting" intervals are the fifth and octave, with thirds; sixths are considered dissonances. Leaps of more than a sixth were not uncommon in individual voices.) 

I classify this music with the Medieval Era, but it had much in common with early Renaissance ideals. It “bridges” between these two periods of history. 

Dean: How did the Sonata evolve? 

Britten: The Sonata came into being in the late 16th century. It was a way of differentiating instrumental from vocal music. If it was played, it was a sonata. If it was sung, it was a cantata. Today the term Sonata refers to an instrumental piece, usually in several movements. Less frequently the term applies to a larger group like the string sonatas of Rossini and Mendelssohn. 

In the Baroque Era a popular form of Sonata would be with a string or wind instrument accompanied by the piano. 

Ann: And the orchestra? How does it evolve? Does one instrument become more refined and then those refinements branch off to another instrument? 

Britten: Yes. But people had been refining instruments for thousands of years, improving on each, one after the other. It would take me a long time just to talk about changes in the “strings” and the varieties of stringed instruments. 

Ann: *(nodding Okay.)* Did the orchestra start only with a couple of musicians, and then move to three, four, five, and more? 

Britten: Yes. About 400 years ago, musicians started forming combinations together that turned into what we would now call an orchestra. In the 1500s, for example, the word "consort" was used to mean a group of instrumentalists—and sometimes singers as well—making music together or "in concert." Two or three would gather, and more would join them. In Italy around 1600, the composer Claudio Monteverdi knew exactly what instruments he wanted to accompany his first opera *Orfeo*. 

This was a turning point. For the first time, he said exactly what instruments should play his piece: fifteen viols of certain sizes, two violins, four flutes—two large and two medium-sized, two oboes, two cornetts
(small wooden trumpets), four trumpets, five trombones, a harp, two
harpsichords, and three small organs.

**Ann:** I have an analogy. Think of each instrument as a cell. If we think in
terms of biology, for example, Monteverdi's “combination” was like -- the
first multi-cellular organism. And it led to a more complex organism --
the modern orchestra playing a symphony.

**Britten:** So to speak. By that I mean: instruments organized into sections. In
the next century -- up to about 1700, which was during Johann Sebastian
Bach's time -- the “orchestra” then developed extensively. The violin family
— violin, viola, cello, and bass — replaced the viols, and this string section
became central to the Baroque orchestra. When Bach worked with an
“orchestra,” he sat at the organ or harpsichord and gave cues from his bench.

In the Baroque era, a musical director began to conduct the group of
musicians. Jean-Baptiste Lully, who was in charge of music at the French
court in the 1600s, used to pound out the beat for his musicians using a long
pole, which he tapped on the floor.

**The orchestra kept developing in the next century, up to the 1800s,**
the era of Haydn and Beethoven. Now you can imagine the orchestral
story expanding from there. Think about the big orchestras we have
today.

**Ann:** Do you see a straight-line development of evolution here? Does the
evolution of music look like a tree? Or, more like a bush, perhaps?

**Britten:** The evolution of music is looks rather more like a bush, with
many lines of development growing from each tiny branch.

**Dean:** That follows the way evolution took place in biology.

**Ann:** Are there sudden breaks in styles of music leading into the
Renaissance? Are there leaps into new forms, like in biology?

**Britten:** Let’s see. Renaissance music began in northern Europe— in
central and northern France, the Netherlands, and Belgium. The style
of the Burgundian composers (the Franco-Flemish school) was a
reaction against the excessive complexity and style of the late 14th
century *ars subtilior*. The Burgundian style contained a balanced
polyphony in all voices… (Interrupted.)

**Benedict:** The Dean spoke of the *separation* of the secular from the
sacred. Does secular music now break away from the sacred music of
the church?

**Britten:** Yes. The sacred compositions at the time were the *mass*, the
*motet*, and the *laude*. The secular types were the *chanson*, the *frottola*,
and the *madrigal*. They were branches on the evolutionary “bush” as it
were.
The principle of complexity alternates and combines with simplicity. The principles are mutually related, as the Dean says. Composers -- in the generation after Josquin des Pres -- explored more complexity in counterpoint, but that increase in a single direction could go only so far without simplicity. The most extreme expression of complexity is in the work of Nicolas Gombert, with contrapuntal intricacies ending in Baroque fugal forms.

I see advances in complexity in romantic music in the nineteenth century. It began with Beethoven and Schubert and followed with Wagner and Mahler, Strauss and Schoenberg. Music became more complicated through this period, up to about the time of the First World War. But we would have to make these terms more precise, “operational,” before I could be conclusive about this matter.

After the First World War, the pendulum swings back. Look at the shift in the size and mix of the orchestra at that time. We find the composer Igor Stravinsky, for example, not writing for a hundred players, as he had done in his ballets Petrushka and The Rite of Spring, but for seven players -- as in The Soldier's Tale and his Octet for Winds. Now Stravinsky is writing simple, tonal lines.

Ann: What about the 20th century, say, with Jazz? Do you see Jazz growing in complexity?

Britten: The Big Band Swing of the 30s and 40s gave way to a Jazz called Bebop, and that became complicated. (The excitement of crowds for Charlie Parker, Dizzy Gillespie, and Max Roach was enormous.) The complexity in Jazz kept increasing before the pendulum swung back to simplicity. What we got was Rock and Roll -- Chuck Berry and Elvis. We all shook our legs and danced to a simpler tune. I need to study the question more carefully.

Alice: The Dean proposed that evolution is not just based the tension between simple and the complex, but also on plurality and unity, and other opposites. They keep developing together.

Britten: I mentioned Igor Stravinsky. He wrote in his book Poetics of Music that, for him – and I can quote this-- “Variety is valued only as a means of attaining similarity.” That could mean greater diversity requires more unity. Stravinsky also believed that music was a revelation of a “higher order.” The sociologist Herbert Spencer says that the evolution of society involves a differentiation of institutions. Do you see this principle in music: a differentiation of styles?
Britten: Absolutely. Societies in Europe developed different musical traditions. In England, composers like Thomas Tallis and William Byrd wrote sacred music; a group of madrigalists adapted the Italian form for English tastes. Differentiation...Let’s see.

Look at Spain. Spain developed instrumental and vocal styles of its own. Tomás Luis de Victoria and other composers were writing for a new instrument called the guitar.

Look at Germany. Germans cultivated polyphonic forms built on the Protestant chorales that replaced the Roman Catholic Gregorian Chant. And German composers specialized in organ music. This became the basis for the flowering of the Baroque organ style that ended with Bach.

Look at France. The French developed a special style of diction known as musique mesuré. It was used in secular chansons, with composers such as Guillaume Costeley and Claude Le Jeune part of the movement. Yes, constant differentiation.

Cycles

Derek: The Dean has talked about cycles as a principle in evolution. How do cycles come into music?
Britten: They appear in different ways. Formally, for example, there is something named the “song cycle.” (Puzzled faces.) The song cycle is a group of songs performed in a sequence; all of the songs are by the same composer, or they may use words from the same poet. The sequence is given some unity by having something in common, like a narrative or a person.
Derek: But we talked about the cycles that occur through time—like seasons in the year; and in the economy—like prosperity and poverty; or in psychology (my field)—manic depression—waxing and waning, you could say.

Evolution in the Classical Period

Instrumental music overpowers the human voice, and the symphony is born. Small changes lead to what you might call a qualititative change.
Tom: So the symphony evolved from the sonata.
Britten: Yes, the symphony evolved from the sonata. The “sonata form” developed during the Classical era to become the primary form of instrumental composition. But the opera and the oratorio were saved, while the “voice” becomes, let us say, instrumental. We see simple patterns, such as arpeggios and the Alberti bass liven the movement of the piece.
Mary: How does a new form develop from the old? Was it like in principle the way cells were built on their ancestors, molecules?
Britten: You probably don’t know the names of predecessor-composers, like Johann Stamitz, Franz Xaver Richter, Carl Stamitz, and Christian Cannabich. (They preceded the “greats,” whose names you probably are familiar with.) They exerted a profound influence on Joseph Haydn and Wolfgang Amadeus Mozart, who were the central figures of the Classical period. (The Dean says to himself: I see the principle of continuity.) These great composers built their work on the past, and influenced those other great composers who followed them: Ludwig van Beethoven and Franz Schubert, for example, who in turn became transitional composers for the next period, and so on. Beethoven and Schubert would then lead us right into the Romantic Period, expanding and enriching earlier forms of music.

Evolution in the Romantic Period

Dean: The “Romantic Period” came with a lot of other changes in what might be called “high culture”– in literature, philosophy, and the arts. I say the Romantic Period deepened interiority.

Britten: Well, yes. In the Romantic era, music became more expressive and emotional, if that’s what you mean. I can name some composers - like Schumann, Chopin, Mendelssohn, Bellini, and Berlioz. In the late 19th century, we see a big expansion in the size of the orchestra and the number of composers: Johann Strauss II, Brahms, Liszt, Tchaikovsky, Verdi, and Wagner. Between 1890 and 1910, a third wave of composers came with Dvořák, Mahler, Richard Strauss, Puccini, and Sibelius. They created more complex and longer works.

Dean: Students, what are your thoughts and questions at this juncture?

Barbara: I am in political science. What about the politics in this new period of history? How did that influence music?

Britten: Yes. Thank you for introducing this aspect of those times. Late 19th century music shows a nationalistic fervor in the work of Dvořák, Sibelius, and Grieg -- and in also Saint-Saëns, Fauré, Rachmaninoff, and Franck. But music also has its own character apart from nation states.

Dean: We have already entered the 20th century, and now we see inventions in mass media and technologies.

Britten: Yes. Now music is no longer listened to only in private concerts and elite clubs. Artists could be heard nationwide. Music performances became portable. Headphones allowed people sitting next to each other to listen to entirely different performances.

Benedict: It’s invention all the way; and expansion.
Derek: How did musical instruments expand?

Britten: Well, in the Medieval Period drums were used mostly for military and dance purposes: kettledrums and bells and cymbals. There were also bowed instruments like the vielles (precursors to the violin family); and plucked strings like the lute; different trumpets, and the horn and small organs. During the 1300s large organs started to appear in the churches. Composers and listeners are very dependent upon new technology.

The Principle of Freedom

We saw greater freedom happening in chemistry and biology and civilization but you were not here. “Degrees of freedom” is a term used in mechanical systems. In physics that involves counting the number of parameters within which something can operate. It refers to the total number of independent ways in which the position and configuration of a mechanical system may change. Put another way, it is the total number of independent ways in which the particles of a system can take up energy.

Perry: Let’s make it simple. A ship at sea has six degrees of freedom. It can move up and down, move left and right, move forward and backward (surging. It can tilt forward and back (called pitching) turn left and right (called yawing) and tilt side to side like rolling.

Dean: If you put yourself in the place of the system itself you can see the greater number of choices of what can happen. In the evolution of animals, the degrees of freedom increases roughly over time -- until you get to humans. As humans evolve the degrees of freedom become even greater. It is the story of freedom evolving.

Mary: We saw animals evolving with more capacity to make choices -- based on the evolution of their senses and the brain.

Britten: Okay, yes. More choices in music: more instruments, more chords, and more styles to choose from. There is more freedom for people to compose and innovate. Twentieth century music saw more freedom for musicians to choose various musical instruments, different keys, pitches and styles of music.

At the end of the 20th century, composers broke the rules of classical music. Inventors made more amplification available, and also new electronic instruments. The synthesizer revolutionized everything. One musician could now have the freedom to play any “voice” immediately on a single instrument -- the synthesizer. A musician playing a synthesizer had the option of composing with the sounds of violins, coronets, clarinets, drums, bassoons, and so on, all right at a his or her fingertips.

Music Theory
Tom: In biology, evolution, “chance” plays a big role. Stephen Jay Gould wrote that if we could rewind the "tape" of evolution, and replay history, the result would not be the same. Humans would be almost certain not to “re-evolve.” This is because natural history is based on randomness. Britten: How about putting chance and purpose together in evolution? Aleatoric music is a composition in which some part of it is left to chance -- on purpose. John Cage was a pioneer in this field. His guide was a text called the I Ching. You must have read about the “I Ching” in your assignment in human history.

In 1957 Cage lectured on Experimental Music. In the lecture, he stated that, “Music is a purposeless play.” Cage also believed that music is "an affirmation of life.” Music gets us to pay attention to the wonderful sounds around us. We don’t usually notice the rhythm of street traffic in the background of our lives. A child picks up a stone and looks at with amazement, enthralled; but we adults don’t normally notice its aesthetic quality.

Tom: I cannot think of a reason why music would evolve. Why should it? Music is not caused by Natural Selection. There is no struggle for survival related to it.

Britten: Music is based on emotions. You would learn about the expression marks on a music sheet—like “Amoroso” (Britten sounds the word tenderly), “Animato” (he speaks with liveliness), “Doloroso” (sorrowfully); “Furioso” (angrily) “Grazioso” (his voice has a elegant grace now). We live by our feelings. You grow by them. You mature through them. You appreciate feelings and transcend them through music. That’s the purpose.

Dean: Interesting.

Britten: I thought of transcendence when I was listening last night to Zoltan Kodaly’s Duo for Cello and Violin. Kodaly wrote this Duo in 1914. It’s a transformation of folksong experience in Hungary into a classical structure—a “transcendence,” you might say, of folk into classical. In the opening movement, you hear the extreme range of both the violin and the cello. Kodaly uses wild tumultuous sounds and rich sonorities. I was repelled by the sound at first, but then I began to be attracted to it. I sensed the way in which he was expressing the feelings of Hungarian friends -- the pain and agony they had felt in their lives.

In the second movement, the violin goes center stage, wailing in the Magyar styles, with cello accompaniment. That sound was foreign and dissonant to me, but then I connected again with those Hungarians: a
scream, a shout, and agony. Kodaly was sharing his life experience, translating into music those gut feelings of people he knew in Hungary.32

**Britten:** Great composers thought Beethoven was noise. At first, Franz Schubert did not like it.

**Dean:** Beethoven was inventing, breaking the mold.

**Britten:** Schubert grew up listening to the harmonies of Mozart. When he heard Beethoven, he wrote in his journal that this “new composer confounds the tragic and the comic, the sacred and the profane, the pleasant and the unpleasant, heroic strains and mere howling.” He said **Beethoven brings feelings “not of love but of madness.”** He incites people to “scornful laughter instead of lifting our thoughts to God.” He hated what Beethoven was doing. Only during later years did Schubert appreciate Beethoven’s power.

**Dean:** He could not comprehend how music could become more complex and beautiful. **He transformed and transcended the past.**

**Tom:** I don’t get it.

**Dean:** You have grown beyond the emotions of childhood. You don’t cry for your milk anymore. So there is some music that brings us beyond our egos and into a larger community.

**Britten:** Now think about this: you may **listen to music for its own sake, simply for enjoying the feeling it evokes. Music says what you cannot say with words.**

**Tom:** But, there is no struggle for survival here. There is no **Natural Selection.** So, I still don’t get why music would evolve or how there could be a purpose for it.

**Britten:** There are reasons for evolution apart from survival.

**Dean:** I’m curious about this, too, like Tom. *(Pauses)* At one time, there was no such thing as a concerto. Australopithecus could not have appreciated it. The emotions of humans matured in civilization. And it may have something with changes in the body’s vibrations.

**Britten:** **There is a rhythm is in the body. In ancient times, the body’s rhythms brought people to share their feelings with one another.** People needed to celebrate a birth or mourn a death. Music deepened our lives. It created a greater sense of who we are.

**Mary:** Can you tell us, Why are we here?

**Dean:** Professor Britten. We talked about the fact that Mozart was an inventor. He brought forth deep emotions and enriched our lives. You spoke to me about **Mozart’s Concerto No. 9 in E-flat major.** Could you describe for us something of the way that piece develops musically?
Britten: We first hear, Allegro, then second, Andantino, and third the Rondo. And in each of these three concerto movements, **Mozart combines different musical elements to create something new.** He was working with a soloist to create a sense of her feeling and presence to the audience.

The first movement gives the listener, for me— the impression of **joyful audacity.** There is an eagerness to move ahead, almost unpredictably. And then in the second movement, **a key change takes place to relative “C-minor,”** and this shifts everything into a dark place. It is infused with a terrible sense of mourning and anguish. Finally, the third movement combines both of these feelings into a single intricate and beautiful, almost terrifyingly emotionally complex whole.

Dean: How does Mozart **synthesize** such different moods…from joy to agony and then to a new power that integrates such different moods?

Britten: Mozart develops two emotional sides in the person of the pianist. He wants to **dramatize the tension between the first and second movements.** Then he integrates them by using repeated contrasts in instrumental texture, harmony, melody and theme. I am moved when I hear it.

Dean: I see: It’s the metaphor expressed through music. **Mozart is bringing together those contrasts to produce a higher, deeper mood.** He is **synthesizing** these movements.

Britten: I think so. The first movement is about the boldness of the soloist; it is joyful. The second movement in C-minor takes the concerto's drama in an entirely new direction. In it Mozart introduces a vivid emotional dimension to the soloist – raw, mournful, soul-wrenching anguish. The musical contrast of the second movement is harmonic; but once again there are additional, less prominent contrasting elements that advance the same thematic ends.

Tom: Does Mozart have a **purpose**?

Britten: Well. These contrasts serve two purposes. First, Mozart uses harsh dissonances to set the stage; I mean he creates a harmonic conflict between voices in the orchestration. This deepens the listener's sense of spiritual anguish. Then, he intertwines C-minor passages (the main body of the movement) with – I would say -- wistful harmonic forays back to E-flat major. This serves as a signpost for reminiscence of the "happier days" of the first movement. So Mozart uses harmonic contrast to highlight the comparison between the two moods of the soloist, whom I mentioned, developed in the first and second movements.

Dean: But how does Mozart make the transition between the two moods?
**Britten:** To emphasize the new (mournful) aspect of the soloist in the second movement, Mozart uses musical contrasts, carefully chosen. I can tell those of you who know music. Some of these “contrasts” are anything but subtle: for example, the Andantino tempo of the second movement is markedly less lively than the Allegro of the first, which sends a signal to the listener that an emotional shift is to take place. Composers would understand why Mozart decided to write this movement in the relative minor (C) of E-flat.

**Dean:** I am not sure all students are following this point.

**Britten:** The harmonic minor scale contains a dissonant augmented second interval between the sixth and seventh degrees. Mozart uses it to good effect. In measure 4, he uses a neighboring non-chord tone on the downbeat to introduce the augmented second dissonance between the first and second violins; and then he accents this harsh sound -- laden with associations of mourning -- with a decisive *fortepiano*. This forces the movement's modality into the listener's consciousness. A similar device occurs in measure 12, where Mozart once again adds non-chord leading tones into an “iv chord,” where they make the same augmented second with “A flats.”

**Dean:** Goodness! I think you are far beyond the class. Students, do you have questions? He is talking about the development of new sensitivities, the evolution of emotions. What about your major field?

**Barbara:** We said the principles of evolution are the same in music as in physical world, only transcended. In this class, we have talked about how atoms “transform” into molecules, molecules transform into cells, and so on. That led me back to thinking, in terms of political science, about how nations transform. What does “transformation” mean in music?

**Britten:** “Transformation” in music is any process that a composer may apply to some basic element in the composition. An element might be a melody or a chord that changes its progression. It may involve *rotation*, *permutation*, *inversion*, *retrogression*, indeed, all sorts of reversals and combinations can transform the sound. If the change is big, it becomes a *metamorphosis*.

**Tom:** In biology we looked at evolution as both slow and sudden, with occasional gaps or leaps. Is music the same?

**Britten:** Change in the course of music is also both slow and sudden. Look at the music of Arnold Schoenberg. Schoenberg's atonal music made a strong break with the past in harmonic structure. This quick kind of change does happen. But some music scholars now challenge just how sudden even *this* change was. They argue that Schoenberg's “atonal” music does not
constitute a sudden break, that is, a *qualitatively different* type of music. Much of his music is “atonal,” but Schoenberg did not make a complete break with prior practices, even in the harmonic realm. Instead, he transformed music by a series of incremental changes.\footnote{33}

**Ann:** I’m majoring in theater. We ask: what is the purpose of theater? Shakespeare says theater holds up a mirror to us …we are actors on a world stage. My teachers say, “Theater arouses, enlivens, and enriches.” So my question is... What is music for?

**Benedict:** Check your body. **Music is life; it’s your nature.**

**Ann:** What does that mean?

**Britten:** It means that music starts with natural needs. **Have you ever been on a lake in the woods and heard the call of a loon?** Loons are social. They make different sounds…different calls. The *hoot* call keeps them in contact with mates, and their chicks. The *tremolo* call sounds like... insane laughter. This call consists of 8 to 10 notes and is voiced with different frequencies and intensity. It’s a sign of agitation or fear: a predator is too close.

The *wail* occurs at night; you can hear it for miles. It is haunting. It keeps these creatures in contact with each other. They have a community to maintain: they support each other; they need each other. Then there is the *yodel*. It is made by male loons to advertise their territory. If you hear it, you are too close. Give them some space.

**Tom:** You mean: the body and the mind work together like birds of a feather? I am serious. The body and mind must work together to create music.

**Britten:** Yes. The body and the mind interpenetrate. But the mind has a higher purpose than the body. **Leonard Bernstein said, “Music... can name the unnamable and communicate the unknowable.”** Leonard da Vinci said: “Do you know that our soul is composed of harmony!”

**Dean:** Music is a “richly grained experience.” It cannot be explained by a scheme. But can also be the *cause* for thought! How is music connected with the body? *(Smiles)*

**Britten:** When we talk about music, we say, the sound is going “up” or “down.” That’s a perception we learn from our ears in relationship to our whole body. We learn that concept from our bodily experience of space. In music we talk about a composition being either in “contraction” or “expansion.” We get that concept from bodily perception, from *feeling*, tightening and relaxation in our own bodies and from *seeing* something’s external to ourselves contract and expand. We talk about music as being “warm” or “cool.” We get that from the body *feeling* a temperature external...
to itself. But then from those bodily experiences we *abstract* from *perception* to *conception*. But the body is the source of the idea: music goes—usually—from pulse and impulse to rhythm and thought.34

**Dean:** When Beethoven was asked about his compositional process, he said: “The elaboration begins in my head: expanding, compressing, raising, and deepening...It rises, it grows tall, I hear and see the image in its entire extent, as if cast in a single mould.” What do you think?

**Derek:** Mozart could translate the sounds he heard in his head onto paper.35

**Alice:** Would you say that music has a philosophy?

**Britten:** Yes... and no. The *philosopher* Schelling said, “Art documents what philosophy cannot represent externally.” The “aesthetic”—music, in this instance—“is the culmination of a philosophical system.” Music *is the end of philosophy*. Music is not philosophy, but is emblematic of something more.

**Alice:** More what? What did Schelling say?

**Britten:** He said: *more freedom*. Freedom is evolving through music. Music helps us to arrive at a greater sense of freedom...more choices perhaps in some heavenly place.

What is the future of music?

**Perry:** I have looked into this. A *resonance* operates throughout all the body’s organs. The motion of the liver chimes with the movement of the heart at the interval of an octave. What I mean is this vibration is real, not just in our imagination.

**Dean:** Thanks, Perry; this is a knockout! This resonance should be measurable, and so scientists should be able to prove or disprove this hypothesis. I know about body’s homeostasis but not about the harmony.

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**Vibrations**

**Britten:** Pythagoras discovered that the *pitch* of a musical note depends upon the length of the string that produces it. He correlated the intervals of the musical scale with simple numerical ratios. Look.

An octave is produced when a musician plays a string that is stopped exactly halfway along its length. The octave has the same quality of sound as the note produced by the unstopped string; but since it vibrates at twice the frequency, it is heard at a higher pitch. The mathematical relationship between the keynote and its octave is a frequency ratio of 1:2. In every type of musical scale, the notes “progress” in a series of intervals from a keynote to the octave above or below. Pythagoras discovered musical harmony.

**Alice:** Did he see a connection to the universe?
**Britten:** Ah, yes! For him—as for Lord Byron, music on earth was a faint echo of the “harmony of the spheres.” In ancient cosmology, the planetary spheres ascended from Earth to Heaven like the rungs of a ladder. Each sphere was said to correspond to a different note of a grand musical scale. Each tone sent out by the planets depended upon the ratios of their respective orbits, just as the tone of a lyre-string depended upon its length.

**Perry:** Kepler was an ardent Pythagorean. Pythagoras and Plato had idealized the circle but Kepler found “nature” in this case preferred the ellipse. The astronomer Fred Hoyle said that Kepler’s description of the correspondence between musical ratios and planetary velocities is “frighteningly good." Pythagoreans used music to heal the body and to elevate the soul.

**Perry:** Physicists know that vibrations began right after the Big Bang, and that they kept going. We live in a universe of vibrations. They began by opening up those subatomic particles with a spin. Physicists see a progressive evolution in vibrations that step up in size. **Atoms are made of a nucleus and electron shells. The electrons orbit the nucleus and rotate about their own axes. These are vibrations in the category of a million billion times a second (10 to the 13th Hertz).**

**Dean:** Does the frequency of these vibrations change at each stage of evolution? Does it change from atoms to molecules…to humans?

**Perry:** Yes. **Atoms are in groups with a much lower vibration due to their larger mass, but still in the category of Gigahertz (10⁹ Hertz).** If we look at any aggregate of atoms in a crystal, we find two kinds of motion: a circular spin-like motion and a reciprocating, to-and-fro motion, at relatively fixed points.

**Dean:** Is it possible to trace the different atomic and molecular levels of vibrations all the way from the Big Bang to organisms, and Homo sapiens?

**Perry:** Vibrations are “turtles all the way down.” In theory, it could be “music all the way down”—dissonance, harmony, pitches, and melodies. **At the molecular level, vibrations could go from monatomic to ionic compounds, and to polymers—chains that are 100,000 units long—to the DNA. The vibrations are measurable in stages, even though we cannot hear them with our ears. A vibration occurs when atoms in a molecule are in periodic motion, while the molecule as a whole has constant rotational motion.**

**Dean:** What about the cells in an organism?

**Dean:** Have any scientists studied the music of molecules?

**Perry:** Sure. Google “Gene2music” and look for “samples.” You can hear “protein music” there. Check out the websites of biologists. You can
listen to compositions and even submit your own genetic sequence and have it translated to music. The browser allows you to send in a sequence coding for a protein, which will then be converted into music and returned as a MIDI audio file.

Tom: I’ll check it out…Darwin thought music might have its “origin” in animals. These rhythms of molecules -- like bird songs in courtship – may have some sort of meaning for them. Monkeys beat on hollow logs marking territory.³⁷

Derek: The sounds of chords are in the unconscious, waiting to be heard. Beethoven’s chords must speak of sounds that he heard himself, while composing. They are already there, potentially. You just have to learn how to hear them.

Perry: Dmitri Tymoczko teaches at Princeton. He borrowed some of the mathematics that string theorists invented to test “the secrets of the universe.” (He writes on the board.)

**Chords and String Theory**

He found a way to represent the universe of all musical chords in graphic form. (By the way, he wrote the first paper on music theory ever published in the journal *Science.*) He says the cosmos is filled with chords of weird, multidimensional spaces, known as orbifolds; they turn back on themselves with a twist. They are like the Möbius strips that math teachers use to prove that a two-dimensional figure can have only one side.

Ah! Fibonacci numbers apply to Bach’s *Art of the Fugue!* The Fugue starts simple, like the universe before it becomes complex. Soon it’s elaborate – turning and twisting around its central theme, like a spiral dance up a staircase, ascending in circles, like the inside of a seashell.

Dean: Great! Harry… and Stewart, what do you know about the Fibonacci numbers? Does it have anything to do with evolution?

**Math and Music**

Harry: Fibonacci numbers advance in this way: 1, 2, 3, 5, 8, 13. You add the last two numbers together to get the next number.

Dean: And what about the Golden Ratio?

Harry: The Golden Ratio. Two quantities are in the Golden Ratio if the ratio between the sum of those quantities and the larger one is the same as the ratio between the larger one and the smaller. The Golden Ratio is a number equal to about 1.61…or, something like that. The digits go on forever without repeating.

Alice: The Golden Ratio may explain evolution. Plato said our senses conceal pure thought. There is a hidden truth beyond everything. Stewart,
what do you think?
Perry: The Golden Ratio exists in molecules. The DNA is based on the Golden Ratio. The length of the curve in each of these helixes is 34 angstroms and the width 21 angstroms. (One angstrom is one hundred millionth of a centimeter.) The numbers 21 and 34 are two consecutive Fibonacci numbers. You can also find the Golden Ratio in crystal structures and snowflakes. I am looking into the question of how spiral galaxies carry the Golden Ratio in their structures.
Britten: You are not alone. The violinmaker Stradivarius was aware of the Golden Ratio and used it to place the f-holes in his violin.
Dean: Could symphonies be created around this Ratio?
Britten: The opening motif of Ludwig van Beethoven's Symphony No. 5 in C minor, Op. 67, occurs exactly at the Golden Mean point of 0.618 in bar 372 of 601, and again at bar 228, which is the other golden section point—0.618034 from the end of the piece, but Beethoven had to use 601 bars to get these figures. Bob, you looked at this. Please hand out that information we talked about.
Bob: There are many articles and books that explain how composers use the Golden Mean in their music.38
Britten: The Golden Ratio is in sections of Claude Debussy's Image, Reflections in Water. The sequence of keys is marked out by the intervals 34, 21, 13 and 8; and the main climax is at the phi position. It is also in La Mer, but I'm not sure whether Debussy sought purposely to do it.39
Perry: I think the Golden Ratio goes through the whole process of evolution. You find it from sunflowers to classical music.
Perry: Right. The Ratio should be found in every subject -- from architecture to aesthetics, from music to zoology.
Britten: You can see the Fibonacci pattern on the piano: there are thirteen notes in the span of any note through its octave. A scale is comprised of eight notes. The 5th and 3rd notes create the basic foundation of chords and are based on the whole tone, which is two steps from the root tone, by that I mean the first note of the scale. The piano keyboard scale of C to the C above, a span as I said of thirteen keys, consists of eight white keys and five black keys split into groups of three and two. In a scale, the dominant note is the 5th note of major scale. The sequence of keys is marked out by the reverse intervals 34, 21, 13 and 8. And so it keeps going with the Ratio.40
Dean: Stewart Perry! Do you find these same proportions and ratios applying in chemistry?
Perry: It’s in the law of constant proportions of chemical compounds. This is a fundamental chemical law.

Dean: What does this law mean?

Perry: Joseph Proust discovered it in 1799 while looking at the law of definite proportions. He found that copper carbonate must always be made from the same fixed proportions of copper, carbon, and oxygen. All compounds contain elements in definite proportions. I mean: chemical compounds have a constant structure, which is not dependent on the conditions of their formation.

Dean: Can you explain that better for us?

Perry: In physical chemistry we see that the atom ratios in compounds are equal to the ratios of the Fibonacci numbers taken through one: 2/5, 3/8, 5/13, 8/21, 13/34. We know that such ratios strive in the limit to the square of the golden proportion.  

Dean: My God, Stewart! And this also shows up in plants and vegetation?

Perry: In plant morphogenesis there is a field called phyllotaxis. It is the study of symmetrical constructions in organs of plants. It’s about their origins and functions in the environment. And this is connected to Fibonacci numbers. The Fibonacci patterns are in the organization of vegetative shoots and reproductive structures in plants.

Dean: So this is how we evolved from the Big Bang! The significance of this Ratio to evolution must be GREATER THAN THE PRINCIPLE OF NATURAL SELECTION. The principle of Natural Selection cannot be found from the beginning of the Big Bang to Beethoven.

Perry: Some call the Golden Ratio mystical, but I know it is rooted in science. I know it is in galaxy formations. The spiral inside M51 -- the Whirlpool Galaxy -- is close to this golden section. The ratio of the lengths of the thorax and abdomen in most bees is connected to the Golden Ratio. A cross section of the DNA fits nicely into a golden decagon.

Dean: Could “music” be a basis for research in physics?

Britten: Who knows? Think about these concepts in music theory: harmony, discord, minor, major, accelerando, andante, pacato, perfect interval, pitch, roll, rubato, diatonic, meter signature, triplet, theme, and the list goes on. Could we be composing our own history?

Derek: Stravinsky’s The Rite of Spring shocked people out of their seats -- when it was first played in 1913. It was explosive, like earthquakes and storms; masterful, like the birth of a never-before-heard musical season. So, I’m wondering what’s next? What’s next in music?
Jerry: The sounds of atomic vibrations are outside our ear’s capacity to hear.

Dean: Have a great weekend!

11. The Field of Theater, Drama, and Poetry

The Dean: We have with us Professor Bertolt Simon from our Theater Arts Department.

The Evolution of Theater

Ann: Thank you. The beginning is in “folk theater.” In India, theater began in the second millennium B.C. E. with rituals and feasts among tribes. They “acted out” events that took place in their daily lives. Historians write about how some members pretended they were wild animals and others were their hunters. But there is no hard evidence for exactly when this started.

Theater in India began to develop in a more formal way with the Rigveda and its hymns. The Ramayana and Mahabharata became the first plays in India. Sanskrit drama became a distinct art in the last few centuries B.C.E. -- associated with seasonal festivals. A man named Bharat Muni wrote the Natya Shastra. This may be the earliest (surviving) text on theater and drama. This early theater evolved what have become the different fine arts – such as dance, music, mime, sculpture, painting and architecture. Bharat Muni was the leading figure…He lived in the second century B.C.E.42

Theater in China began around 1500 B.C.E. during the Shang Dynasty. It was accompanied by music with lots of clowning and acrobatic displays. The Tang Dynasty is known as "The Age of 1000 Entertainments." Ming Huang formed an acting school known as “The Pear Garden” and produced a type of musical drama.

Professor Simon: Ann has studied theater from around the world, but it would take her too long to tell you the whole story. So, Ann, would you…summarize quickly.

Ann: Yes sir. The earliest recorded theatrical events I could find took place in Egypt; they date back to 2000 B.C.E. These were passion plays. The story of the god Osiris was performed at festivals.

Greece. The most famous playwrights flourished during the fifth century B.C.E.: Aeschylus, Sophocles, Euripides, and Aristophanes. At that time tragedies and satyr plays were performed at a festival in honor of the god Dionysus in Athens. These writers produced a series of
performances called a "tetralogy." The first, second and third plays of the tetralogy consisted of a dramatic trilogy based on mythological events; the last performance was a satyr play. The latter was a play on a lighter note, with some dance and celebration. Performances of a tetralogy lasted for seven

**Chart: Evolution of Theater**

**Ann:** The dithyramb was an ancient Greek hymn sung to the god Dionysus. It was the music of their religion in the 6th century B.C.E. in Athens.

As you can see by my timeline, a poet by the name of Thespis started theater there. Thespis impersonated a character and interacted with a chorus. He invented the first “musical” – so to speak -- with chorus members, who were singer-dancers. There had been a chorus before he came on the scene, but now the singers engaged in dialogue with him.

**Ann:** I can accent your “principles” of evolution. Let’s see: I mentioned how playwrights “invented” plays some 200 years after Thespis created a “social” dialogue with his chorus. We see the plots of tragedy and comedy emerging with increasing complexity. The first three playwrights were tragedians. You could say that tragedy is an attempt to “resolve opposites.” In fact, dramatists argue that Greek tragedy should be seen as “interplay of opposites” – what have been called the Dionysian and Apollonian forces.

Aeschylus is famous for his *Oresteia*. Here I see greater “complexity” in plot formation. Yes, I would argue that human drama developed more complexity in the plots during the peak period of development of Greek tragedy. I think Sophocles developed even more complexity in *Oedipus Rex*...

**Dean:** Let me propose a principle: Greek playwrights put abstract ideas into their stories, developing a greater “interiority” in the process.

**Ann:** Yes, I would agree. A more complex interplay began to develop between the roles that actors took. There was an increased refinement and expansion of each character, more individuality, and a greater emphasis on the interior life-- that is deeper dimensions of emotional life.

**Dean:** What about sacred and secular?

**Ann:** At first, these plays developed a strong religious theme—Athena and Apollo played prominent roles in the resolution of Aeschylus’s trilogy the *Oresteia*, for example—but Euripides began to develop a “natural” (more secular) theme.

**Prof. Simon:** You said human emotions started with animals. Now emotions are the subject matter of theater on a more complex level.
Dean: Theater now allows people to become more of an observer of their own emotions, not just participants.

Prof. Simon: But the deep emotions in civilization are timeless, like rage, grief, jealousy, humor, and love. They are with us as the same or similar across all cultures.

Dean: You mean timeless in terms of human history. Ann said that four thousand years ago theater consisted mostly of festivals and circus performances in which crude emotions were expressed. Does theater history show how the crude evolves into refined emotions over time? How do “rage” and “terror” in animals develop into lighter versions of human “anger” and “fear” and anxiety? Theater might tell us something about this evolution.

Prof. Simon: Explain more of what you mean.

Dean: Humans share the feeling of panic with animals, but since Homo sapiens the brain has been evolving. When does a feeling of respect first evolve? When does a sense of courtesy appear? When does patience appear? The evolution of human emotions has never been written. What do students think?

Tom: In biology, we do not know for sure if we can use the word “emotion” to refer to what happens at the animal level. I could see “patience” in the lion “waiting” for the kill. Lions wait patiently to pounce on antelopes. But this is more “instinct” than emotion.

Kathleen: I think that patience develops into “faith” over time. Look at the story of Job in the Old Testament.

Tom: A variety of emotions differentiate in the evolution of human emotions -- fear and worry, fright and horror, trepidation and apprehension, and so on. There is complexity as such emotions evolve in humans. Theater allows us to understand them.

Ann: The greater number of emotions you can master in theater means the greater freedom and power you have as an actor. There is more choice -- for actors to portray the range of human emotions: Panic, terror, fright, dread, dismay, disappointment, sadness, misery, shock, unease…these are all different human emotions. The actor must know them all.

Yes, and there is more choice for writing plays when you know all the different emotions. Do you understand what am I saying? These principles of “increasing freedom” with complexity have been principles of evolution.

Prof. Simon: Roman theater developed carnival-like religious festivals. They included prizefighting, flute playing, dancing, and some acting. After the fall of the Roman Empire, theater almost died.
Dean: Theater virtually died in the Dark Ages? Then, what about continuity? Does Greek and Roman drama become extinct before another species arises? How does this compare with our views on the continuity of biological evolution? Tom, what do you think?

Tom: I could make a guess based on biology. The taxonomic structure of biological life goes from the Kingdom (such as Animalia) to Phylum to Class to Order to Family to Genus to Species and Subspecies.

So we can make this analogy: theater is one species of art while music and painting represent other species under the same genus. So, art is the Genus and theater is the Species, while Greek and Roman Theater are subspecies. Let’s say that Greek drama is a subspecies of a class. It is like a butterfly that exists under the class of Insecta. And there are many subspecies of butterflies that die out but leave their genes to other developing butterflies. So Greek theater died out as a unique species but left its type of drama to the Romans, who took it up giving it a different coloring. And then that species got wiped out, while another species began to evolve.

Tom: Lightning starts fires that destroy forests. There is nothing left but arid land -- until another set of trees starts to grow up. It looks like the Dark Ages until a new forest rebuilds.43 (The Dean is amazed again.)

Prof. Simon: Now we begin to see a secularization of theater.

Dean: Secularization separates from the sacred! How?

Ann: It means that the church does not control the theater. Instead, theater differentiated and became autonomous along with the institutions of society. Theater differentiates along with institutions, such as government and the market, and religion. The free market allows theaters to evolve in new ways.

Simon: But in 1642, the British Parliament closed the theaters. This was at the time of Oliver Cromwell and the Commonwealth in England. There was no theater again until Charles II came to the throne in 1660. The plays at that time were masques—with a concentration on costume, dance and bright scenery, not much acting with a plot.

Anne: But during the 1600s in France, theater developed with Jean Racine and Molière. They wrote some of the best comedies in European history. (You can see them listed on my chart.) I personally like Le Misanthrope by Molière because the play differs so much from other farces at the time. It had dynamic characters, like Alceste and Célimène, as opposed to the flat characters of most satirists.

Now notice gender changes. Women began to appear on stage, instead of just young men and boys taking female roles. This had been
the case even in the plays performed during Shakespeare’s time right up until the revival of theater in 1660. This was a big step. After that, greater freedom evolves, more choices for actors.

Simon: Theaters had been licensed and controlled by the state, but with markets at the beginning of the 18th Century, we see a broader concept of theater appealing to property owners and merchants, and then eventually to the general public.

Mary: William Shakespeare shocked people with new language. He developed more complex feelings and opened new doors. What had been private performance for royalty went public on the stage at that time. He portrayed the private emotional life of kings and queens.

Ann: In Shakespeare's time, the emphasis on stage scenery was lessened and the plot’s complexity increased. Shakespeare expresses subtle feelings along with the crude. Private feelings go public. There was a growing awareness among what the Dean calls “antinomies:” crude and refined, conscious and unconscious, private and public.

Ann: Theater works best -- depends on -- tension and resolution. Shakespeare invented hundreds metaphors to create new feelings. I recall some: “The earth has music for those who listen.” “The love of heaven makes one heavenly.” “There’s method in my madness”; “I wear my heart on my sleeve”; and “fair play,” “a sorry sight.” Shakespeare helped us evolve with new thoughts. He was incredible!

Simon: Shakespeare’s villains subvert “the glory of war.” You will see subversive intent in Henry V and nearly every other one of Shakespeare’s works on war. These plays pretend to depict the heroism of battle, but their subtext calls into question the legitimacy of war. They critique the actions of “mighty men.” They “mangle their glory.” Shakespeare exposes the immorality that thrives under the guise of bravery and nationalism.

Dean: Yes, but that’s technology. We talked about how technology is the clearest example of a continuum. We saw the continuum of an increase in speed—from walking to chariots to bicycles, automobiles, airplanes, jets and rockets. But theater and drama has its own story.

Dean: Tell us more about changes from the sacred to the more secular modes of theater.

Simon: You are asking too much of us in our time period. Look at Faust in the 1800s. (Simon is now teasing the Dean on his search across disciplines.) You must have heard Faust, the play by Johann von Goethe.

I've studied now Philosophy
And Jurisprudence, Medicine, 
And even, alas! Theology 
All through and through with ardor keen! 
Here now I stand, poor fool, and see 
I'm just as wise as formerly.

Faust is a man who is in a struggle to know everything he can about the whole universe. Could it be an analogue for what you attempting in this very class?

Dean: But Faust is a character out of German Romanticism. We -- this class -- do not belong in that category! We stand between the real and the ideal and are looking for resolutions. We are not “Romantic.” “The Devil enters as the tempter of the academic mind. This is what happens to “mad genius” unfettered by rules.”

Dean: In evolution, Romanticism cannot win out over Realism. Nor can Spiritualism win over Materialism. Now, let’s continue with the evolution of theater. Tell us about Romanticism. It is only a phase of evolution.

Dean: Simplicity and complexity. Is there a constant increase of complexity?

Ann: Richard Wagner’s operas show a more complicated (she reads) “contrapuntal texture, rich harmonies and orchestration, and an elaborate use of leitmotifs. He pioneered advances in musical language, like great color and shifting tonal centers.” For sure, Wagner transformed the arts by mixing them together. He called this combination "total artwork."

Dean: Would you call Wagner’s work a synthesis?

Simon: Wagner was synthesizing all the poetic, visual, musical and dramatic arts.

Dean: This is now a new conflict -- Reason against Absurdity.

Simon: Well. You could look at it that way. A popular genre of the 20th century was called Absurdism.

Absurdism reached its peak in the 1950s after World War II but it kept influencing drama right through the 1970s. Samuel Beckett’s Waiting for Godot is considered a quintessential Absurdist play.

Dean: So we see parallel attitudes toward the world in theater and literature -- Realism and Idealism, Romanticism and Naturalism. Theater “acts out” the emotions behind these philosophies, so that we are made to feel them at a personal level.
Dean: Ann, once again, do you think that theater gives us a richer understanding of ourselves? Does theater help us answer the question “Who are we?”

Ann: Yes. Some people say that plays are just entertainment but I would say theater teaches us. “With which character do you most identify?”

Dean: What is the purpose of theater? Does theater help us evolve?

Benedict: I saw a theater production last night by Evan Brenner. It is a monologue drawn directly from the Pali Canon, that is, the Theravada Buddhist scriptures. It tells the life story of Siddhartha Gautama. Are we evolving toward that light?

Simon: I saw a play about the Buddha called Siddhartha. It was an adaptation of Herman Hesse’s classic novel about the Buddha. I should also add that theater in this case is drama but also non-drama; I mean, this notion of “pureness” where there is no normal emotion.

I saw an opera at the Metropolitan Opera in New York City called Satyagraha. It was about the power of light and “truth-force” that Gandhi proclaimed. The opera Satyagraha was by Philip Glass. There were no dramatic emotions, I mean, no fierce jealousy or flaming resentment. There was no adultery, betrayal, revenge, and murder, no gripping drama.

Dean: But “drama” is what theater is all about.

Simon: Drama was not the essence of this opera. The leading edge was a feeling of pureness, purity. (The Dean is thinking No: Aristotle says that a plot is a knot. It is tied out of the multiple strands of competing wills. The ugly knot will in due course come undone. It happens in a climactic moment of “loosening tension” or "dénoyement.”)

As the opera progresses, it happens almost imperceptibly, but he sheds more and more of his clothes. By the end he's the Gandhi you recognize from images of him: the slender, bird-legged figure in the white loincloth. These acts of shedding outer garments had an extraordinary power in this staging. It is like people shedding their ego. At the end of the battle scene in Act I, you know that Gandhi has the support of the chorus. Suddenly they take off their shoes and line them up, dozens of them, downstage.

It goes with the abandonment of the "I" for the "we." They say with the Bhagavad Gita: "Let people feel hatred for no being.” The scene is spare, but it has these elevated feelings.

Simon: Gandhi sings: "The Lord said, I have passed through many a birth and many have you. I know them all but you do not.” These sacral lines are sung to a single musical figure—a beautiful ascending scale, of eight notes,
in the Phrygian mode, repeated thirty times and yet never quite the same in each repetition.

The Evolution of Poetry

Professor Burns: Poetry began in ancient times with speech and oration. Storytellers would recite their histories and recount the dramatic stories of their lives together. Consider the *Iliad* in Ancient Greek times and *Beowulf* in Middle English. At first, the stories were oral. People made no distinction between what we would call “myth” and “history.” They were “tales” with some correspondence to fact.

Dean: How did these tales evolve?

Burns: They evolved from one another – the way, as you would say, that molecules evolved from atoms. Virgil composed the *Aeneid* by following closely the epics attributed by many to Homer, the *Iliad* and the *Odyssey*. He hoped that his would be the Roman version of these two Greek epics, joined together. You might say he synthesized (combined) the old myths and Homeric legend. The poetic details were his inventions. The foundation is the hexameter, the same in both languages, and the body also has its rhythm.

Burns: Hexameter is a metrical line of verse consisting of six feet. It was standard in classic Greek and Latin literature. It is in the Iliad and the Aeneid.

Dean: What about *Beowulf*? It goes back to the 7th century C.E.

Burns: You can identify the meter and alliteration in the first 16 lines of *Beowulf*. Most poetry is based on meter. Meter is a pattern of sound; it’s the rhythm of a poem. In poetry, a “foot” is composed of syllabic sounds.


Kornberg: Thank God we have science without religion!

Dean: Yes! Thank God we have science and poetry! I have been proposing that evolution is based on “opposition, tension, and resolution.” This would include the tensions between purpose and chance, structure and change, and more. The resolution tells us something about the nature of things.

Burns: The poet has more than a hundred devices to choose -- metaphor, irony, repetition, metonymy, synecdoche, and so on... Do the math on the possible combinations and permutations; the choices would be endless.
Anne: (to the Dean). You said that “intuition” is one source of knowledge. Poetry is based on intuition and insight. Poets have known about evolution for a long time – for centuries before Darwin. Poetry is based on insight, and a sixth sense. Poets know more than scientists do about their own field. *(Kornberg twists in his seat but says nothing.)*

Dean: Tell me more.

Anne How could a poet in the 13th century know evolution (by intuition) before Darwin knew it empirically? Do you remember this Rumi poem?

*I died as a mineral and became a plant,*
*I died as plant and rose to animal,*
*I died as animal and I was Man.*

*Why should I fear dying?*

Benedict: Your concepts in chemistry -- attraction and repulsion, symmetry and asymmetry -- came from somewhere. Where did you get those concepts? What was their origin? These words originated with language -- long before the science of chemistry ever appeared.

Kornberg: The average brain consists of one hundred billion neurons. Each neuron is connected to other neurons: typically about one thousand neurons are connected to ten thousand others. The number of combinations possible for different thoughts (or brain states) in each of us can exceed the number of known particles in the entire known universe.

Dean: That’s incredible! The brain could be evolving to represent the universe!

Kornberg: A baby's brain begins in the womb. Four weeks into gestation, the first neurons are already forming at a rate of 250,000 every minute. It’s like the Big Bang. Billions of neurons will forge links with billions of other neurons and eventually there will be trillions and trillions of connections between cells. Every link between neurons is organized based on its history. At this point nothing is random; nothing is arbitrary.

Kornberg: Professor Britten, you should read *This Is Your Brain on Music!* It’s a layman’s guide to the neuroscience of music. It tells how babies begin life with synaesthesia; they hear sounds as smells and tastes as colors. According to this account, by the age of five we are all musical experts, so I must conclude that music is wired into the brain.

Britten: So the physical brain is the key to music!

Kornberg: These studies show that watching a musician perform affects brain chemistry differently from listening to a recording. Researchers
find *encephalization* vital in this process. Encephalization is the process by which “brain mass” increases dramatically in relation to total body mass.

It’s a process of “differentiation and synthesis.” A simple “synapse” first emerged in a single-celled eukaryote. Then it underwent expansion and diversification … repeatedly. It developed further into the components of the brain—we know today—as multicellular organisms branched out from single-celled organisms, and again as vertebrates branched out from the invertebrates. These synapses have not stopped evolving. And so, all evolution -- including consciousness -- comes back to the “brain itself” evolving.

Dean: *Yogis can control the heartbeat, blood pressure, and white blood corpuscles. This has all been documented. They develop an incredible self-discipline. It is consciousness that makes the chemistry change. Conscious life can shape – maybe regulate -- the brain’s nervous system.* *(Kornberg is not happy.)*

Burns: Oh! The poet Jane Hirshfield says that poetry swings between the “language” of the conscious and the unconscious. You could argue that the unconscious is closer to the nervous system than the conscious mind.

Benedict: You mean the brain and the body could be speaking to us, poetically, through the unconscious?

Burns: In his book *Leaping Poetry* Robert Bly says poetry “can be described as a leap from the conscious to the unconscious and back again.”

Ann: I propose: “Great poets and playwrights search to find what is universal.”

Kabir was a poet in India during the 1400s. The Dean might be interested in his poem. I brought a copy. *(He reads:)*

> **Between the conscious and the unconscious, the mind has put up a swing:**
> all earth creatures, even the supernovas, sway between these two trees, and it never winds down.

Dean, which wins in the long run? Is it Life or Death?

Dean: Very funny. That’s it folks. Thanks for coming to class, everyone. See you next time.

### 10. The Field of Philosophy

Dean: Welcome everybody. Today we have with us Professor Arthur James.
Notes on Evolution  
From Professor Arthur James

Thursday Night
The list below could be called antinomies or polarities. I learned them years ago from the Dean:


When one side is exaggerated or overemphasized, there will be a distortion about the true nature of things. For example, Quality and Quantity are very different from one another, even though some scholars have seen one side subsumed under the other. What examples can I give of this problem down through history?

The sound of a musical chord is not reducible to numbers, like a 2:1 ratio. In the last century, psychologists tried to quantify intelligence by I.Q. scores, but they could never fully reduce this concept to a number. Quantity and Quality are different aspects of intelligence and linked, but one cannot fully explain the other.

There are other variations on those ideas listed above. Other pairs could be listed (e.g. Matter/Spirit or Body/Mind, and Form/Content), but my purpose here is to help you learn how to think. I am giving you a way to think reflexively with the greater likelihood that you will get more truth out of your inquiry. The perspective I present is not dualistic, but a method for thinking about nature in its evolution. These are categories in philosophy that serve as a strategy to check whether you are on the right track. The polarities are guides, not to be taken as final principles that explain everything.

Postmodern Philosophy
Well, structuralists search for polar oppositions in culture. For example, the anthropologist Claude Levi-Strauss argued that such oppositions are found in all cultures, so for him they became a device for interpreting data in his fieldwork. He saw polarities as fundamental to di
I look at polarities (antinomies) from a different standpoint. Objectivity exists with Subjectivity. What is logos?

Heraclitus postulated a model of nature that created the foundation for all other speculation on physics and metaphysics. It was his idea that the universe is in constant change, and that there is an underlying order and reason for this change called —Logos. This term -- from his time on -- formed the foundation of European thought. Every time you walk into a science class, or an economics class, or political science course, everything you do in that class originates with Heraclitus's speculations on change. Now, what is Logos? Well….

Logos is the union of all opposites. Logos cannot be deconstructed without losing Reason itself. What does that mean?

In his essay "Différance," Derrida says that this key word points to a number of diverse features that govern the creation of meaning. The first is “deferral,” which asserts that words can never fully signify what they mean; they can only be defined through an appeal to additional words, from which they differ even though they appear similar. Thus, “meaning” is forever "deferred" or postponed through an endless chain of signifiers.

Do you see?

So, a “complete meaning” is always postponed in language; there is never a moment when a “meaning” is fully understood. So how does this apply to your study of evolution?

Everybody should practice contrasting and comparing. So this is my strategy for thinking about evolution: look for the opposing idea of what you might otherwise consider the Truth. There is no master scheme anywhere that completely defines nature.

This perspective shows you how your study can become distorted, but also how the problem can be corrected. When one idea becomes a metaphysic, that is, attempting to explain everything, a suffix ism appears. This has happened to many great concepts, such as “secular” and “science” and “objectivity.” Over-accented, “secular” becomes, disparagingly, secularism, which is merely a one-sided outlook. Science becomes scientism. “Objectivity” becomes, negatively, objectivism; “subjective” becomes subjectivism. The helpful idea of “commerce” devolves into commercialism. The idea of the “individual” becomes individualism.

And there are many other examples. The great idea of “universal” when over-valued takes on the restricted idea of universalism; the
word “particular” when accepted as a doctrine becomes particularism; the simple term “matter” in its ideological expression becomes materialism; the great idea of “spirit,” as a system of belief becomes spiritualism; the excellent word “intellect” by overemphasis becomes intellectualism; the important concept “ideal” when applied to explain all things became idealism; “real,” overdrawn, becomes realism; the simple word “department” can become the pejorative departmentalism; the important word “profession” when over-accented as a way of life becomes professionalism; the fine word “feminine” when applied as a strong belief or a singular ideology becomes feminism; the wonderful idea of “human” turned into a belief called humanism.

(I’m sure the Dean has talked about these with you. Ask him more about this last point on humanism.)

Think of great ideas in complementary opposition to one another -- similar to those opposites in Yin/Yang philosophy. Each of the on the way in which you look at them. How is this so? The French sociologist Georges Gurvitch described the relationships that develop among antinomies: complementary, mutual involvement, ambiguity, polarization, and reciprocity.

Antinomies –like those I listed above -- change their connection over time. And they each change in their connotation, revealing more of our nature as formative ideas in the mind, yet also keeping something of the “past.” They become universal.

The concepts of “Self” and “Freedom” in the time of Thales were both different and the same as today. And, I would add, how much you have changed in the concept of your own “self” between the time you were age ten and today! You change, but you cannot eliminate your past self or, more accurately perhaps, your idea of “self.”

The same is true for the idea of Freedom. So, what is going on here?

Unity/Plurality: The Ball Game Tied in the Last Inning

The “Modern Synthesis” was a set of theories from different sciences that had joined to support Darwinian thought. It involved collaboration among leading biologists who called it a “unified theory of evolution.” It was to include all different “life sciences,”

The Evolution of Philosophy

Prof. Benedict: Tell us about reincarnation. Does that have something to do with early philosophy?
James: This was a belief in the East, but also a little in the West. Parmenides asked what happens to the soul after death. He thought that it must be transformed into other bodies. He agreed with Pythagoras that the soul lived on and is incarnated into another body after death. For him, death was just a “phase” in a cycle of rebirths. So in effect, evolution does not stop with death. Life goes on, into the “other side.”

The Tao is like a well:
used but never used up.
It is like the eternal void:
filled with infinite possibilities.

Modern Philosophy

James: Modern philosophy began with Hobbes, Descartes, and Newton, and continued with Locke, Berkeley, Hume, Rousseau, and Kant. None of them knew about biological evolution, but their ideas all bear on what is relevant to your project.
James: But not everyone in philosophy took this path. Kierkegaard, Nietzsche, Heidegger, and Sartre were all concerned with “the meaning of life,” not evolution. They considered questions about life and death more important.

James: Henri Bergson argued that intuition is deeper than the intellect. In his *Matter and Memory* written in 1896, and *Creative Evolution* in 1907, he tried to integrate the findings of biology with a theory of consciousness. He considered intuition—not reason and the intellect—to be the highest human faculty.47

In *Creative Evolution*, Bergson argued that the “inventive urge”—not “natural selection”—is at the heart of evolution. Man's intuition has developed as an instrument of survival in evolution.

James: Eminent thinkers – for students, I will write a list on the blackboard. Theodor Adorno, Louis Althusser, Roland Barthes, Michael Bakhtin, Jean Baudrillard, Walter Benjamin, Kenneth Burke, Terry Eagleton, Stanley Fish, Michel Foucault, Anthony Giddens, Antonio Gramsci, Jurgen Habermas, Donna Haraway, Max Horkheimer, Julia Kristeva, Herbert Marcuse, Maurice Merleau-Ponty, Richard Rorty, Edward Said, Charles Taylor, Ludwig Wittgenstein… and others. The ideas of these thinkers all bear on evolution, but I do not have time to discuss them.

**Polarities and Evolution**

Dean: Professor Kornberg, remind us of how polarities operate in chemistry.

Kornberg: A voltage has polarity. A magnet also has polarity: One end represents the "north" and the other the "south." The spin of an entity in quantum mechanics has a polarity - positive or negative.

Dean: Okay. *(Looking to James:)* Professor James, please tell us about polarities in the work of philosophers. This notion has been with us since the beginning.

James: Hegel’s Subject is the end and the beginning, the summation of evolution. Hegel did not see how a mind could be shaped by the organization of society. He did not understand how the institution of the state could help shape a mind. He had no direct perspective on how evolution happens through the structures of society.

James: Okay. The institutional forces of society never became a reality for Hegel, never a power in themselves. (Sociology did not exist at the time of Hegel.) He missed seeing how the earth and the structure of society were part of evolution.

Dean: The question of the individual and “the other” has been discussed among philosophers for decades. It began with *recognition* of the Other
in Hegel and the concept of “the other” in Edmund Husserl and Martin Buber.

And now Richard Kearney has approached the problem of “otherness” through the field of hermeneutics. He emphasizes the importance of “understanding” in one’s relation to the other in everyday life. Understanding requires a sense of Otherness and is essential to understanding one’s self.

The Origins of Justice in Nature

James: Think through the logic. Justice should not be isolated as though it did not come from nature. Justice is affiliated with Order by its principled mutuality with Freedom.

Kornberg: Justice has nothing to do with Nature. This is nonsense.

James: Think again. The logic: Justice is social, and Nature is social. Justice has something to do with equity and symmetry in nature. These are some of your constants in physical evolution.

Dean: Right. We talked about symmetry in the science of nature. And we talked about it in the arts. Professor Kornberg, remind us about symmetry, if you would.

Kornberg: We classify molecules according to their symmetry. With the principle of symmetry in science, we can predict a molecule’s chemical properties—its dipole moment, for example. Every textbook on physical chemistry has a chapter on symmetry. And there are studies on the functional “equality” of molecular structures.

James: Ah. So we might say that justice began with symmetry and equality. The elements characteristics of justice began in nature. It began in the structure of atoms and molecules.

Kornberg: Well, I guess just about everybody knows Newton’s Third Law: "To every action there is an equal and opposite reaction."

Whenever a particle A exerts a force on another particle B, B simultaneously exerts a force on A with the same magnitude in the opposite direction. These two forces act along the same line.

Kornberg: We talk about how black holes formed from the gravitational collapse of a star. Here you find there the beginning of equality and equilibrium.

Dean: How does this work?

Kornberg: The gravitational pull from the core of the star is equal to the gravitational pull of the gases, which causes these forces to form a type of orbit. But when this equality is broken, the star can go into several different stages.

Benedict: This is the beginning of Justice as a set of physical principles.
Bob: Is everything we know connected to experience and consciousness?

James: Yes. In 1909 William James described the importance of “experienced relations.” So philosophy in his outlook must be based on experienced relations, and any kind of relation that is experienced must be counted as “real” as anything else. Feelings are as real as the stars in the sky.

His great study of religious experience is based on this assertion. So James is a bridge for conducting a dialogue between science and religion.

Kornberg: Electrons tunnel across 23.5 trillion synapses of the brain, but there is no evidence of their connection to consciousness.

Benedict: That’s because you cannot see consciousness. You are like a fish in water: You cannot see the water. When consciousness becomes an object to itself, it is gone. You see an object but do not see consciousness. Yet, it is there, hidden in the subject.

Benedict: Wait. I have a question for you both. What is “real”?

James: Take Mozart as he plays the Jupiter Symphony. His music sheet is one thing—it is an object, a written chord, played on visible keys—but it brings a feeling that becomes more real to him than the piano.

Dean: You can see the evidence for this in the evolution of language. Kenneth Burke writes that the strategy of metonymy is to convey some intangible state in terms of the tangible. We speak of the “heart” rather than of our emotions. James: Dean, you taught me about Kenneth Burke. Burke speaks about the development of identity. That is what makes something real. It doesn’t matter whether it is the piano or the “feeling” of music it expresses.

Identity

Dean: Burke takes "identity" as his key term for what is real. He says “identity” is fundamental to being human. “Burke’s “philosophy of identity” leads us into pre-human times. We said earlier that a lion could identify an antelope. Atoms can identify other atoms.

Dean: In order for us to understand each other, we must have some common identity. Burke calls it “consubstantial recognition.” It’s all about getting to common standards. Professor Benedict, you are aware of this: Musicians have standards. Scientists have standards. Faculties have standards. In any communication there must be standards.

Benedict: Right. This is a community enterprise; humanity must be a dialogue based on equity.

Quick Summary

Benedict: I must ask: Could there be a paradox here? Could one side tend to be slightly more powerful in the long run? Is the Subject more
powerful than the Object? Could Life be more powerful than Death -- in the long run?

Dean: What’s our purpose? Where are we going? Professor James, can you sum up the “purpose” of it all?

James: Socrates said the purpose of philosophy is to gain self-knowledge. Plato said the purpose of philosophy is the discovery of reality -- through dialectical thought. Aristotle said we should begin with “awe and wonder” -- about the causes and principles of things. Rene Descartes said the purpose of philosophy is to clarify truth by first being skeptical. John Locke said the purpose is to analyze ideas “locked” into the mind. Herbert Spencer said “evolution” is now the basis for philosophy to find unity of thought --among faculty in all disciplines. There you are. That’s the means… and the end of my story. (He smiles.)

Dean: Thank you. Enjoy the rest of your day!

11. The Field of Psychology

Dean: We have with us today Professor Carl Mowrer who has had a distinguished career in psychology. His laboratory research is too technical for our purposes, but he has also studied paranormal behavior and will speak to us about this. But first, we want him to tell us about the evolution of psychology.

Professor Mowrer:

The Evolution of Psychology: A Basis for Class Discussion.

This timeline leaves out a lot; it’s not fair to the class.

Derek: Look at the beginning of asylums. The chart does not tell you that these were terrible places.

Dean: Do you see any progress over time?

Derek: Yes. Definitely. In the beginning, people believed in evil spirits. The “mentally ill” were mocked, condemned, and chained to walls. We still don’t have the right words for this condition we call “mentally ill.” Even this word to describe this condition is not adequate – in my judgment.

Dean: Define “progress” in this history.

Derek: Progress …well, I think we have developed more respect for the mentally ill. Bedlam Hospital; built in the 14th century. It was famous for mayhem. Patients were tortured there; the hospital was in chaos.
Progress? Today, the Bedlam hospital has become a model for others. Patients there are medically treated and shown respect. Some women were committed to asylums for the "crime" of attempting to leave their husbands. Some people were beaten to death. On the timeline, you cannot see progress in the work of people like B. F. Skinner, Jean Piaget, Festinger, Thorndike, Allport, Erik Erikson, McClelland and hundreds of others, Milgram, Cronbach, Newcomb, Adler; so you need to know more about the details, and not just the names. (The Dean understands.)

Dean: Professor Mowrer -- The problem is not solved. Some of the best people face depression. Look at Joseph Haydn, Winston Churchill, Abe Lincoln, Charles Dickens—they all experienced depression.

Mowrer: The stigma has not gone away. (He points on his chart to Søren Kierkegaard’s Fear and Trembling and Sickness Unto Death.

Dean: What are the causes?

Mowrer: Very complex. We know that the causes for psychoses such as paranoia, schizophrenia, and manic depression can have both environmental and genetic origins. We do not have the time to discuss the connections.

Dean: Okay, let’s hear about your research on the paranormal. This is your expertise. It may have something to do with evolution and the future.

Paranormal Phenomena

Can you tell us what this means?

Mowrer: In the West, scientists and spiritualists established the Society for Psychical Research in London in 1882. Formal studies began there. Societies then developed in the United States -- like the American Society of Psychical Research, and the Parapsychological Association. Let’s see: telepathy, precognition, clairvoyance, psychokinesis, reincarnation, ghosts and other similar phenomena.

Mowrer: Telepathy refers to the transfer of information between people without any outward sound; or without a physical device to convey the sound, like a radio. Information travels from one mind to another, by some means other than the five senses.

Precognition is the perception of information about future events before they occur; it is like weather forecasting, but intuitive-based not empirical. Clairvoyance is about obtaining information from remote locations, seeing places and situations that you can’t see with your senses. What else? Psychokinesis is the mind’s ability to influence matter; it’s when an ashtray is pushed along a floor with no human being touching it.
Reincarnation refers to the rebirth of a soul in a new physical body after death; you die and wake up again on the other side, then “you” come back to earth again at some later point in another body without remembering the past, while carrying the karma of the past in your unseen body.

Ghosts. They usually occur in places where the deceased person once lived.

Dean: Okay. Do these phenomena have anything to do with evolution?

Mowrer: You theorize evolution to be a process of “increasing interiority.” It is like “we” are in a gradual movement, from the apes. Apes and animals give signs outside themselves but humans who create symbols go deeper. They seek greater knowledge about themselves inside. The evolution of humankind is from the outside to the inside so to speak. I am saying that these paranormal phenomena are still farther inside and difficult for science to quantify and verify.

Dean: What do you mean?

Mowrer: Scientific inventions and discoveries – like the telegraph, the phone, radio and television – evolved in the last century as external, “outside.” I see these technological inventions as parallel to these evolving inside. Nobody believed that sentences, images, messages, information, could be passed between people from such lengthy distances and remote locations. But this communication technology has kept going.

James Clerk Maxwell showed mathematically that electromagnetic waves could propagate through free space. Heinrich Hertz and others demonstrated radio wave propagation on a laboratory scale. Nikola Tesla demonstrated the transmission and radiation of radio frequency energy in 1892 and 1893 proposing that it might be used for the “telecommunication of information. In 1895, Marconi built a wireless system capable of transmitting signals at significant distances.

I study how messages transfer information from mind to mind, inside the psyche from one to the other. These are latent abilities being discovered within us. A radio transmission appears to be “outside,” but when it is inside, it is called telepathy. All of this information is in the “air” so to speak. The mind works to communicate with other minds in a way similar to that of a telephone. It is simply at different frequencies of vibration.

And these capacities are evolving. Today people are walking around with cell phones and all kinds of inventions that look like they are talking to somebody who is not there.
Dean: Interesting. For me, there is a parallel to what you are saying with the Big Bang and the brain. Everything began from “inside” the Big Bang. Now, does evolution continue with this growing interior consciousness? Is there an interior social web? What does that mean?

Mowrer: Certain external inventions, like the television, allowed people to transform images into electronic signals and transfer information across long distances, but this same capacity to communicate information across distances is in the psyche itself. It’s called “clairvoyance.”

Barbara: Clairvoyance can be stronger in some people than others from childhood. It is the same with musical abilities. Some people are born with “perfect pitch” and other cannot sing follow a note at all.

Dean: Our powers keep expanding.

Mowrer: Let’s go back to the technology. Television allowed people to transmit images, along with sound, at a distance. Images and sound went through the air, not just words traveling through the air, as in telepathy. In the 1940s nobody believed that transmitting images through the air could happen. My own parents did not believe it could happen. But it did. And the differences between radio and television are similar to the differences between telepathy and clairvoyance.

Dean: What does that say about evolution?

Mowrer: The invention of television is equivalent to the self-discovery of clairvoyance. Clairvoyants pick up images through the air without any mechanical or electronic means. They can see and describe the appearance of people on the other side for example. They can also hear their words.

The ability to “hear” from a remote place is telepathy, but the added ability to “see” images is clairvoyance. It is a different mode of transferring information, though parallel in type to radio and television.

Dean: (wanting clarification) In other words, the ability to see what is remote with your body and physical eyes – like television -- is similar to the internal process that is called clairvoyance? Clairvoyance internally acts like the transmission of televised images externally. (Mowrer nods agreement.)

Mowrer: Look at “clairsentience.” Some people – like my daughter – can touch you and receive a message about how you are feeling.

Ann: Wow. How did your daughter discover she had this ability?

Mowrer: She told me about it one day after she had taken an airline home. A person touched her on the plane, and my daughter knew immediately that this person had just gotten a divorce and spoke to her about it. The woman broke down in tears at my daughter’s awareness,
and together they talked about it.

**Mowrer:** You have talked in this class about the electromagnetic spectrum. Look at the X-ray. It has a wavelength of around 10 to 0.01 nanometers. A few clairvoyants can see into the physical body -- like an X-ray. You all talked about these wavelengths. Right?

**Tom:** I know the human ear can detect sound waves at about 20Hz at the low end -- to 20,000Hz at the high end. The dog whistle is pitched at 22,000Hz, beyond the ability of human ears to hear.

Can you give us an example of a person who can see -- like an X-ray?

**Mowrer:** Edgar Cayce. Cayce died in the 1940s, but I visited his Institute at Virginia Beach and talked with people who knew him. I have read his documented cases, and there are hundreds of books about him. Renowned people visited him during his lifetime and testified on his behalf. The Institute receives 70,000 visitors each year. When Cayce was alive, people went to him for a diagnosis. He would move into a trance and was able to “see” into their body and offer remedies and treatment.

**Dean:** How can we study his work?

**Ann:** But how could a mind see into the body?

**Mowrer:** Nobody thought a machine could do this either -- until it was done. The mind can work internally similar to the way in which an engineer works with X-ray machines externally. X-rays are electromagnetic waves; they are short frequencies that penetrate through the thickness of matter. The X-ray technology lets a stream of fast electrons come to a sudden stop at a metal plate. Let’s see…how to be brief?

X-rays require creating a concentrated beam of electrons and smashing them into a metal film. The result of that crash between the metallic film and the highly charged electrons is a concentration of high-energy radiation.

**Mowrer:** Now think for a moment. There are waves passing through this room right now that you cannot see with your eyes or hear with your ears. If you had a radio, you might hear Beethoven’s Ninth Symphony on WGBH, but your brain cannot “tune” to it. The music is actually “here,” right now, in the air. But to hear it, you must turn on a radio.

Science verifies the reality of those waves you cannot see, touch, or hear. But skilled psychics can go farther, into realms that so far are not quantifiable by science.

**Dean:** Hmmm. Are you saying that science is based on vibrations at the physical level, not paranormal? Scientists are therefore limited in what they can confirm about “reality.” (“Sensate mentality.”)
Mowrer: Yes. Science is limited. Look. A crystal radio receiver needs no battery source except the power received from the radio waves by an outdoor wire antenna. Clairvoyants have the equivalent of those “crystals” built into the brain, you might say.

Dean: What might evolve in the future?

Mowrer: You talked about the progression of speed in travel – from walking and running to the wheel and carriage to the bicycle and the automobile, and from jet planes to missiles. We keep inventing technology that moves us faster and faster between distant places. Right?

Dean: Right. How does this connect with paranormal behavior and evolution?

Mowrer: Astral travel.

Harry: What? This is the future?

Mowrer: Astral travel has been known since ancient times. Shamans knew about it. Your astral body is like a second—double—body. It exists around you right now, but you cannot see it. At death, it leaves your physical body to travel on another frequency, faster than a missile. It works on a frequency different from that of the earth plane, one in which there is no air resistance. It would take me another class session to talk about it. If you are interested, there are a lot of books to read on the subject.

Dean: But tell us more about this “astral” body?

Mowrer: The ancient Egyptians knew about astral planes. They spoke of a soul hovering outside the physical body in the ka. (The ka is equivalent to a subtle body.) The subtle body is attached to the physical body by means of a silver cord invisible to the physical eye.

Dean: How does this “astral body” relate to evolution?

Mowrer: I know people who experience astral projection.

Dean: Who?

Mowrer: My own wife had an out-of-body experience. You should talk to her.

Dean: What!

Mowrer: When she was in college as an undergraduate, one day she was relaxing in bed, and suddenly she felt her “body” moving toward the ceiling and then toward the door. Robert Monroe. He was educated at Columbia University; he became a CEO of a television station. Monroe experienced his astral body when he relaxed during meditation. He wrote books about his experiences. He created an Institute for training. You can start with his book called Journeys Out of the Body.
One day back in 1958 he was relaxing during meditation when he had his first out-of-body experience. He had been practicing a lot of meditation, and in one quiet moment he felt his hand fall through the floor. It scared him. He pulled back his hand and wondered what had happened. He founded The Monroe Institute. It’s devoted to teaching and researching human consciousness.

**Mowrer:** Monroe says that the second body has weight and can be visible to your eye under special conditions. It can produce a sensation of touch just like physical touch, and yet it is more plastic and may adopt virtually any form required of it.

**Dean:** Why don’t scientists study his work? There should be attempts to replicate this experience.

**Mowrer:** You talked about memory being stored in the brain. You also talked about how memory is stored in society -- I mean in places like libraries, in books, on film and the Internet. *(The Deans nods.)* There is something in the realm of the paranormal called the “Akashic Records.” These Records are in “vibrational space” – operating at a high frequency.

**Dean:** What is this “Record”?

**Mowrer:** The *Akashic Record* is a history of people and humankind. I do not know how far back in time it goes into the universe, but it is a compendium of history and knowledge. The Record contains all that is known to human experience. This is an invisible “library” on a "universal computer," so to speak. The Record is constantly updated, and “specialists” can access it through astral connections. Verification is vital. I can give you examples in my own case.

**Mediums**

I sit in sessions where people train to improve their skills in mediumship. I watch how they describe those who live in what William James once called “the other side.”

**Mediums** can meet with you “one on one,” but they might charge you a fee, like a psychiatrist. Or, they can stand before an audience and report on what deceased relatives say to members of an audience. Only individuals in the audience and those who have died and gone to the other side -- know the “facts” they hold in common. That’s verification.

There is a level of verification for me when I find confirmation given to me from members of an audience who have been addressed by a medium. They confirm what they have learned. I am told that “no one else” could have known the facts given by the medium that is “communicating” with their deceased relatives.
Dean: What about your own personal experience?

Mowrer: I go to mediums to study and document their work. I have heard facts given to me by my own relatives. For example, my father, mother, and uncle died decades ago, but they “come through” to me through mediums.

I set up a continuum of zero to ten to measure how convinced I am of the information given to me by a medium. If a medium says that I am intelligent and imaginative, I give him or her a zero. This “fact” (signaling quote) is too generalized. Everybody has some degree of intelligence and imagination. If the medium says I have some sadness or anger, I also give him or her a zero. These emotions are too general to warrant any justification as valid. Everybody has these emotions.

Dean: How does information from a medium climb up your scale from zero to ten?

Mowrer: You need validity and reliability, that is, consistency. (The Dean nods Yes.) My deceased Uncle Fred came through a medium one day and told me that he liked to “hang around” my office because I have a small mobile of sailboats suspended from my ceiling. (He was a sailor when he was alive.) He has since appeared in other sessions in his sailor outfit, sometimes with a tugboat in the background. In his late years he was a captain of tugboats. He has been reliable in the sense of coming through different mediums. I give Uncle Fred a “nine” because is always correct. Nobody knows about that mobile of sailboats on the ceiling in the corner of my office. Nobody sees it; I had even forgotten about it myself; I put the mobile there many years before I went to the medium. And the medium could not have known that this particular mobile was there. He did not even know me personally. He did not even know about the office where I worked.

Mowrer: I have done that for forty years. Let me give you an example. I heard of a Spiritualist Church located about three hours away from my home, down on Cape Cod. The Church had a Saturday conference in which individual mediums sat in different booths and “read” for about fifteen minutes. You pay them fifteen dollars for that brief time. I had a chance to compare.

I went to the first medium. He said to me --among other things -- that my father, who is deceased, was telling me to get hearing aids. He had needed them when he was alive. I said to the medium that it was my mother who had hearing problems, not my father. He said: “Well, I knew it was a parent but we are not always perfect on receiving a message. It could have been your mother, and I made a mistake.”
So I went immediately to another booth downstairs where a different medium was sitting. He looked at me as I walked in and said he could see that my father was with me. “Your father is telling you that you need hearing aids.” I said, “But it was my mother who needed the hearing aids before she died.” He said: “Well, it is your father who tells me that he kept his hearing loss a secret to his family; he was too embarrassed to admit it. But he wants you to know that you need those aids. Your own family would be pleased if you got them.”

Well, those visits with two independent mediums -- separated by less than a minute -- showed comparative accuracy. Both mediums were on target, but the second one was a bull’s eye, slightly more accurate, insisting it was my father. My wife and daughter had told me months before I went to this church that I needed hearing aids. But I kept denying that I had any hearing loss. So he is here watching me.

Barbara: (Surprised.) You mean your wife and daughter had been telling you the same thing that your deceased father tells you through the medium?

Mowrer: Exactly. I denied any loss. I did not believe that I needed them. Now I had to question whether I was denying the loss just like my father had done. So I checked with an audiologist and found that I really needed hearing aids. They had all been right. I bought the aids, and now I can hear very well.

Mowrer: In 1940, a fellow by the name of J. B. Rhine started some research on a subject he called “extrasensory perception,” or ESP, which some people call a “sixth sense.” He asked people to guess the face of cards hidden from them and calculated the ratio of success. The book was titled Extra-Sensory Perception After Sixty Years. His findings were reportedly good. He made some errors in procedure, but in my opinion he did not focus enough on the most skilled clairvoyants – like I do. He was taking virtually anybody into his research.

Dean: Were his findings replicated?

Mowrer: Yes. As I remember, fifty studies were published. Over 60% of the independent studies reported “significant results”; in other words, they were “highly indicative” that people do have ESP.

Barbara: Why not set up your own laboratory?

Reincarnation

Dean: Reincarnation means that a particular individual soul after death of the physical migrates to a new body. Do Buddhists distinguish between “rebirth” and “reincarnation”?

Mowrer: Buddhists don’t believe in an individual self or soul that adheres to a particular individual. Rebirth does not refer to a particular
soul coming back to life in another body. It means that there is energy that persists and may pass into and inhabit a new body. Let me tell you a personal story. It may be hard for you to believe but ...(he laughs) …you asked for it.

The first medium that I went to see was Simeon Stefanidakis who works in Brookline, Massachusetts. When I came to a session, Simeon saw someone surrounded by a great light sitting in a meditative posture, holding an ancient hourglass. The sand is running out, Simeon said: “Now he is turning it over to show you that you have plenty of time left in your life to study this subject.”

I was amazed because I was thinking to myself at that very moment that I did not have enough time left in my life to study paranormal phenomena. This “figure” on “the other side” had read my mind and was giving me the answer: “You do have time.” Simeon did not know I was thinking this thought at that moment, just reporting what was said to him by his inner vision.

Barbara: Why is the figure showing you an hourglass?

Mowrer: Simeon said that the figure indicates I had once worked with him in ancient Egypt. I was a “trainee” in his work. He had been the builder of the first pyramid. Simeon saw this figure sitting, but then also standing on a step of a pyramid. He was indicating that he was one level higher than me in the hierarchy. The figure, in Simeon’s sight and hearing, said that I would recognize him soon by his “golden rings.”

I left the session stunned and amazed at what had happened and wondered what it meant. This was my first experience with the idea of reincarnation.

Barbara: Who was this figure in a light that appeared to Simeon?

Mowrer: The next day I went to see a piano teacher for a lesson. I had never met her before, but as I entered her apartment, I saw a painting of a man on the wall. He was sitting in a meditative posture with a light-rays stemming from his body that stretched into golden rings. I was shocked.

I asked her who this man in the portrait. She said that his name is Imhotep, the builder of the first pyramid. Her husband – who taught at Boston University – had painted this figure. He had done research on ancient Egypt and was led to sketch Imhotep as he saw him in his mind’s eye. She told me that her husband is an intuitive and had seen Imhotep clairvoyantly.50 My experience with Simeon -- and seeing the portrait of this figure on the wall -- was a turning point. This experience of seeing the painting came only days after it was predicted in my session with Simeon.
This is called “precognition.” And the idea of my having worked with Imhotep four thousand years ago points to reincarnation.

Dean: Why don’t scientists look into reincarnation?

Mowrer: Dr. Brian Weiss. He has degrees from Columbia and Yale. He’s a trained M.D. who works as a psychiatrist. His credentials couldn’t be challenged. I have talked with him. I’m persuaded that his work is authentic. Barbara: How does Dr. Weiss do his work? How does he verify this…reincarnation?

Mowrer: He first discovered it when treating one of his patients. He was using hypnosis and during one of the sessions, the patient reached what Weiss calls a “between lives” state. The patient then communicated with the dead relatives of Weiss himself! He published his experience in a book called Many Lives, Many Masters. He published books on his work, such as Messages from Masters, Through Time into Healing, Same Soul, and Many Bodies. I cannot remember the titles of all his books, but they are good.

Dean: Why is so little attention given to this subject in the university? Are there other professionals that are equally reliable and established?

Mowrer: Well. There is Dr. Michael Newton, whose books include Journey of Souls, Destiny of Souls, and Life Between Lives. Carol Bowman has done work on the past life memories of children. You can read her books, such as Children's Past Lives and Return From Heaven.

Let’s see. There is Dr. Bruce Goldberg who has written Past Lives – Future Lives and Roger Woolger, a psychoanalyst. And there is Morris Netherton, a Ph.D. and a pioneer of past-life regression with a book called Past Lives Therapy.

Dean: I don’t know them. Tell us more about scientific documentation.

Mowrer: Dr. Ian Stevenson did research with no hypnosis or counseling. Instead, he went around the world and documented thousands of cases of children who remembered a past life.

He had a very methodical scientific mind. He would learn the name of a deceased person the child remembered. Then he would look up that person in the medical records and interview relatives. He checked out the facts on the deceased person’s life to try to match the accuracy of the child's memory.

Barbara: That’s amazing. Can we invite him to campus?

Mowrer: He died in 2007, but he had devoted forty years to documenting past life memories all over the world. He has over 3000 cases in his files.

He was a medical doctor who wrote scholarly papers before he began this past-life research. He was head of the Department of Psychiatry at the University of Virginia, Director of the Division of
Personality Studies at the University of Virginia.

Barbara: Who are the skeptics?

Mowrer: Paul Kurtz, founder of the Committee for Skeptical Inquiry, believes all this research is just “pseudoscience.” Carl Sagan and Arthur C. Clarke were intrigued when they heard about Dr. Stevenson’s research, but they said it fell short of “full proof.” Clarke said that Stevenson had produced studies that were “hard to explain”; he could not find any physical mechanisms that could account for it.51

Dean: Why would anyone want to reincarnate? (The Dean looks serious.)

Mowrer: My friends say it is for the soul to advance toward higher forms of life. A soul – beyond earth life -- continues through these reincarnations to “learn lessons” on earth. The earth is a place for growth -- toward increasing perfection. You can continue to develop on “the other side”—reportedly—but the earth plane gives you a greater opportunity for progress.

Barbara: Progress? The earth is a school?

Mowrer: Yes. We start in kindergarten and move from one level to the next. We continue until we attain mastery over a subject. But perfection is not easy. (The Dean looks suspicious. How can you learn the meaning of deep compassion, love, faith, humility, and forgiveness – all in one lifetime? That’s not easy.

I have come to agree with those friends of mine who say that the purpose of life is to help others. Everyone in this cycle of birth and death is moving toward perfection… everyone whose intention is to progress. We are here to teach one another. Our service to one another is vital…

Forecasting the Future

Mowrer: We call it “precognition.” How might precognition be possible? I think the deceased are on a different time scale, I mean, a higher frequency. (He looks to the class.) The Dean and I talked about this. A rock is made up of atoms that vibrate at a certain speed…Right?

Dean: Yes. We looked at this: the molecules in the rock vibrate at a slower speed than those that crystallize to form water or ice. Energy, when it is slowed down, becomes mass or matter. Matter speeded up becomes energy. Clocks on high mountains run faster than those on lower ground.

Mowrer: We are in a “sea of frequencies.” Electromagnetic waves go through space at 186,000 miles per second from the station to your radio.

Mowrer: They are there. There is the International Society for the Study of Subtle Energies and Energy Medicine. It is international. It has members
from different disciplines -- medicine, physics and psychology.

**Dean:** I mean, the higher your frequency, the more slowly you change. This means you could move toward infinity; some might say, “eternity.”

Could you live forever? Can psychics predict the future? What do you think?

**Mowrer:** I taught a class one semester and asked a clairvoyant to come talk about her work. She told a football player about the location of injuries on his body. He was flabbergasted because only he knew about them. She went around the class to each student — it was almost like a sideshow — and finally came to me and said that I had a daughter on the West Coast going to school.

I did have a daughter going to graduate school in California. She said that I should warn my daughter of a possible automobile accident on or around September 30th -- about four months away. My daughter, she said, would be riding in a light tan convertible car on Route 1 alongside the Pacific Ocean, and would be -- or was likely to be -- in a terrible car accident.

I was skeptical but called my daughter about the psychic’s prediction and warned her to be alert. When the time came -- four months later -- I called her in California and found that she had been invited to ride in a light tan convertible car on Route 1. She told me that she had not accepted the invitation.

**Dean:** How could this woman have predicted such an event -- so far off in time? In such detail!

**Harry:** It’s spooky. It sounds like everything is determined.

**Mowrer:** I worried about it myself. But other forecasts have been given to me by mediums. My deceased uncle would anticipate events -- mostly about trips that I would be taking overseas. I thought about the implications. What about free will?

**Dean:** *(skeptical)* “Well? What about it?”

**Mowrer:** I began to see that those on the other side -- like Imhotep and my uncle -- were doing the same thing that scientists do. They are like weather forecasters who see more variables operating in the atmosphere than you and I can see. You do not know when a comet will appear, but a good astronomer can tell you. They know the variables. They know their science. And you accept their specialized knowledge without question. Those entities, if you will, on the “other side” have expertise because they know the patterns of nature. They can come up with a “forecast,” a precognition, not a “prediction” exactly.

**Dean:** Whaddy mean?

**Mowrer:** Now wait a minute. Imagine this situation: You are sitting on a hilltop, and you see two cars on separate roads traveling toward an
intersection at the same speed. They are at the same distance away from the intersection on two separate roads. You can forecast a crash in the making, but the drivers below cannot see it. The hill is blocking their ability to see each other driving toward the same intersection.

You can predict the crash from your vantage point on the hill, but the drivers in their separate cars are unable see what is about to happen. They have no idea of what lies ahead. So, think: the “beings” on the other side are like you on that hill. They can see more and farther ahead than the separate drivers can see.

The ants can’t see us, but we can see them. They don’t have human eyes; we have evolved beyond them. We can see where they are going. We can predict what they will do and where they will go.

Mowrer: It is inherited to some degree, and it can also be learned.

Mowrer: My friend Carole Lynne is a medium and gives training lessons in Newton. You could “Google” her. Or call her up; email her. Check out her webpage. You could go to her training sessions and be given the opportunity to try out.

Barbara: Could you call it empirical evidence?

Mowrer: I would. But it is equally experiential evidence. I have seen hundreds of people identify their loved ones on the basis of events they have shared together in the past. Questions?

Ann: What about ghosts?

Mowrer: Ghosts have been around a long time. They were reported in Homer’s epics, the Iliad and the Odyssey. Allegedly they can appear complete with the wounds that killed them. The Bible has references to ghosts in the books of Deuteronomy and Samuel. The disciples of Jesus thought he was a ghost when they saw him after he died. In the first century A.D., Plutarch described a ghost of a murdered man haunting public baths. Pliny the Younger described the haunting of a house in Athens by some ghost that was bound in chains.

Ghosts are complex. The subject would take a semester to discuss, but I can tell you of my own personal experience in which a friend of mine speaks to ghosts, those who have died and remain connected to earth.

Mowrer: Shirley Pratt. She lives in Needham, Massachusetts. She sits weekly with her friend Ruth to counsel those who get stuck on the earth plane after they die. I have watched her work for decades.

Let me say first: People who die normally move through their astral body and are greeted by loved ones on the other side. But some people who have died get stuck on earth in their astral body. They become bewildered. They may not be conscious of what has happened to
them. They could have died in a sudden accident, an airline crash, or have been murdered—whatever might cause them not to go through the normal process of leaving the earth plane.

**Dean:** This seems odd to me.

**Mowrer:** The Gallup Poll says that three in four Americans believe in the paranormal. Many have seen ghosts. But researchers on the Committee for Skeptical Inquiry laugh at the idea.

**Mary:** We said that the “self” is always changing and transcending the past.

**Mowrer:** And sages in the East say we keep coming back to earth -- to find perfection. So evolution is cyclical in this sense. We are on only one of many “frequency planes.”

**Mowrer:** Now look at this case: water requires a specific temperature to remain a liquid. If you raise the temperature to a certain point, you get steam. Steam is a higher frequency, but it is not water. The water has been transformed. If you lower the temperature, the water becomes ice. Transformed. It freezes because of less molecular motion. The temperature is just an expression of the frequency and motion of the smallest particles, the molecules. If you change the molecular motion or the speed with which the molecules move, they will transform from gas to liquid, then liquid to solid.

You can feel the air with a wind, but you cannot see the air. *(nods, “Okay”)* The air is transparent, but it is still there. It is real.

**Mowrer:** I’ll make you a bet. Think of your theory of constant invention. *(The Dean nods.)* Put aside all future earthquakes, global warming, and the nuclear wars ahead. Look at the frequency pattern. *(He stands up, in good humor but looking upward like Rasputin.)*

I predict: by means of new inventions in technology, we will be able to communicate with the dead. It will follow in the manner of radio before television. I propose that within one hundred years we will acquire the technology to reach the frequency of the dead that are now picked up by mediums.

**Dean:** *(shocked in disbelief)* No!

**Mowrer:** Remember, it has been close to 14 billion years of evolution to get to where we are now. *(The Dean remains stunned.)* I bet you were one of those who didn’t think we’d go to the moon! *(The Dean hesitates, and says, “Okay.”)* I have to say again: In the early1900s, my grandparents did not believe that our speech—our spoken words—could be transmitted through the air to distant places, but it happened. My parents said that images could not be sent through the air, but that
too had developed by the 1940s.
Dean: That’s progress. There are many stories of lost civilizations like Atlantis and Lemuria. They were allegedly destroyed by advanced technology. Now look at our nuclear weapons. People with psychic abilities have warned us about the misuse of technology. Our weapons could destroy whole nations. Those on “the other side” have warned us about the danger.
Dean: How do you know?
Mowrer: Gopi Krishna. He was a Hindu who channeled kundalini… that force in the body that produces high energy.
In the Hindu tradition kundalini is an energy that sleeps at the base of the spine. Aroused, it has a serpent-like movement, and moves up the spine. At lower chakra levels, it brings sexual excitement; but with careful meditation, it also brings strength and enlightenment at higher levels. If it moves too quickly, it can bring pain and sickness. He began his yoga training when he was working in the government. In 1937 he experienced a quick arousal of this kundalini energy. The experience shattered his mind and sent him to the hospital. Yogis know that if the energy is aroused prematurely, it can be experienced in a negative way. It is tricky to channel it just right.
Mowrer: He began to write poetry in iambic pentameter. He wrote of future of nuclear wars in his poetry. He said that some “Higher Intelligence” gave this poem about war to him at great speed. He could hardly keep up with the words given to him. In 1950 at the peak of his consciousness, he dictated poems in German, French, and Italian. These were languages he had never learned, never spoken before. In other words, he went far beyond his formal education and experience, beyond the scope of his own intelligence. Gopi said it should be studied in biology. He said that Kundalini is a biological force pushing evolution. He made every effort to interest scientists in research.
Anne: Healing?
I’ll give you a personal example. Friends told me of an eighty-year-old fellow in Cambridge who was dying. He had been a technician at M.I.T. but was retired. He had all sorts of medical problems, like diabetes, a bad heart, and more. The doctor said he had only a short time left to live. He was desperate to live and went to the library to look up Yoga practices. He meditated every day.

Suddenly, after much practice, he experienced kundalini energy. He was careful: he knew about its danger but also its healing power. He meditated correctly and was completely healed. I went to visit him personally in Cambridge and taped our interview. I was amazed. He
told me about the technique he had used. I never took time to practice it. You can listen to the tape. It’s still in my files. It was what Buddha said to do.

Dean: Who does this work today? Where could students study it?
Mowrer: Barbara Ann Brennan. She’s clairvoyant, does healing work, and teaches classes.

Dean: (intently): Who is she? What are her credentials?
Mowrer: She got a bachelor’s degree in physics; and in the 1960s, she got a Masters in Atmospheric Physics. She went to work as a research scientist at NASA’s Goddard Space Flight Center. In 1970 she began to see clairvoyantly. She started to study the “human energy field” and wrote a book called *Hands of Light*. It sold over a million copies and was printed in over 20 languages. She has written other books with drawings of auras and energy fields, with pictures showing how human energy fields interact with each other.

Jane: What do these fields look like?
Mowrer: She describes seven-layers of energy. Each has a different frequency. Each has different types of energy that perform different functions. The *Chakras*, for example, are energy centers. They are first mentioned in the *Upanishads*, originally oral tales in India that are now over 4,000 years old. The word *chakra* in Sanskrit literally means “wheel” or “turning”; this refers to the circling movement of these energy centers and also to their capacity as “transformers.” In Indian medicine, there are seven such centers in the body. They receive and process cosmic energy and help advance a healthy body.

I went to see her at a Boston conference decades ago. She gave me every indication that she actually receives messages in healing sessions. As I already explained, this is what my daughter does, intuitively. Brennan sees patterns in the energy of her clients and talks about the roots of their problems.

She established a school to train people as professional healers. Her school started in New York, and she is now in Florida. Six years ago, she opened the "Barbara Brennan School of Healing Europe," and she has other schools around the world. You might want to read her second book, *Light Emerging*. It’s in my library; I will loan it to you.

Near Death Experiences

Mowrer: They happen after an individual has been pronounced clinically dead -- or close to death. Doctors have been reporting them with the cardiac resuscitation techniques. We call them NDEs.

Mowrer: First, I read a book by Dr. Raymond Moody. He had so much
evidence in his cases that I wanted to talk with him. I had lunch with him in Providence, Rhode Island. We talked. He has a Ph.D. in philosophy and an M.D.; he is trained as a physician. He does good research. You can get his books on Amazon -- or just “Google” his webpage. Millions of people have experienced NDEs.

Jane: What is an NDE?
Mowrer: Well, the body has to be “near death.” The people who have these experiences observe others around them, or see images, from a perspective outside of their physical bodies. Sometimes their bodies are called “clinically dead” and yet, they recover. Some are able to talk in detail about things that were happening around them during the time they were in a near-death state. For me, it shows that consciousness is not located in the brain alone. There is an astral body coincident with the physical body.

Jane: Do you have anything more you can give us as evidence?
Mowrer: During a near-death experience, some people see their dead relatives. Some people see their own bodies below them and have a sense of peace. Some go to the ceiling in a hospital and observe from above as doctors and nurses perform resuscitation efforts on them. After they are revived, the patients tell their physician about things that happened in the room they’ve been in while they were considered dead, and even what was happening down the hallway. Doctors and nurses know the patient could not have seen those events down the hall while lying on the hospital bed. Yet, the attending physicians confirm and testify to the patient’s observations. That’s evidence.

Some report having had a “tunnel experience.” (Jane starts to raise her hand.) I mean they move through a hollow passageway. Some go up a staircase. Some have said that they experience moving “beyond” this life – like to heaven -- and are given the choice to return to their bodies.

Others see a brilliant light; some even “speak” to that light and receive answers. Some report a feeling of “unconditional love.” Some have a “life review.” (The Dean looks out over the class for questions.) Jane: “A life review”: What’s that?
Mowrer: You see a kind of movie of your life as you passed through it on earth. You witness how you interacted with people at different stages of living on earth. You experience the impacts you had on people. It is like a kind of “judgment day.” I mean it becomes a kind of self-judgment in light of what you have done and what has happened with you on earth...
Dean: We need science. Give us some good documentation on these NDEs. Mowrer: Dr. Kenneth Ring is Professor Emeritus of Psychology at the University of Connecticut. He researches near-death experiences. He’s co-founder of the International Association for Near-Death Studies and founding editor of the Journal of Near-Death Studies. He is one of many professionals who have done research on these cases. There were other researchers, such as George Ritchie, Michael Sabom, and Bruce Greyson. Dr. Greyson wrote an overview of NDEs for the Encyclopedia Britannica. He has been the Editor-in-Chief of the Journal of Near-Death-Studies. I think the medical profession is largely uninterested. Kenneth Ring found that people who have had a near-death experience have a greater appreciation for life. His interviewees showed a higher level of self-esteem, and a greater compassion for others.

Dean: Can you see any way that NDEs fit with physics?

Mowrer: Go see Dr. Dean Radin is Director of the Institute for Noetic Sciences. He has authored, well, I would say over 200 technical articles, a dozen book chapters, and books like The Conscious Universe and Entangled Minds. He has articles, very technical ones, in journals like the Foundations of Physics. He says that the concept of “entanglement” in quantum physics is a basis to talk about how consciousness is linked with the body.

Dean: Does this fellow, Dr. Radin, see everything as having some consciousness – I mean everything: body organs, liver, stones, toenails, trees, and stars?

Mowrer: Do you remember the Apollo 14 mission? On board was the astronaut Dr. Edgar Mitchell. He founded the Consciousness Research Laboratory where Dr. Radin is also the Director. Dr. Mitchell studied quantum physics.

There are vibrations in the body that physicists and physicians cannot measure. Some psychologists say this is “the heart of matter.”

Dean: What do you mean?

Mowrer: Well, Paul Pearsall argues that the heart is more than scientists think it is. The dynamics of the heart -- not the brain -- are the magnetic center of the body. Pearsall says that a major part of one’s “self” is embodied in the heart. It has to do with the question “Who are we?” In the forward of this book by Pearsall called The Heart’s Code, Gary Schwartz and Linda Russe say that the brain revolves around the heart. In the forward of this book by Pearsall called The Heart’s Code, Gary Schwartz and Linda Russe say that the brain revolves around the heart. In the forward of this book by Pearsall called The Heart’s Code, Gary Schwartz and Linda Russe say that the brain revolves around the heart. In the forward of this book by Pearsall called The Heart’s Code, Gary Schwartz and Linda Russe say that the brain revolves around the heart.

Dean: We talked about the heart as a metaphor for feeling.
Mowrer: These authors propose that the heart has its own intelligence, independent of the brain. They say it communicates “an info-energetic code” conveyed through tens of thousands of miles of blood vessels and 75 trillion cells of the heart and circulatory system.

Dean: What do you mean? Are you starting to “go mystical?” (He frowns.) Let’s stay with science.

Mowrer: Pearsall tells how he was giving a lecture on the heart’s role in life experience, and a member of the audience, a psychiatrist, was moved to tears. She recounted a story about an eight-year old girl who had been the recipient of a heart transplant. The heart donor, a ten-year-old girl, had been murdered. After the transplant, the recipient of the heart suffered nightmares about the man who had killed the donor. The heart recipient described the time, weapon, and place, the man’s appearance, and what the little girl had said to her assailant. The police were able to identify and prosecute the murderer with her information as a basis for their case! So the heart recipient had access to all the information and terror of the donor.

Dean: That is hard to believe.

Mowrer: I went to talk with a heart recipient who was transformed by the feelings of her donor. I wanted to verify what people said to me. The woman’s name is Claire Sylvia. She had been dying from pulmonary hypertension. In 1988 she had a heart-lung transplant. She was given the organs of an 18-year-old boy who had been killed in a motorcycle accident near his home in Maine. After the transplant she discovered that she had acquired new feelings and preferences. She wondered whether these could be from her donor. I went to see her to learn firsthand.

Jane: (mesmerized). What did you find out?

Mowrer: She said that she had developed a fondness for certain foods that she did not like before the transplant-- like Snickers bars, green peppers, Kentucky Fried Chicken. She did not know anything about her donor, but after the operation she felt her personality changing.

She felt like she was becoming masculine. She became more aggressive and assertive than she had been before, more confident. She stopped getting colds. Her daughter asked: "Why are you walking like that? You're lumbering - like a muscle-bound football player." She felt “manlier” with a new “strength and vibrancy.”

Then she began to dream about "Tim." She searched the hospital records and finally found where the donor’s family lived. She wrote a letter to her donor’s parents, and they agreed to talk with her. Talking
with them she realized that everything new she was experiencing was true about him, her donor. His sister told her, “Yes, Tim loved green peppers, but what he really loved were chicken nuggets.” Sylvia replied: “So that explained my trips to Kentucky Fried Chicken.”

The Self in Evolution

Dean: How do you define the “self”? We have talked about this word “self” in all subjects. It has been there since the Big Bang.

Mowrer: The “self” refers to a person's essential being. It distinguishes them from others. In my field the “self” is the agent responsible for all actions ascribed to an individual.

Dean: So it refers to the “agent responsible” for all of its actions. That fits the meaning across all departments. Scientists talk about the “self-organization” of chemicals in a test tube. Economists talk about the self-organization of markets. What else can you say?

Mowrer: The “self” refers to a unified being that is the source of consciousness.

Dean: Wow! The idea of “self” exists in continuity from the beginning of evolution. What do you think? We are becoming conscious of who we are.

Kornberg: The self applies in physics to “non-equilibrium processes.” As you know it also applies in chemistry, sometimes called “self-assembly.”

Wilson: In biology it can refer to a self-organization, like the schools of fish or flocks of birds. In fact, the connections between self-organization and Gaia theory have been explored. The earth is self-organizing.

Kornberg: Think about it. You cannot understand self-organization by breaking down the whole structure into smaller sub-parts. You cannot understand it by its parts. A “self-organizing system” is the process of how a macro-structure evolves from underlying local interaction of parts.

Summary

Mowrer: No. Instead, I suggest you read Ken Wilber. He summarizes and synthesizes all the work done in psychology up to this point in time.

Wilber speaks of the evolution of the self through waves of consciousness in the “Great Nest” of all things. He diagrams a series of concentric circles of body, mind, soul, and spirit. We are in “developmental lines,” he says; but we have to watch the pathologies, as well as the advances that happen in this evolution from the first stages of civilization.

Dean: What do you mean?

Parsons: I read Up from Eden, where Wilber distinguishes stages of society as part of self-development. Am I right?

Mowrer: Yes. And he goes on with other books to specify five stages of
evolution—primitive, archaic, historic, early modern, and modern.
Parsons: But he does not describe the separation of the secular from the secular and the separation of the evolving institutions of society, I mean, like religion apart from the state, the market systems as different from civil society.
Mowrer: Yes. But he does describe evolution at nine different levels of personal and transpersonal stages from sensorimotor, phantasmic-emotional, rep-mind, rule/role mind, formal-reflexive, vision-logic, psychic, subtle, and causal non-dual.
Parsons: Buddha and Jesus were totally nonviolent. In Ken Wilber’s work I find no discussion of social movements in society, like those of Mahatma Gandhi. There were new seeds of change beginning in the last century. I mean like those of Martin Luther King, Caesar Chavez in the farm movement, and Dorothy Day in the workers’ movement, Kagawa in Japan, and more. The evolution of society is missing in Wilber.
Dean: Tell us more what you mean.
Parsons: The structure of the mind is not the same as the structure of society—with its institutions.
Mowrer: Let me quote what Wilber foresees in the future. Wilber sees us moving toward a greater “interiority.”

Looking deep within the mind, in the very interior of the self, when the mind becomes very, very quiet, and one listens very carefully, in that infinite Silence, the soul begins to whisper, and its feather-soft voice takes one far beyond what the mind could ever imagine, beyond anything rationality could possibly tolerate, beyond anything logic can endure. In its gentle whisperings, there are the faintest hints of infinite love, glimmers of a life that time forgot, flashes of a bliss that must not be mentioned, an infinite intersection where the mysteries of eternity breathe life into mortal time, where suffering and pain have forgotten how to pronounce their own names, this secret quiet intersection of time and the very timeless, an intersection called the soul.
Dean: Go quickly now!

12. The Field of Religion
In the original story the Dean died suddenly after the last class, leaving a grieving faculty. The faculty decided to hold a last class session on religion in his honor. This session would have been his wish. New panel discussants for the meeting on religion were chosen to inform the discussion. Professor Benedict is now in charge and introduces the new guests.

Benedict: We have with us, Professor Ramana Singh, who teaches Eastern religions—such as Buddhism, Jainism, and Hinduism. We have Professor Theresa Merton and Professor Thomas Gallagher Burns, S.J.,
over there (*points to them and smiles*), who teach about Catholicism and its history. Karl Tillich, in front of me here, represents the Protestant tradition. Let’s see. Over there (*points*) is Martin Herschel, who teaches the history of Judaism. And here (*pointing*) Jalal al-Ghazzali studies Islam. Welcome to all of you. Professor Kornberg will tell our new guests something of what we have been discussing so far.

**Kornberg:** Let me offer a quick summary of what the Dean has proposed through previous classes. Our new guest-scholars need a “catch-up.”

First, the Dean proposed that for scientists to “know anything” (like stars or rocks) is possible only through human *consciousness*. That does not deny the existence of things outside the mind but it does say that our senses and mind shape what we see. Second, he proposed that -- as human beings -- we “know” by *participant observation*. We are participants in the creation of knowledge. We are the subjects, as well as the objects of what we investigate. This is the case in every field, from astronomy to zoology. By our consciousness and participation we become part of the object of our own inquiry.

**Benedict:** Good. And the Dean also said he was taking a *perspective*, not creating a theory. His perspective began with an analogy borrowed from Aristotle: “An acorn holds the potential for what grows later as a tree -- roots, bark, trunk, and leaves.” The Big Bang had the potential for what came later as atoms, molecules, cells, animals, human beings and civilizations. All the subjects we teach on campus were latent there - - in the seed of the Big Bang.

**Kornberg:** The Dean asked us to investigate what concepts are held in common among our departments, like physics, chemistry, biology, music, sociology psychology, philosophy, and the arts. He proposed a strategy for students to think about evolution based on the resolution of “opposition” and differences. He described most of them as *polarities*, which could also be called binaries and antinomies. He wanted us to think about them as “substantive concepts” that apply to all fields involved in evolution. He suggested polarities like:

*Attraction-Repulsion, Synthesis-Differentiation, Symmetry-Asymmetry, Continuity-Discontinuity, Linearity-Cyclicity, Equality-Hierarchy, Simplicity-Complexity, Creation-Destruction, Change and Permanence, Individuality-Community, Abstract/Concrete, and Inner-Outer*

**Benedict:** In other words, the Dean proposed a framework to explore
evolution through concepts that are held in common among all disciplines in the university. He also proposed that a major key to evolution is synthesis, as this concept describes the resolution of differences and opposites in all our fields of knowledge. Nature, he argued, is always inventing new things from the old in a process of transformation.

Benedict: That includes a sense of the “self.” We saw how the word “self” exists in every stage of evolution in now in the field of religion.

Burns: The great writer Soren Kierkegaard says that the “self” keeps revealing itself. According to Kierkegaard, “self-realization” comes slowly.

Kornberg: Professor Tillich can you give us a timeline of religion in evolution? You were going to bring a chart for us for a perspective.

Tillich: Yes. I can hand these copies out to students.

Evolution of Religion

Benedict: Do today’s religious beliefs differ on evolution?

Prof. Burns: Dr. Michael Behe is Catholic and a brilliant biochemist. Behe says there is evidence of biological systems that are “irreducibly complex.” “They could not possibly have evolved by natural selection.” They must have evolved by “intelligent design.”

Wilson: No credible biologist today would support Michael Behe’s position.

Perry: Behe’s argument is persuasive. Certain parts of animals and cells cannot be explained by natural selection. For example, specialized tasks cannot have evolved in the eukaryotic cell with any continuity in time. This includes the digestion of nutrients and the excretion of wastes. Proteins are synthesized outside these compartments and reach their destinations only with the help of “signal” chemicals that turn other reactions “on-and-off” at the appropriate times. This is a “regulated traffic flow” in the cell that is incredibly complex – Behe calls it an “irreducible system.” All parts must function in harmony or the system breaks down. It could not have evolved in time in any normal way. How could it have evolved in a time sequence? And look at the coordinated mechanism that causes blood to clot...

Wilson: The class should know at least that Dr. Behe accepts the biology of evolution. That’s different than being a creationist.

Herschel: Gerald Schroeder is a Jew. He was educated at MIT and immigrated to Israel where he studied the Torah. He was interested in the Kabalistic School. He has combined the thinking of a 13th-century Kabalist scholar by the name of Nachmonodies with modern cosmology and general relativity. Schroeder says the purpose of evolution is “the
gaining of wisdom.”

Singh: In Hindu thought, cosmic evolution is a polarization that took place right from the beginning. Shiva is a god who represents the elements of the universe. Shakti is a goddess with dynamic potency; she makes these elements come to life. As they come together within you -- as these two energies combine -- they are the *Unmanifested.*

Kornberg: There is no “unmanifested” in science. Can you measure it? *(Singh thinks: “The ‘dark energy’ of physics cannot be seen or measured.”)*

Singh: You cannot measure the unmanifested. You have to experience it. It is divine energy. It *manifests* through your body. “Tantra” is a method of meditation that helps you experience high energies, the music and beauty behind all things. They are the energies of Male and Female ... the warp and woof of the universe.

**Tantra**

Singh: Tantric practices were first handed down through oral tradition. But the books Professor Benedict is talking about are thousands of years old! They were written as a dialogue between the Hindu god Shiva -- who is "the penetrating power of focused energy" -- and his consort, Shakti, the female creative force.

Benedict: Hinduism and Buddhism assume that the universe is composed of universal energy, greater than any individual or group.

Singh: The practice of Tantra focuses on the enlightenment of individuals. It is a practice by a couple embraced in love. This *universal energy can channel sexual energy through each partner in liberating ways.* Tantra elevates a couple’s relationship into an art. Love becomes a sacrament. Partners become more "complete" in their experience together. They discover parts of themselves that have been dormant or repressed.

Benedict: Would you say that this energy has helped to drive evolution right from the beginning?

Singh: It is a divine energy. We can channel that energy to aid spiritual development. When we practice Tantra, the boundaries of our mind and body expand with a new awareness; we are more empowered. *We perfect ourselves through self-denial and restraint. This may include celibacy or what Gandhi called ‘brahmacharya.’* In this tradition, sexual energy is called “hidden lightning.” When this form of life energy becomes properly disciplined, it is creative. By that means, *lovers can move into a higher stage of consciousness.* Sexual energies are Divine and powerful. They are not just for biological survival. They advance evolution.

Benedict: We talked in class about the integration of opposing energies—
remember, the Yin-Yang principles? In terms of Eastern thought, these energies are in the body. They can be combined as you say, “Synthesized.”

Singh: Harmonization of the Ying-Yang energy in Tantra practice can bring more than ecstasy. It becomes a subtle, joyous transcendence. It stays with you. These forces are exquisite -- our inmost power.

Benedict: In Hindu thinking, the on-going process of integrating these energies over time brings about a completion of one's self. Remember when the Dean asked, “What is the self?”

Singh: If this consciousness is developed, it leads to the completion of the “self.” The Tantras are sacred teachings that make us aware of our subtle body. I cannot go into all the details of this practice, but I can say that over time it reveals what we call a “transcending energy.” With practice, partners can master the tantric postures, known as asanas, and pranayamas, or breathing techniques. Partners can tone and strengthen ...and harmonize the Yin-Yang forces for each other.

Benedict: Do you recall that we talked about Kundalini energy?

Singh: Kundalini is the force behind evolution. When couples, romantic partners, channel this force, they deepen their love for one another -- and for others on the planet. Partners mature emotionally.

Merton: In Catholicism, nuns and priests practice celibacy.

Singh: Yes. And so do dedicated Buddhists. Tantra is subtle energy, transformative. A couple merges their energies in the process – right into a blissful union.

Benedict: The Dean would call it “synthesis” – the harmonizing of opposites.

Singh: Yes. But it is not an energy you measure; rather, it is an experience. When a couple can realize the heavenly nature in one another, the “self” matures.

**The Self**

Singh: The word “self” is used everyday with a small “s”. It is like what some of you call the ego. It is the cause of suffering. In Buddhism, you think you have an ego or “self,” but it is illusory. You need to “let go” of personal ideas about the self. They foster self-centeredness and all the traits of egocentricity.

Kornberg: What traits?

Singh: Human emotions like hate, fear, disgust, anger, attraction and repulsion. The Buddha saw that we suffer because we consider our "self" — our ego identity — as something fixed. Prof. Mowrer:) There is no “self”! What is this?

Singh: The feeling of a separate "I" is just your ego-consciousness. It is
composed of desires and emotions. The “I” and the “self” are illusions. They are part of your ego, clinging to attachments and desires. The more desire and aversion we have, the stronger the ego. Dropping the “ego-self” is the final stage of human evolution.

Singh: The proof is in the experience. The Buddha said, “search for your higher Self, capital “S”. It’s spelled with a capital “S” to distinguish it from the ego. Ultimately, this higher Self is all that exists. You must lose your “ego-self”—to experience that higher Magnificence, Splendor, and Beauty in the universe. It is there in-and-through the body.

Mary: Who am I?

Singh: You are in the great dance of existence. The body participates in subtle energies that are gateways into every part of the universe.

Benedict: Let us move on to other guests. Professor Burns…the self?


Parsons: That is pure subjectivity. Objectively, our identity changes in the context of society. Our self-identity develops through culture and social relations. It is created first through the family; then, it expands in association with friends; and then it grows larger as we identify with more groups and eventually with a country. When we travel, we begin to identify with other people other countries around the world. Our human identity keeps expanding as we mature.

Burns: Catholics would identify with the life of Christ. Saints like St. Teresa of Avila and St. John of the Cross -- did not need to travel around the world to find their identity. They found union with Jesus right where they lived.

Merton: The highest identity is what Catholics call "Consummate union." St. Teresa called it "the seventh resting-place" -- the "interior castle."

Compassion

Singh: But Buddhists have differences with Christian theology. First, Buddhists have no God. Second, there is no permanent “self” as I mentioned.

Tillich: Well, in terms of syntax: God is the object of your sentence. But God is not an object. So I use the term transtheistic. This is not theism. Trantheism is neither theism nor atheism.

Singh: Buddhism is not against the Divine (atheism), but against theo-ontology: the positing (labeling) of an objective, eternalized Being or "substantia", an underlying "outer" thingness: permanent, separated,
defined, continuous and solid. Its intent is transtheist. Tillich: “Transtheism” is not a view often held by Protestants, but it is in concord with Jainism and Buddhism. It is part of a movement called “spirituality.” Suffering leads people to deepen their faith. People do not know what happens after they die.

**Complexity and Simplicity**

Kornberg: I see evolution showing an increase in complexity. But how could there be an “increase in simplicity?” They are contradictory. Singh: Compassion is simple, but you would find it complex to experience. To get to the Buddha’s level of Compassion is not easy, in fact, rare for followers. Buddha’s level of Compassion cannot be explained in ordinary language.

Kornberg: Simple and complex is maybe like Einstein’s E=mc squared. That is a simple formula in mathematics but it is extremely complex to understand.

Merton: Jesus lived in simplicity, “Be like a child.” He said: “Whoever does not receive the Kingdom of God like a child cannot enter into it.”

Burns: Jesus said: “Love your enemies.” That sounds simple. But you must develop a “Christ consciousness.” (He looks at Kornberg.) Can you love your enemies? (Kornberg says nothing.)

Singh: The Buddha, if living in his body today, might say to the Dean: “Self-realization in its final form is the synthesis of all opposites.” That includes complex and simple. There is no opposition in Nirvana.

Benedict: Synthesis ends right there. Remember in physics: Nucleosynthesis is the process of creating new atomic nuclei. Does that make sense in your language? The Dean compared the Big Bang with the potential hidden in an acorn.

Merton: Jesus spoke of bread and the potential hidden in you: “The Kingdom of Heaven is like “yeast, which a woman took, and hid in three measures of meal, until it was all leavened. The Kingdom is within you.”

Burns: Jesus also said: “The Kingdom of Heaven is like a treasure hidden in the field.”

**The Purpose of Evolution**

Merton: The purpose! The purpose is to bring heaven into the earth. It is -- as has been said -- the final synthesis. We are here to join heaven with earth. The prayer of Jesus was: “Thy Kingdom come; Thy will be done, on earth as it is in Heaven.”

Benedict: Professor Ghazzali, what would you say is the purpose of evolution? The Bahá’í Faith is one of the fastest growing of the world’s religions. It has more than five million followers in virtually every nation.
Ghazzali: Bahá'u'lláh taught that the purpose of evolution was the development of the soul -- with all its capacities. Evolution takes us -- with our help -- towards the Great Communion. Bahá'u'lláh taught that we must establish a world community. For him it meant everyone coming together to create a global federation to stop war. Nations go to war because there is no law and order. Vermont does not go to war with Massachusetts because there is a federation of higher laws.

Ghazzali: Bahá'u'lláh said when we learn more about what love means, our awareness increases. We expand consciousness -- toward higher and deeper levels, like a world community.

to the Transcendent One. Bahá'u'lláh taught that as the soul evolves it develops the attributes of God. So divine qualities are not external; they are latent within the soul, just as the color, the fragrance, and the vitality of a flower are latent in the seed. They need only to evolve to be understood.

Singh: The purpose of evolution is to reach Enlightenment, Buddha’s complete awareness. To realize Nirvana -- with all your atoms and molecules and cells maintained, transformed and transcended.

Benedict: That sounds like Buddha. That is the end of evolution.

Merton: The Savior became omnipresent. That is why he could say: “For I was hungry and you gave me something to eat; I was thirsty and you gave me drink; I was a stranger and you invited me in; I needed clothes and you clothed me; I was sick and you looked after me; I was in prison and you came to visit me.” His disciples could not understand who he was. But he had become one with the Creator.

Herschel: Jesus grew up in the Jewish tradition. Look at what the Torah says -- in Isaiah, "Is it not to divide your bread with the hungry? And bring the homeless poor into the house; when you see the naked, to cover him; and not to hide yourself from your own flesh?" Those ideas were in Judaism before Jesus was born. Jesus is “the son of man.”

Singh: There is no difference between Buddhahood and Christhood. There was of course a difference in them as two individuals. Siddartha lived four hundred years before Jesus was born.

Kornberg: There are no differences?

Singh: There are historical differences. There was Gautama and then there was Jesus. But in the Buddha, after his enlightenment, there were for him -- to borrow the Dean’s words -- no polarities or antinomies. Buddhists today call it “non-duality.” The path of the Buddha brings
you into the uttermost sublime consciousness. The radiance in the universe is in him... and equally hidden in you.

Tillich: In Christ there is no East and West. In Christ there is no male or female.

The Evolution of Power

Burns: I think: the earth is evolving toward the Divine: “the power and the glory forever.”
Benedict: The Big Bang evolved through the fusion of atoms into molecules and through billions of years into cells and the fusion of animals in mating. Each stage gave birth to the next stage.
Perry: The idea of power in our mind has developed from seeing it outside our bodies to seeing it as a power inside as a spirit.
Mowrer: Slaves gained power after the Civil War but the fight for equality is not over. Women gained more power with voting right but the prejudice is still there. Minorities have been developing more power and authority in society.
Britten: Think how power has been evolving inside. What of the power of Beethoven? Music began with drums and dance but has become increasingly pure, inward, and deeper.
Benedict: How do you see power in the Catholic Church, objectively? Is it changing?
Merton: Power in the Roman Catholic Church has changed. The principle of “subsidiarity” was defined in the Church to help decentralize its command bureaucracy. The Church coined the idea as a moral principle, and restated it in a papal encyclical, “Quadragesimo Anno,” in 1941. The encyclical said, “It is an injustice, a grave evil and a disturbance of right order for a large and higher organization to arrogate to itself functions which can be performed efficiently by smaller and lower bodies...” Today there is a mounting call for more power for women around the world.
Benedict: Professor Tillich, how has power evolved in Protestant churches?
Tillich: Protestants have developed different types of power by way of their organization. The Episcopal Church is the next closest in command power to the Catholic Church but with less authority at the top. The Methodist and Presbyterian churches are more decentralized; they argue over which is more democratic. For example, the Methodist churches own their own local property while the Presbyterians require a higher body (the Presbytery) to own local churches. The Quakers are among the most decentralized.
Merton: We are evolving through the power of love. Look at the Catholic peace activists in the last century. In the United States, we saw
the Berrigan brothers, Dorothy Day, Cesar Chavez and Dolores Huerta. In France, look at Lanzo del Vasto. In Brazil, look at Dom Helder Camara. In Ireland, look at Mairead Corrigan. In Italy, look at Danilo Dolci. They all modeled themselves after the life of Jesus. They practiced love in the face of violence.
Singh: Look at Gandhi, a Hindu. Look at Martin Luther King, a Baptist.
Benedict: King defined “power” as the capacity to create change.
Tillich: The universe is evolving in the power of a great Presence. That kind of power has no polarity like subjective and objective. There is an unspeakable Majesty that has given us the power to create heaven on earth.
Merton: Think of the power of Jesus washed the feet of his disciples when they were arguing about their own status. None had His power of healing. He said: “Thy Will be done on earth as it is in heaven.”
Kornberg: If heaven is to come on earth, what is heaven like?
Jalal al-Ghazzali: I recall by memory what the Muslim poet Rumi wrote:

The Universe
What if someone said to an embryo in the womb,
"Outside of your world of black nothing
is a miraculously ordered universe;
a vast Earth covered with tasty food;
mountains, oceans and plains,
fragrant orchards and fields full of crops;
a luminous sky beyond your reach,
with a sun, moonbeams, and uncountable stars;
and there are winds from south, north and west,
and gardens replete with sweet flowers
like a banquet at a wedding feast.
The wonders of this world are beyond description.
What are you doing living in a dark prison,
Drinking blood through that narrow tube?"
But the womb-world is all an embryo knows
And it would not be particularly impressed
By such amazing tales, saying dismissively:
“You’re crazy. That is all a deluded fantasy.”
One day you will look back and laugh at yourself.
You’ll say, “I can’t believe I was so asleep!
How did I ever forget the truth?
How ridiculous to believe that sadness and sickness
Are anything other than bad dreams.”

Oppositions in Evolution
Benedict: They were present in Mesopotamia and in ancient Greece. But -- as the Dean said -- polarities in philosophy need not be an “either/or proposition.” One is not supreme over the other in everyday life. The “subject “cannot totally subsume the “object,” And it is not
“freedom over order”. His oppositions are abstract and mutually involved.
Kornberg: For the Dean, evolution is a mutual working out of these antinomies through time. On earth, it is not the ideal over the real. It is not heaven over hell. It is not life over death. Rather, it is the evolution of one side through the other. The subject is to be found in the object. Heaven is to be found in the earth. What do you think?
Burns: The Jesuit Teilhard de Chardin talked about how we evolve through a “living earth.” This was the case for him before scientists ever knew about Gaia. He came up with the idea before James Lovelock confirmed scientifically that the evolution of life contributes to the stability of the global temperature, ocean salinity, and oxygen in the atmosphere.
Benedict:. Lovelock, the biologist, said the Earth is a living organic being; the earth is self-organizing and self-regulating. Gaia scientists see the participation of living organisms in the carbon cycle as one of the complex processes that maintain conditions suitable for life.
Sister Merton -- is Father Burns right?
Merton: Teilhard de Chardin thought the Earth was alive. It was not matter (in chemistry) versus life (in biology.) He proposed “mutuality” as a way to understand evolution. This is better for me than Herbert Spencer’s “survival of the fittest.” Our universe, he insisted, strives towards a higher consciousness. It arranges itself into more and more complex structures. The Earth, he said, is a guiding force at the center of our future. At the Omega Point we will see “complete compassion” with “ultimate happiness. (Singh thinks of: Buddha’s “Ultimate Compassion!”)
Burns: Chardin says we are evolving towards a “great Passion.” The Earth is evolving as a new organ of consciousness. He called it the “Noosphere.” The Noosphere is “consciousness” evolving at a planetary level. He said: This stage is comparable to the evolution of the cerebral cortex after the appearance of the human brain. It becomes a "planetary thinking network."
Merton: According to Chardin, the Noosphere is a growing global network of self-awareness. It gives us instantaneous feedback. It develops an “immediate planetary communication.” It becomes a different world network of identity.
Jerry: A “Global network developing right now -- around the world. It’s the Internet! How could this Jesuit have imagined the Internet?
Mary: Well, he was amazing. The Internet is of course outside and did
not exist in his day. He said a planetary communication would soon evolve. But Chardin said it evolves with the heart, not just the mind. Merton: He said that humanity is building a “composite brain.” And it is happening right now before our eyes.

Burns: God is in and outside human consciousness: Immanent and transcendent at the same time. The Jesuit Bernard Lonergan proposed a cosmic process that develops from stage to stage. Each stage exhibits a greater freedom than the preceding stage, and this leads to the freedom of humanity to restructure itself. In this sense Father Lonergan was like our Dean. He taught about development toward an “interior” life. He saw everything as the “ground of consciousness.” He sees the evolving universe as he put it, “generalized emergent probability.”

Merton: These antinomies are not just pure opposites. Catholics believe people can experience heaven on earth. Read the works of St. Ignatius of Loyola and St. Teresa of Avila. Students can also read about St. John, Saint Augustine, Saint Anthony, Hildegard of Bingen, Thomas Aquinas, Catherine of Sienna, and Francis de Sales...

Who Are We?

Merton: We are the Children of God! We are human beings with the Divine within us.

Burns: Yes. But Catholic intellectuals also wrestle with the complexity of your question.

Mary: “How?”

Burns: For example, we debate the work of Søren Kierkegaard, a philosopher who lived and wrote in the nineteenth century. Kierkegaard argues you must search the inmost depth of your existence. Your inner life harbors a secret. The “self” has a secret -- unknown to you.

Reincarnation

Singh: Life on earth is a theater. Here is where we keep learning new roles. It is a constant “self-realization.”

Kornberg: What do you mean?

Singh: If you grew up in Eastern religions like Hinduism and Jainism, you would know about reincarnation. You would believe the soul reincarnates through a cycle of lives known as Samsara. Each time a human being is born, they gain karma. Karma is action and reaction, the natural law of cause and effect. People are unable to overcome it and this then leads to the need for reincarnation. After spiritual practice of role playing on earth a person finally realizes their “larger self.” But they must lose their body and ego. When you learn “Self” with a capital “S”, all desires in this world vanish. You need not be born again.
Benedict: Now, how would a Protestant see this evolving self?
Tillich: Jesus said you must give up your self to find your self. Paul puts it another way in Galatians 2:20. “I myself no longer live, but Christ lives in me.”
Kornberg: These are just religious beliefs. Where is the truth?

Truth

James: For Kierkegaard, truth is in both orders: objective and subjective. The objective thinker finds truth by approximation. The subjective thinker finds truth by appropriation. The objective thinker needs to quantify something, making it into a probability. The subjective thinker must accept uncertainty. Faith can only be attained by an acceptance of uncertainty.
Burns: So Kierkegaard says “truth” is a paradox of oppositions: subject and object.
Merton: In seeking eternal happiness, a person must experience suffering. This is the irony of life on earth.
Kornberg: Let’s go back to evolution.
Merton: Jesus represents the final stage in this long journey through history from the Big Bang. This history has a sacred side.
Benedict: What would the Dean say about what is sacred?
Kornberg: Truth! Life! These are sacred.
Singh: Mahatma Gandhi put these concepts together. He invented a new word for their integration: Satyagraha. It means bringing truth into your life. It is a synthesis of love and truth in action.
Burns: The most Holy is hidden within each individual.
Parsons: If you think only in terms of the individual and a subjective mind, you cannot see society objectively. The evolution of society must be understood or you miss the truth. Mercea Eliade was the world’s top expert on “the sacred.” He thought only in terms of the mind. Look at what he did!
Burns: What?
Parsons: He became a fascist. And don’t forget that other greatest philosopher of the mind, Martin Heidegger. He became a Nazi. He did not understand society. In his day, Heidegger thought capitalism was a civil society. Civil society evolved in the next century as the Third Sector. For Hegel and Heidegger, the state was sacred. They could not see the differentiation of society into different sectors, the state, religion, science, art, and more. The word “society” was invented to represent all sectors.
Burns: But Kierkegaard was a critic….
Parsons: *(Interrupts)* ...was a critic of Hegel. Yes, but his work was a psychology of feelings and emotions of the individual. **Individualism** was the *zeitgeist* of his time. *(Pause.)* **Auguste Comte** was inventing the idea of society in his day. If you look for what is sacred only in the individual -- in the subjective mind alone -- you will not see what becomes sacred outside in a nation. If you think of “spirituality” as belonging to the individual, you will *not* see nations as sacred, stockpiling nuclear weapons.

Burns: Do you remember Father Drinan? *(Parsons nods.)* He was a Jesuit who was also a world federalist. He saw human life as sacred everywhere. He said we must build an international community, build global law -- develop a “world government.”

Herschel: Do you remember Norman Cousins? He was a Jew—an advocate of liberal causes, and editor of the *Saturday Review*, President of the World Federalists. He worked with Drinan.

Mowrer: I knew Cousins. He told me: “It took rivers of blood in the First World War to sicken people enough to create the League of Nations, but that world body was not binding enough to stop World War II. So after World War II with its Holocaust and mass killing we organized a *confederation*, the United Nations. It was more enforceable than the League but not strong enough to stop more mass killings and terrorists. What new horror of war will it take to create a world government with enforceable law?

Will it take a “suitcase nuclear bomb” blowing off in Washington D.C. -- slaughtering all the members of Congress, killing all sitting Justices of the Supreme Court, and the President of the United States? There would be nothing left of this government... nothing but radiation.

Merton: But we are progressing in the tradition Jesus left to us. Nonviolent revolutions are evolving to overthrow dictators. **Look at the nonviolent revolution in Guatemala in 1944. Thousands of people overthrew Ubico, the dictator who loved Hitler. Citizens got rid of him nonviolently -- without violence.**

Perry: And those nonviolent Velvet and Orange revolutions are evolving! Citizens sacrifice their lives without violence.

Merton: All empires in history have fallen—the Persian, Mongolian, Egyptian, Incan, Aztecan, ... the Roman and British Empires. They all fail...over time.

Ghazzali: Who is the empire today? Millions around the world marched to stop the Iraq War. Yet Congress agreed to invade Iraq. The enemy is us!

Burns:  **Jesus sacrificed his life for all of humanity.**

The Evolution of Sacrifice
Wilson: The origin of sacrifice goes back (at least) to animals. Mother squirrels sacrifice their lives to save their children from predators. That means they save the species. It is all about identity. We talked about how ants sacrifice for the good of their community; birds sacrifice to keep the flock from starvation. A flock of birds, a herd of buffalo, a school of fish—is group identity. It is like us—it is their “nation” so to speak. Each is a collective identity.

Perry: Identity and sacrifice could be traced back to the beginning of evolution. Atoms can “identify” other atoms. They sacrifice themselves when attracted different kinds of atoms—fusing to produce molecules—like oxygen and hydrogen—combining to create water. Go further. Lions can identify lions of like kind. And antelopes can identify lions as their enemy. In these early stages of identity we could say that antelopes give up their lives for their enemy.

Wilson: Remember biology. There is a lot of cooperation in evolution. Kropotkin saw evolution based on cooperation and “mutual aid.” We have yet to learn how identity works here. Dogs adopt orphan cats. Dolphins swim under injured animals in the sea—and push them to the surface to breathe. There is some sense of sameness here.

Benedict: For the Aztecs “sacrifice” was a way of paying their debt to the gods. Human sacrifice was like a gift to them. This primitive notion of sacrifice as a gift could have been an evolutionary forerunner of the story of Abraham who saved his son and instead sacrificed a lamb. And then later of Christ—as you say—who gave his life to save humanity.

Herschel: In the Middle East, the notion of sacrifice and suffering began in ancient Israel. The victim begins in the Hebrew Scriptures, for example in Isaiah's identification of Israel as the suffering servant who will redeem the world. The ancient Hebrews found meaning in their sufferings by identifying with the role of the sacrificial victim.

Benedict: They were a small tribal nation surrounded by larger empires.

Herschel: It is a tale of testing, punishment, and redemption: "For whom the Lord loveth he chasteneth." Judeo-Christian identification with the victim is historically based. Jews were able to live through the drama of victimization. Remember the Old Testament promise: "I will put my law in their inward parts, and write it in their hearts" (Jer. 31:33)

Singh: Their food was set on holy grass before an altar. The high priests—Brahmins—were entrusted with the divine rites. A Vedic proverb runs: "Sacrifice is the navel of the world". Yes, we have evolved spiritually.

Benedict: We “think” about sacrifice, as an idea but in talking about it. Sacrifice is emotional, an experience. It can be a sacrifice of those most
precious to us. (Kathleen gave up her child for adoption. That was a terrible sacrifice.)

Britten: We talked about the emotion of sacrifice as interpreted in Stravinsky’s The Rite of Spring. The sound caused a riot in the audience. Stravinsky was portraying the ancient and primitive sacrifice of precious young girls.

Derek: But why? Why make such terrible sacrifices? Why sacrifice those who are most dear to us?

Wilson: The meaning of sacrifice is evolving. We talked about the sacrifices of mother squirrels to save their young...at the animal level. And then the sacrifices made by the Aztecs to the sun god. They were meant to preserve life. Then we move to Abraham’s intention to sacrifice his son; but then, seeing an angel. He broke tradition, made a leap of faith and substituted a lamb for his son. Is there an evolutionary progression here?

Merton: But look at “transcendence” in this evolution. Jesus became the lamb for all humanity. He sacrificed his life for everyone: That’s the highest stage – and final stage -- of human evolution.

Mary: The sacrifice of Jesus meant that he found complete unity with all life and nature, accepting all differences. How did he do it?

Burns: Jesus kept talking to people in parables. Parables are “extended metaphors” like similes and allegories. Do parables help people understand the highest level of consciousness -- Heaven? Is the parable based on the same principle that started with the Big Bang?

Merton: Parables were the way Jesus brought his followers toward a higher level of awareness -- beyond humankind -- like atoms to molecules, and molecules to cells, all the way through animals to Homo sapiens. Now to heaven.

Kornberg: Are you saying that the appearance of Christ consciousness -- bring all human differences to an end?

Burns: Does this final inward unity represent what philosophers call the Absolute?

Mary: This is the end of evolution?

Merton: Is this the Self -- at once imminent and transcendent?

Jalal al-Ghazzali: Is a greater “Self” inside and outside us?

Merton: Will we pass into a different frequency of time -- when we go to the other side?

Benedict: Our time is up.

Kornberg: (He points to the guest scholars.) “You have the last word!”

Speak your ideal...in one sentence!
Merton: Love your enemy!
Singh: Meditate with love in your heart!
Parsons: Build a global federation.
Ghazzali: Satyagraha! Act in truth and love.
Benedict: We must end this seminar. Class! We’re done. Thank you all!
(Throws a kiss. Students raise their hands and call out: “THANK YOU!”
(Mary, Jerry, James, Ann, Barbara, Alice, Tom, Derek, Bob, Harry, and Kathleen -- all shout “Great”, “WONDERFUL!”
(Speaking at once) Jerry, Derek, Mary, Alice, Harry, and James: Please, keep the seminar going.
This class must meet again.
Benedict: It’s finished.


2 Published Quantum Implications, Essays in Honor of David Bohm, Routledge & Kegan Paul, Ltd. 1987 Copyright Routledge & Kegan Paul


performance, and conclude that a high parasite mutation rate is preferred over a lower rate, and that crossover has little effect on its performance.


Ibid. 162.


Lynn Margulis dedicated the last eight chapters of her book, *The Symbiotic Planet*, to Gaia. She said that Gaia is “not an organism,” but "an emergent property of interaction among organisms." She defined Gaia as "the series of interacting ecosystems that compose a single huge ecosystem at the Earth's surface." She argues that the surface of the planet behaves as a physiological system in certain limited ways. In effect, the earth's surface looks alive.

She is summarizing an outlook proposed by Derek Gatherer, School of Biomolecular Sciences, John Moores University, Liverpool L3 3AF, United Kingdom. *Journal of Social and Evolutionary Systems*, Volume 20, Issue 1, 1997, Pages 75-92.

"Long before it’s in the papers. "*World Science*, September 26, 2008. Courtesy Yale University and *World Science* staff. In recent years, scientists have found that many “control regions lie within so-called “junk DNA”—gene sequences whose function had been unclear, because they don’t directly code for the production of molecules, as other DNA does.


Joachim L. Dagg. “A Metaphor for Herbert Spencer's Explanatory System Inst. Phytopathology and Plant Protection,” Grisebachstr. 6, Georg-August-University, 37077 Göttingen, Germany. Spencer's defenders say that he need not have apologized for his analogy. Scientists use analogies today, such as *The Selfish Gene* (Dawkins, 1976); *Gaia* (Lovelock, 1988); and *The Red Queen* (Ridley, 1993). Dagg describes Spencer's explanatory system as structured like a hologram, where each part reflects the whole from a different perspective.

Sorokin believed that the West was in a terrible crisis but that this would only be a transition to a very different phase of civilization. His “phases” can be summarized in another way: First, the *ideational* culture is built around God, or some transcendental source of truth; in it, material concerns are secondary to spiritual ones. Second, the *idealistic* culture synthesizes spiritual and material values through reason. Third, the *sensate* culture is built around material concerns that de-emphasize the spiritual as the foundation upon which the culture is built. Each one of them is a partial truth, and so true human “flourishing” would be out of balance if civilization focused too heavily on one mentality over another. Neither ideational nor sensate cultures can go on forever without experiencing a correction—marking a transition from one state to another. There is no
indication of these phases moving in a progressive sense.

15 Lucretius’s *De Rerum Natura* has explanations for changing phenomena, like erosion, evaporation, wind, and sound. Famous are his principles, such as "nothing can come from nothing" and "nothing can touch body but body."

16 Russel D. Fernald, *Aquatic Adaptations in Fish Eyes* (New York: Springer, 1998.)

17 Social theories of exchange propose that humans “reciprocate valued activities” (e.g., giving respect and getting help) and that these transactions are "held together" by the principle of reinforcement. Exchange transactions that involve reciprocal reinforcement by “partners” increase in frequency or probability. Those transactions that are not mutually reinforcing, or are costly to the partners, decrease in frequency over time. George Homans, “Social Behavior as Exchange.” *American Journal of Sociology*, 63 (6) 1958: 597–606. R. Emerson, “Power-Dependence Relations” *American Sociological Review*, 27(1) 1962: 31–41. Peter Blau, *Exchange and Power in Social Life*. New York: Wiley. 1964.


20 Structuralism was a fashion in France in the 1950s and 60s. Scholars studied the underlying structures inherent in texts and used analytical concepts from disciplines from other disciplines to interpret them. “Structuralists” wanted to integrate their work into other bodies of knowledge, as seen in the work of Ferdinand de Saussure in linguistics, Claude Lévi-Strauss in anthropology, and early 20th-century psychologists. Post-structuralism holds that the study of underlying structures is culturally conditioned and subject to misinterpretations. To understand an object (e.g., one of the many meanings of a text), it is necessary to study both the object and the systems of knowledge that produced the object. Post-structuralism then becomes a study of how knowledge is produced.

21 One of the questions of literary theory is "What is literature?" Another is: “How does one define a "text?" For some theorists "texts" comprise "works belonging to the Western
literary canon," such as those of Aristotle or Shakespeare, but others include works of non-fiction, popular fiction, films, historical documents, law, and advertising. This broadens the field of literature to include cultural studies. Some scholars then treat cultural events, such as fashions and folk songs as "texts." In this sense literary theory can be thought of as the theory of interpretation, closely linked with phenomenology.

22 Scholars recognize four laws of Aristotelian logic: the law of non-contradiction (A is not non-A), the law of identity (A is A), the law of excluded middle (either A or non-A), and the law of rational inference from what is known to what is unknown. Bertrand Russell makes a distinction between the "law of excluded middle" and the "law of contradiction." In *The Problems of Philosophy*, he cites three "Laws of Thought" as more or less "self evident" or "a priori" in the sense of Aristotle:

1. Law of identity: 'Whatever is, is.'
2. Law of non-contradiction: 'Nothing can both be and not be.'
3. Law of excluded middle: 'Everything must either be or not be.'


24 In *Of Grammatology*, Derrida looks at the binary of speech-and-writing, saying that speech is seen as more important than writing. He says speech gets privileged because speech is associated with presence. For a spoken language to exist, somebody has to be present to be speaking.

25 S. Kumar, “Patterns of Nucleotide Substitution in Mitochondrial Protein Coding Genes of Vertebrates,” *Genetics*. 1996 May; 143(1): 537–548. Institute of Molecular Evolutionary Genetics and Department of Biology, University Park, PA: Pennsylvania State University, 16802.

26 This description of “Chinese Principles” is edited from Karen Albert in *Bonsai Today* (Issue #98, 4/2005).

27 *Synaesthesia* means “union of the senses,” referring to the stimulation of one sensory

28 Wassily Kandinsky. Point and Line to Plane. (NY: Dover Publications). Kandinsky was both a musician and a painter who believed associative color was resounding in the soul. He read theosophy. He saw how the Theosophical Society popularized the wisdom of the ancient books of India and China. Some artists, like Kandinsky, began to work on creating “timeless shapes” in geometry, such as the circle, the square, and triangle. He saw spatial elements of abstract art as fundamental systems behind reality. At the beginning of the 20th century, Henri Matisse shocked the art world with multi-colored, expressive landscapes and figure paintings, as style of art that critics called by a new name, Fauvism. The raw color developed by the Fauves—literally, “the Wild Beasts”—influenced Kandinsky.

29 In his De Inventione, Cicero listed five stages in creating an oration, namely invention (inventio), arrangement (dispositio), style (elocutio), memory (memoria), and delivery (pronuntiatio). Cicero says, “One must first hit upon what to say; then manage and marshal his discoveries, not merely in orderly fashion, but with a discriminating eye for the exact weight, as it were, of each argument; next go on to array them in the adornments of style; after that keep them guarded in his memory; and in the end deliver them with effect and charm.” Anthony Everitt, Cicero: the life and times of Rome’s greatest politician, (New York: Random House, 2001).

30 Flutes were carved from the wing bone of the red-crowned crane, with five to eight holes capable of producing varied sounds in a nearly accurate octave. The use of the flutes for the Neolithic musician is unknown, but they were probably played in special ceremonies. Chinese stories tell of the importance of music. The sound of the flutes lured cranes to a waiting hunter. See http://www.metmuseum.org/toah/hd/jiah/hd_jiah.htm

31 At the University of California at Berkeley, Anne Draffkorn Kilmer deciphered the music of this song. It was composed in harmonies of thirds, written using a Pythagorean tuning of the diatonic scale. Kilmer, Crocker, and Brown, Sounds from Silence, Berkeley, CA: Bit Enki, 1976), LCC 76-16729.

32 Bela Bartok said, "If I were to name the composer whose works are the most perfect embodiment of the Hungarian spirit, I would answer, Kodaly. His work proves his faith in the Hungarian spirit. The obvious explanation is that all Kodaly’s composing activity is rooted only in Hungarian soil, but the deep inner reason is that his unshakable faith and trust [is] in the constructive power and future of his people." Kodaly had a predilection for melancholy and uncertainty, but Bartok said, Kodaly never sought “Dionysian intoxication – he strives for inner contemplation...His music is not of the kind described nowadays as modern. It has nothing to do with the new atonal, bitonal and polytonal
music – everything in it is based on the principle of tonal balance. His idiom is nevertheless new; he says things that have never been uttered before and demonstrates thereby that the tonal principle has not lost its raison d’être as yet." These quotes are from notes of the Sierra Chamber Society.

Ethan Haimo describes Schoenberg’s music as divided into three periods: tonal, atonal, and serial. Ethan Haimo, *Schoenberg’s Transformation of Musical Language* (Cambridge University Press, 2006).

There are many unresolved questions about Mozart's natural ability. At the age of three, he already sat in front of the harpsichord, attempting to find harmonic successions of thirds; whenever he succeeded, his voice sounded joyful. When Wolfgang was four, his father began to teach him the elements of the harpsichord and the rules of composition. For some music historians, it seems as though Mozart did not need to learn. Right away, he began producing minuets and other small pieces for harpsichord, and several sonatas for harpsichord and violin. By his sixth year he had produced a large number of minuets, sonatas, and even a concerto. His ear could recognize that the violin was usually tuned an eighth of a note lower than his father tuned the instrument. Mozart had composed full-length operas and 28 symphonies by the age of 18, mastering virtually every technique.


No author listed, “Biologists are addressing one of humanity’s strangest attributes, its all-singing, all-dancing culture,” in *The Economist* December 18, 2008.


Hugo Norden, “Proportions in Music” in *Fibonacci Quarterly* vol. 2 (1964), pages 219–222. These are talks about the first fugue in J. S. Bach's *The Art of Fugue* and shows how both the Fibonacci and Lucas numbers appear in its organization.


41 Roger Jean describes a concept of phyllotaxis with a mathematical model of plant growth based on experimental anatomical, cellular, physiological, and paleontological observations. The model provides a framework for formal analyses of botanical data and shows the relevance of phyllotaxis to other structures, such as crystals, and proteins. Roger V. Jean, *Phyllotaxis: A Systemic Study of Plant Pattern Morphogenesis* (Cambridge University Press, 1994).


46 These scientists included R. A. Fisher, Theodosius Dobzhansky, J. B. S. Haldane, Sewall Wright, Julian Huxley, Ernst Mayr, Bernhard Rensch, Sergei Chetverikov, George Gaylord Simpson, and G. Ledyard Stebbins. This “synthesis” resolved conflicts among different branches of science: genetics, cytology, botany, morphology, ecology and paleontology, a major reconciliation of difference. The Modern Synthesis brought together the traditions of Darwin and Mendel, so that evolution within a species could be explained. The agreement stated: diversity within a population arose from the random production of mutations, and the environment acted to select the fittest phenotypes. Those animals capable of reproducing would transmit the genes that gave them their advantage. These genes included those encoding enzymes with better rates of synthesis, and globins with better oxygen-carrying capacity. It was assumed that the same kinds of changes
(gene or chromosomal mutations) that caused evolution within a species also caused the
evolution of new species. If a new phenotype were to be produced, there would need to
be an accumulation of these mutations, and a mechanism of reproductive isolation to
enable them to accumulate in new ways. This “unity” was a political tour de force at the
time, because all scientists could defend their position against fundamentalist Christians
(supporting Creationism) and Communists (supporting Lysenkioism). Lysenko supported
Lamarck, the 18th century French scientist who argued for a theory of evolution before
Darwin. Evolutionary scientists rejected Lamarck’s theory because it was not as solid an
explanation of evolution as Darwin’s theory of natural selection.

Bergson’s concept of time influenced William James, Alfred North Whitehead,
Santayana, and writers like Péguy, Valéry, and John Dos Passos. Whitehead expanded
Bergson’s notions of duration and evolution, applying them to organic life in the physical
realm.

For more on this debate, see Evan Harris Walker, The Physics of Consciousness: The
Quantum Mind and the Meaning of Life (Basic Books: 2000). Bruce Rosenbaum and
Fred Kuttner, Quantum Enigma: Physics Encounters Consciousness, (New York: Oxford
University Press, 2008).

An augmented sixth chord contains the interval of an augmented sixth above its bass.
The chord had its origins in the Renaissance. It was advanced in the Baroque period, and
became a part of the musical style of the Classical and Romantic periods.

This is again the author’s experience while visiting a new piano teacher. The author
found out that Imhotep was the architect who built Egypt's first pyramid and is recognized
by archaeologists as the world's first doctor, priest, scribe, sage, poet, and astrologer. He
was chief minister to Djoser, who reigned between 2630 and 2611 B.C.E. An inscription
on one of the king’s statues gives Imhotep the title of "chancellor of the king of lower
Egypt.” Ian Shaw, Oxford History of Ancient Egypt (Oxford University Press, 2000.)

See Ian Stevenson, Cases of the Reincarnation Type Vol. I: Ten Cases in India,
(1975). University of Virginia Press; Cases of the Reincarnation Type Vol. II: Ten Cases
III: Twelve Cases in Lebanon and Turkey. (1980). University of Virginia Press; Cases of
University of Virginia Press.

Paul P. Pearsall, *The Heart’s Code* p. 55. (1998, p. xii) Pearsall states that we have been too “brain focused” in the search for mind, and that instead of thinking in terms of a dual mind and body, a more rewarding and appropriate approach would be to adopt a triune model: that is, of a thinking brain, the material body and the energetic and emotional heart. The heart is the primary energy center, and in Pearsall’s terms “conveys the code that represents the soul.” The heart’s attributes and functions are much more mysterious and significant than conventional scientific thinking supposes. Therefore, Pearsall argues that, through the psychology of the heart, modern psychology is “beginning to make its first tentative contacts with the soul.” (p. 6) Pearsall examines the nature of cellular memory, life fields and non-local information fields, in an attempt to account for various clinical and psychological evidences that are emerging about the mysterious qualities of the human heart.
