

# ERWIN SCHRÖDINGER

[W. Moore 1989, 'Schrödinger'  
Cambridge University Press]

## "ON CONSCIOUSNESS"

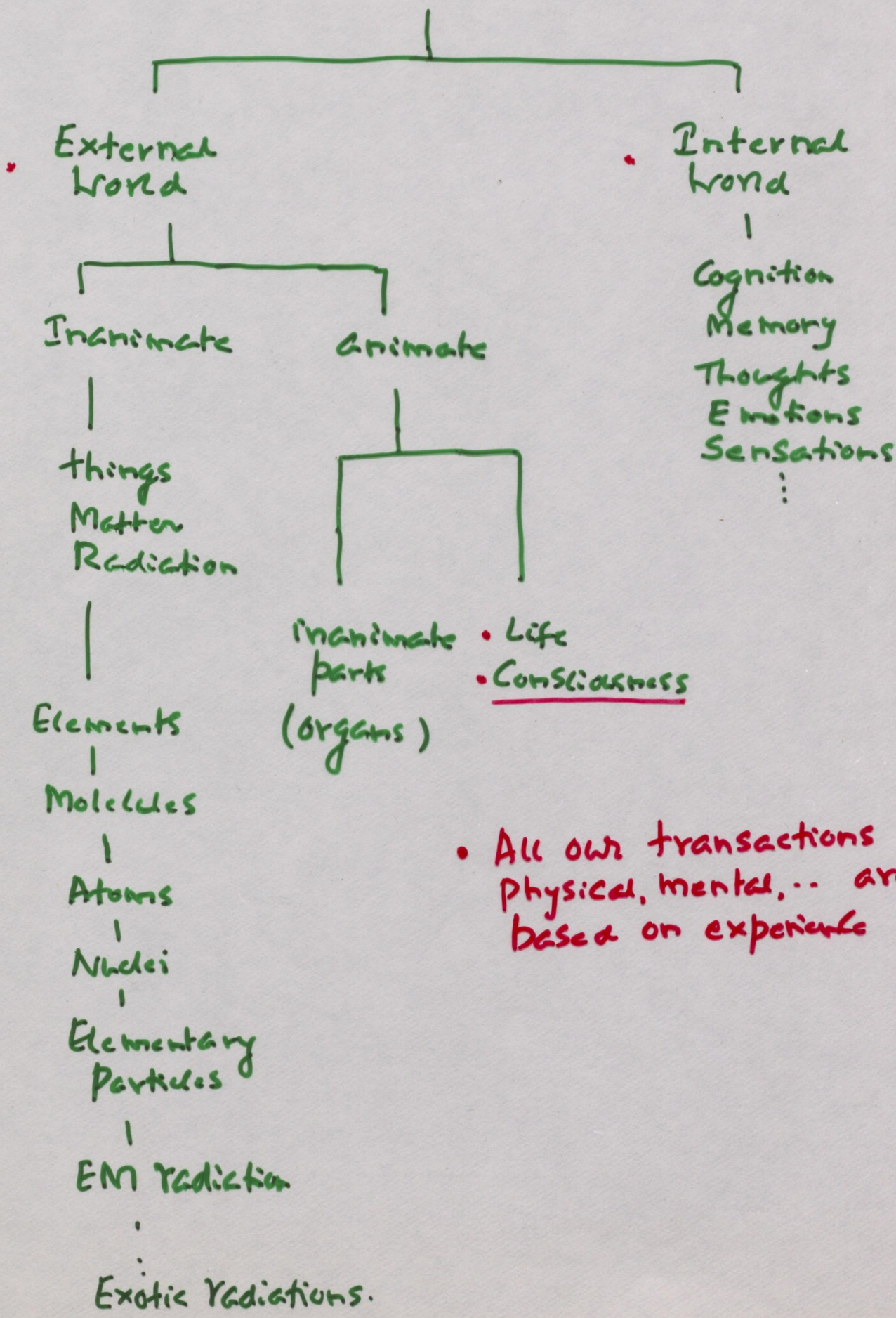
" Although life may be the result of an accident, I do not think that of consciousness.

Consciousness cannot be accounted for in physical terms. For consciousness is absolutely fundamental. It cannot be accounted for in terms of anything else "



This led Schrödinger to the notion of universal consciousness in which we all participate.

# Experience (Conventional Wisdom)

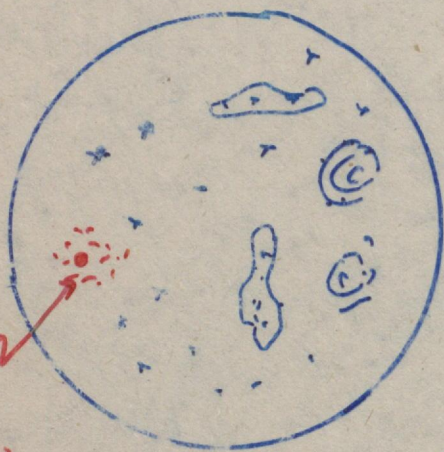


• All our transactions physical, mental, .. are based on experience ...

# The Two View Points.

The SCIENTIST  
(Most Scientists  
Not ALL)

(Objective)



Man,  
other men etc.

The universe of  
Planets, Stars, Galaxies  
were created first.

Then came                       
                     series of

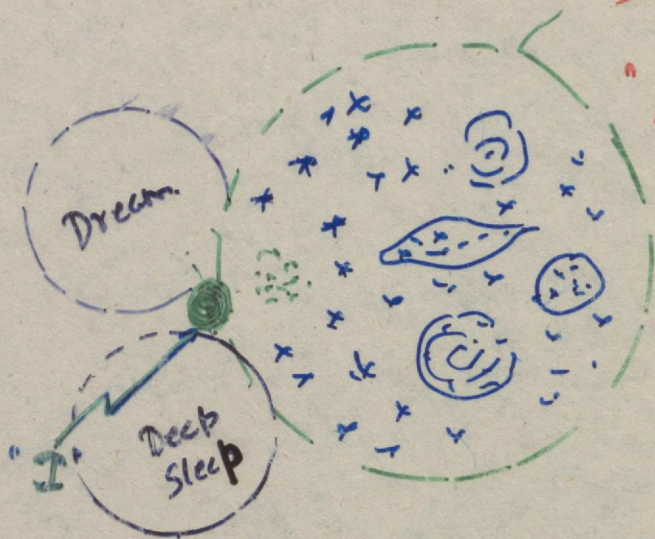
evolutions that  
ensured that one of  
the products was  
Man who developed  
in such a way that  
he had a mind  
that comprehended  
the universe

The universe became  
aware of itself  
through Man

THE IDEALIST.

My Experience

(Subjective)



"Not a  
thing in  
itself"  
but  
a  
representation.

I become aware of  
the universe - including  
others of my ilk - only  
through the sensations  
in my mind - only  
through my experience  
the universe exists -

the rest is all inference  
based on my sensations

My experience makes me  
aware of two <sup>more</sup> different  
states - dreaming and  
sleeping. When this universe  
ceases, only I remain.  
I am not even aware of the  
body in these states

Man has been in search of Reality for millenia

Reality of What?

Man's Experience of

Eyes, Ears, Skin, Tongue, ...

Brain, Mind

**The Internal World**

Thoughts, Feelings, Desires  
 Will Power, Memory, Intelligence  
 dreams, hallucinations  
 Sleep  
 ego, Consciousness

**External World**

Living and Non-Living objects of various kinds -  
 the entire world -  
 the universe -  
 matter, radiation

Experienced →

Experienter →

Different Systems of philosophies emerged - Oriental, Occidental

What is philosophy?

**Hobbes** (1588-1679)

Knowledge of effects from causes and of causes from effects.

**Hegel**

Investigations of things by thought and Contemplation.

Spectroscope  
 Telescopes  
 Microscopes  
 Accelerators } external part of observable

1600 A.D.  
 Entry of Scientific Methodology  
 Bacon, Descartes, Galileo, Kepler, Newton.

**Physical Sciences.**

**Life Sciences**

Physical laws are applicable only to inanimate world. They may not be valid for living systems always.

- Natural Phenomena governed by certain laws.
- Laws may be formulated mathematically and predictions made for experimental verification.
- Experiment is the Final Court of Appeal.

An ugly fact can kill a beautiful theory!

# ALBERT EINSTEIN (1879-1955)

## \* PERSON OF THE CENTURY

" He was the embodiment of Pure Intellect, the Dumbling professor with German accent, a Comic cliché in a thousand films. Instantly recognizable, like Charlie Chaplin's little tramp, Albert Einstein's Shaggy-haired visage was as familiar to ordinary people as to the matrons who fluttered about him in salons from Berlin to Hollywood. Yet he was unfathomably profound - the genius among geniuses who discovered, merely by thinking about it, that the universe was not what it seemed "

TIME MAGAZINE.

" He became, almost despite himself the emblem of all that was new, original and unsettling in the modern age "

" Much to his surprise, his ideas, like Darwin's, reverberated beyond science, influencing modern culture from painting to poetry "

# EINSTEIN

- Born at Ulm 14<sup>th</sup>. March, 1879
- Parents : Father : Herman Einstein  
(Jewish) Mother : Pauline née Koch.  
SISTER : MAJA
- Moved to Munich in 1880.
- At the age of 6, Albert entered Petersschule  
- a Catholic primary school.  
- Religious instruction was compulsory in Bavaria.  
Parents - not religious
- According to Moszkowski  
(Biographer of Einstein)
  - Nature entered Albert's heart as a boy because of the idyllic surroundings of Munich.
  - He indulged in happy contemplations
  - Beauty and Splendour opened the gates of 'religious paradise' for him.
  - Music, violin was another factor in his early life
  - He composed songs in praise of God.
  - Read Bible without being critical, and trying to confirm by rational thinking

(Music + Nature)  
+ God  
Religious  
Feeling as a  
boy.

April 2, 1930

Berlin Philharmonic Orchestra) <sup>Conducted</sup> by  
Bruno Walter (Bach, Beethoven  
Soloist: Yehudi Menuhin and Brahms)

EINSTEIN : "NOW I KNOW THERE IS GOD IN HEAVEN."

# EINSTEIN'S ORIGINAL SCIENTIFIC CONTRIBUTIONS:

THEIR IMPACT ON NEWTONIAN PHYSICS, PHILOSOPHY AND RELIGION.

1. Quantum Hypothesis AND PHOTO-ELECTRIC EFFECT. (Wave/Particle duality)

2. Special Theory of Relativity: (1905)

Michelson  
Morley Expt.

(i) Constancy of velocity of light -

Independent of source or observer motion

(ii) Space-Time Continuum.

(iii) Space Contraction, Time Dilation.

(iv) No Absolute Space,  
No Absolute Time.

(v) Mass = Energy  $E = mc^2$ . (A Bomb)

3. General Theory of Relativity: Gravitation  $\equiv$  Acceleration  
(1915) Big Bang Cosmology

Curvature of } Space = mass.  
                  } Time

Gravity = Warping of  
Space-Time.

Bending of  
light - 1919  
Confirmation  
by Eddington.

4. Bose-Einstein Statistics.

5. The EPR Paradox (Non-Locality)  
Bell

[Einstein: awarded Nobel Prize in 1921 not  
for Relativity, but for photoelectric effect.]

- Space-Time from Passive Background in Newtonian physics, became active participants in the dynamics of the Cosmos.

- The Cosmological Constant - (Big Blunder?)

## General Theory of Relativity:

- Changed completely the origin and fate of the universe.
- Big Bang (ca. 20 billion years ago) beginning of the universe.
- Time started with Big Bang. (No Time before!)
- Beginning of the Laws of Nature.

But, the theory at Big Bang was in conflict with quantum theory.

## Einstein and Statistical Interpretation of Quantum Mechanics

Schrödinger, Heisenberg, Dirac, Niels Bohr.

Tiny particles (protons, electrons, ...) have no definite position and speed. (Heisenberg's uncertainty)

This unpredictable, random element in the basic laws horrified Einstein. He did not accept this: God does not play dice

In a letter to James Franck, Einstein wrote

"I can imagine that God created a world without any laws of nature. A chaos in short. But the notion that God draws lots is highly unsympathetic to me"

**EINSTEIN :** " What interests me is : Could God have made the world different, does the requirement of logical simplicity leave any latitude ?

(in Conversation with Strauss at Princeton in 1944)

Einstein's God is a Pseudonym for Rational Causality of natural processes. Causality finds expression in logical simplicity, in a minimum number of independent postulates, in a natural theory most truly reflecting the world picture.

The question is whether the criterion of logical simplicity leads to an unambiguous world picture. Are two physically different, but logically equally simple schemes possible ?

Einstein believed " God could not have made the world differently "

A single chain of cause and effect embraces the microcosm and the macrocosm.

Physical Constants: <sup>Fine structure constant.</sup> Velocity of light,  $e, m, \dots$

Einstein could not offer a concrete causal explanation of all physical constants. He could not formulate a theory from which he could derive the physical constants.

## Einstein and Statistics -

- Einstein himself is the author of fundamental works on statistics in both classical and quantum physics.
- But, he did not agree with the notion that the statistical laws of quantum mechanics are ultimate laws of physical reality. Einstein believed that there exist deeper laws of non-statistical nature.
- Einstein's contention was NOT to get back to classical conceptions. He had no sympathy for theories made from the classical position of "hidden parameters." He believed in the existence of a subtler theory.
- Empirical vs Pure Thought.  
According to Einstein: The empirical origin of knowledge does not prevent "Pure Thought" from constructing hypothetical conclusions deriving from the general scheme of the universe and not from a given series of experiments. In principle these conclusions should be subject to experimental verification, but they must also possess "inner perfection" in the sense that they derive most naturally from the general conceptions of physical reality."

- Einstein at the age of 12 becomes irreligious

At the age of 12, when he should have been preparing for the bar mitzvah - the Jewish Confirmation he became completely irreligious!

Under the influence of Max Talmud - a medical student from Poland who drew the attention of Einstein to

- Naturwissenschaftliche Volkbücher  
(Popular books on physical science)
- Ludwig Buchener's materialistic "Kraft und Stoff" (Force and Matter)
- Kant's Kritik der Reinen Vernunft  
(Critique of Pure Reason)
- Books on Geometry and other mathematics

Einstein: "Through the readings of popular science books I soon reached the conviction that much in the stories of the Bible could not be true. The consequence was a positively fanatic (orgy of) free thinking coupled with the impression that youth is intentionally being deceived by the state through the lies; it was a crushing impression. Suspicion against every kind of authority grew out of this experience, a skeptical attitude towards the convictions which were alive in any specific social environment - an attitude which has never left me, even though later on, because of a better insight into causal connections, it lost some of the original poignancy."

(Autobiographical Notes)

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• Because of the change of mind, Einstein refused to become bar mitzvahed. (This would have interfered politically if he had accepted the invitation of Ben Gurion to become the president of the State of Israel in 1952 after Weizmann)

• Einstein never attended any religious service never prayed in a Synagogue or at any place of worship. Einstein's last wish was not to be buried in the Jewish tradition, but cremated.

• Einstein's Philosophical Explanation of his Estrangement from traditional Religion:

"It is quite clear to me that the religious paradise of youth was thus lost, was a first attempt to free myself from the chains of the "merely personal", from an existence which is dominated by wishes, hopes and primitive feelings. Out yonder was this huge world before us like a great eternal riddle, which exists independently of us human beings, at least partially accessible to our inspection and thinking. .... The mental grasp of this extrapersonal world within the frame work of the given possibilities swam as the highest aim half consciously and half unconsciously before my mind's eye. Similar motivated men of the present and past as well as the insights which they had achieved, were friends which could not be lost. The road to this paradise was not as comfortable and alluring as the road to the religious paradise but it has proved itself as trustworthy and I have never regretted having chosen it"  
(Autobiographical Notes)

## Spinoza and Einstein:

By 1920, the philosopher that Einstein admired was Baruch Spinoza, the 17<sup>th</sup> Century Jewish philosopher.

- Spinoza
- (i) rejected the traditional Concept of God
  - (ii) denied the existence of cosmic purpose
  - (iii) all events in nature occur according to immutable laws of cause and effect.
  - (iv) the universe is governed by a mechanical or mathematical order and not according to purposeful or moral intentions.

- Though he employed the notion of "God", Spinoza applied it only the structure of the impersonal cosmic order and declared that "neither intellect nor will pertain to God's nature"
- He therefore denied the Judo-Christian conception of a personal God.
- God is the "infinite substance" having the attributes of extension and thought.
- God is devoid of ethical properties, for good and evil are only relative to human desires.
- God's will  $\equiv$  Laws of Nature
- The ultimate objective of religious devotion can only be the perfect harmony of the universe.
- Human aspirations must accept the inexorable dictates of the deterministic laws that govern life.

According to Einstein: Spinoza was the first to apply with strict consistency the idea of an all-pervasive determinism to human thought, feeling and action.

This unexceptionable determinism is the connecting link between Spinoza's philosophy and Einstein's physics and philosophy, the other being the belief in the existence of a SUPER-INTELLIGENCE that reveals in the harmony and beauty of nature.

Unrestricted determinism does not admit a "God who rewards and punishes the objects of his creation and whose purposes are modeled after our own" (Einstein.)

Like Spinoza, Einstein denied the existence of a "Personal God" modeled after the ideal of a Superman, as we would say to-day.

### Einstein's Definition of God :

"I am not an atheist and I don't think I can call myself a Pantheist. We are in the position of a little child entering a huge library filled with books in many languages, in which they are written. The child knows that someone must have written those books. It does not know how. It does not understand the languages in which they are written. The child dimly suspects a mysterious order

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in the arrangements of the books but does not know what it is.

That, it seems to me the attitude of even the most intelligent human beings towards God. We see the Universe marvellously arranged and obeying certain laws, but only dimly understand these laws. Our limited minds grasp the mysterious force that moves the Constellations. I am fascinated by Spinoza's pantheism, but admire even more his contribution to modern thought because he is the first philosopher to deal with Soul and body as one and not two separate things"

## Cosmic Religious Feeling

- 1930. (NEW-YORK TIMES ARTICLE - SCIENCE AND RELIGION. by EINSTEIN.)
- Cosmic Religious Feeling: "the emotional state that one experiences when one recognizes the futility of human desires and the sublimity and marvellous order which reveals itself both in nature and world of thought"

This one order in nature and in thought underlies Einstein's epistemological realism, his belief that a rational explanation of the universe is possible, his belief in the "mysterious comprehensibility of the world"

# Reaction to Einstein's Views on Personal God.

A totally disabled veteran of World War I -  
A patriotic citizen of US :

" The great leaders, thinkers and patriots of the past who fought and died for free thought, free speech, and intellectual liberty arise to salute you ! With the great and mighty Spinoza, your name will live as long as humanity" (Sept 1940)

A historian and president of a historical Society in New Jersey : (14th. Nov. 1940)

" We respect your learning, Dr. Einstein, but there is one thing you do not seem to have learned - That God is a spirit that cannot be found through the telescope or microscope, no more than human thought or emotion can be found by analyzing the brain. As everyone knows religion is based on faith, not on knowledge. Every thinking person, is perhaps assailed at times with religious doubt. My own faith has wavered many a time. But I never told anyone of my spiritual aberrations for two reasons: (1) I feared that I might by mere suggestion, disturb and damage the life and hopes of some fellow being; (2) because I agree with the writer who said " There is a mean streak in anyone who tries to destroy another's faith"... I hope Dr. Einstein, that you were misquoted and that you will yet say something more pleasing to the vast number of Americans who delight to do you honour"

- The most strongly worded letter came from the founder of the Calvary Tabernacle Association in Oklahoma City.

"Professor Einstein, I believe that every Christian in America will answer you, "We will not give up our belief in our God and His Son Jesus Christ, but we invite you if you do not believe in 'the God of the people of this nation, to go back where you came from'. I have done everything in my power to be a blessing to Israel, and then you come along and with one statement from your blasphemous tongue do more to hurt the cause of your people than all the efforts of the Christians who love Israel can do to stamp out anti-Semitism in our land.

Professor Einstein, every Christian in America will immediately reply to you "Take your crazy fallacious theory of evolution and go back to Germany where you came from, or stop trying to break down the faith of a people who gave you a welcome when you were forced to flee your native land"

(12th. Sept. 40.)

Einstein Archives.

Role of Religion: Tradition, Revelation

- Knowledge of what is does not open the door directly to what should be.
- Scientific thinking alone cannot lead us to the ultimate and fundamental purpose of our existence.
- 4 To make clear these fundamental ends and valuations and to set them fast in the emotional life of the individual, seems to me precisely the most important function which religion has to perform in the social life of man.

And if one asks whence derives the authority of such fundamental ends, since they cannot be stated and justified by merely reason one can only answer: they exist in a healthy society as powerful traditions, which act upon the conduct and aspirations and judgements of the individuals; they are there, that is, as something living, without its being necessary to find justification for their existence. They come into being not through demonstration, but through revelation, through the medium of powerful personalities. One must not attempt to justify them, but rather to sense their nature simply and clearly. The highest principles of our aspirations and judgements are given to us in the Jewish-Christian religious tradition. It is a very high goal, which with our weak powers we can reach only very inadequately, but which gives us a sure foundation of our aspirations and valuations.

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According to Einstein himself, his religiosity stemmed from his realization of vanity in human rivalry in struggle for human existence with concomitant feelings of depression and desparation which religion seemed to offer relief

1929: Einstein interviewed by George Sylvester Viereck of Saturday Evening Post.

GSV: To what extent are you influenced by Christianity?

E: As a child, I received instructions both in the Bible and in the Talmud. I am a Jew, but I am enthralled by Nazarene

GSV: Have you read Emil Ludrig's book on Jesus?

E: Emil Ludrig's Jesus is shallow. Jesus is too colossal for pen of phrasemongers, however artful. No man can dispense of Christianity with a bon mot!

GSV: You accept the historical existence of Jesus?

E: Unquestionably! No one can read the Gospels without feeling the actual presence of Jesus. His personality pulsates in every word. No myth is filled with such life.

- On the existence of a Vastly Superior Spirit 16
- Scientific Research is based on the assumption that all events, including the actions of mankind are determined by the laws of nature. Therefore a Research Scientist will hardly be inclined to believe that events could be influenced by a prayer, that is by a wish addressed to a Supernatural Being. However, we have to admit that our knowledge of these laws is only an incomplete piece of work, so that ultimately the belief in the existence of fundamental all-embracing laws rests on a sort of faith. All the same, this faith has largely been justified by the success of science.
- On the otherhand, however, every one who is seriously engaged in the pursuit of science becomes convinced that the laws of nature manifest the existence of a spirit vastly superior to that of men and one in the face of which we with our modest powers must feel humble.
- The pursuit of science leads therefore to a religious feeling of a special kind, which differs essentially from the religiosity of more naive people"

Reply to Phyllis Wright

Sixth-grade Student. to the question - Do Scientists Pray? if they do, what they pray for.?

Einstein: "Science without religion is lame and Religion without Science is blind"

Solovine: "If a serious difficulty is encountered in any branch of science, can religion provide any assistance?"

Long time friend of Einstein.

And conversely, if in religion any difficulty arises concerning the exegesis of a dogma or the removal of an inconsistency can science provide help?"

Einstein replied that he understood Solovine's aversion to the use of the word "religion" when what is meant is an emotional or psychological attitude, which is most obvious in Spinoza and he added

"I have found no better expression than "religious" for confidence in the rational nature of reality as it is accessible to human reason. Whenever this feeling is absent, science degenerates into uninspired empiricism. ....

What we call science has the sole purpose of determining what is. The determining of what ought to be is unrelated to it, and cannot be accomplished methodically. Science can only arrange ethical propositions logically and furnish the means for the realization of ethical aims, but the determination of aims is beyond its scope. At least that is the way I see it."