

Sikhism, Science and Quantum Physics

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1 Contents Page

1	Contents Page	2
2	Introduction	3
3	Cosmology.....	4
3.1	Creation of the Universe.....	4
3.2	Destruction of the Universe	4
3.3	Planets, Solar Systems and Galaxies	4
3.4	Moons.....	5
3.5	Distance of the Moon.....	5
3.6	Life on other planets	6
3.7	Motion of Sun and Moon.....	7
4	Biology and Natural Laws.....	8
4.1	Temperature	8
4.2	Pollination	8
4.3	The Origins of Life	8
4.4	Life in Rocks.....	9
4.5	The idea of the Atom	10
5	Quantum Principles.....	10
5.1	Quantum Field Theory - The Nature of Matter	10
5.2	Unified Field Theory	11
5.3	Entanglement.....	12
6	Conclusion	13

2 Introduction

Science and Dharma (spirituality) are opposite sides of the same coin. Both Science and Dharma aim to explain Truth. However the approach of Science is to use physical measurements and laboratory experiments whereas Dharma requires experimentation in the laboratory of our own inner being through simran (meditation).

Over the last 50 years our ideas about the universe have changed dramatically and the line between science, philosophy and dharma are appearing to blur and merge. Science and in particular quantum physics is a fascinating subject and its ideas provide an excellent validation for some key Dharmic truths outlined in the Sikh Holy Scripture (Sri Guru Granth Sahib Ji).

3 Cosmology

3.1 Creation of the Universe

The currently accepted theory for the creation of the universe is the big bang theory which states that the universe has expanded into its current state from a primordial condition of enormous density and temperature.

The Sri Guru Granth Sahib Ji also supports the idea of a big bang and an expanding universe

“In so many ways, He has unfolded Himself. So many times, He has expanded His expansion. Forever and ever, He is the One, the One Universal Creator.” SGGSJ page 276

“God, who expanded His expanse, is within all; I learned this from the True Guru.” SGGSJ page 671

“By His Hukam, the Expanse of the Universe is expanded.” SGGSJ page 760

“The Gurmukh knows that the Lord has expanded the entire expanse”
SGGSJ page 1054

3.2 Destruction of the Universe

The Sri Guru Granth Sahib Ji also supports the idea of a continuous cycle of creation and destruction of our universe and that our current universe is non-permanent.

“Creation and destruction happen through the Word of the Shabad. Through the Shabad, creation happens again.” SGGSJ page 117

“Nothing of the color and the form of the creation shall remain; the entire expanse is transitory.” SGGSJ page 999

“The entire creation came from God. As it pleases Him, He creates the expanse. As it pleases Him, He becomes the One and Only again.” SGGSJ page 294

3.3 Planets, Solar Systems and Galaxies

Astronomy has led to the discovery of billions of galaxies in our universe each of which probably have planets and solar systems like our own.

The Sikh Holy scripture mentions that there are an uncountable amount of planets, solar systems and galaxies in our universe.

“The planets, solar systems and galaxies, created and arranged by Your Hand, sing.” SGGSJ page 6

“There are planets, solar systems and galaxies. If one speaks of them, there is no limit, no end. There are worlds upon worlds of His Creation. As He commands, so they exist.” SGGSJ page 8

“So many worlds beyond this world-so very many!” SGGSJ page 3

“He established the many worlds and skies.” SGGSJ page 184

“I have searched and searched, across so many worlds, but without the Name, there is no peace.” SGGSJ page 255

“Among all lights, I behold Your Form; all the worlds are Your Maya.” SGGSJ page 351

“Many millions are the fields of creation and the galaxies” SGGSJ page 276

“True are Your worlds, True are Your solar Systems.” SGGSJ page 463

3.4 Moons

Giordano Bruno was the first person to have stated that the moon was one of the planetoids like our own earth. Galileo later supported this theory in 1610. The theory contradicted the current religious ideas about the universe held at that time and therefore even intellectuals (like the Professor of Philosophy at the University of Padua) declined to look through Galileo’s telescope and stuck to their deep-held beliefs. In 1665 Newton once again talked about the moon and its gravitational pull. It was only in the 20th century that our ideas about the moon underwent a sea change when on 21 July 1969 Neil Armstrong and Edwin Arnold actually set foot on the moon.

Scientists have now discovered at least 60 other known moons in addition to ours. Saturn has at least 20 going round it. The Earth and Pluto each have one moon. The fact that there are innumerable moons and suns was mentioned by Guru Nanak in the 16th century when he said,

“There are many Indras, moons and suns and many other worlds and galaxies” SGGSJ Page 7

“Many millions are the moons, suns and stars.” SGGSJ Page 275

“Millions of moons twinkle in the sky.” SGGSJ Page 1162

3.5 Distance of the Moon

Until astronauts visited the Moon, man was not sure what the moon was and how far it was from the earth. Now we have moon rock available for analysis

and we also know the distance between the moon and the earth. Using a mirror left on the moon by the Apollo astronauts, an international group of scientists fired laser beams to the moon from Hawaii, France, Germany and Texas. The laser beams returned to their respective telescopes after 2.652584 seconds. Using the technique known as laser ranging scientists discovered that the Moon was 15,654,023,458 inches (247064.76417298 miles) away from the earth. This is so far the most accurate calculation of the distance between the earth and the moon. The distance keeps changing and the mean distance commonly used by Scientists is 238,866 miles.

Dr. Peter Shelus of McDonald Observatory in Austin (Texas) was one of the scientists conducting the above experiment. He says, *“Although we can measure the distance to an inch of accuracy, it is only correct for a moment in time because the earth and the Moon are rotating, and both are in elliptical orbits.”*

The Sikh Gurus were not scientists and were not interested in calculating distances between planets. But we find a story in the *Janam Sakhi* (Biography) of Guru Nanak where the Earth-Moon distance is said to have been estimated by the Guru. It is given as 52000 *Yojan*. This gives us the distance between the earth and the moon as 236363.63 miles. The difference between the scientific calculations and the Guru’s supposed estimate is merely 2503 miles, which is very insignificant when we measure such long distances. Even scientists had calculated this distance as 225742 miles when the astronauts first visited the moon in 1969.

It is also a fact that this distance keeps changing because the orbits of the earth and the moon are elliptical (egg shaped). It also depends on the moment of measurement. The distance of the Moon from us at its farthest point is 250,000 miles. Taking these facts into account one marvels at the distance given in the *Janam Sakhi*.

3.6 Life on other planets

Science has not yet been able to either prove or disprove the existence of life on other planets. However, the Sri Guru Granth Sahib Ji teaches that there are an uncountable amount of planets with many forms of life on them including human forms of life who also worship the primal being.

“In the realm of karma, the Word is Power. No one else dwells there, except the warriors of great power, the spiritual heroes. They are totally fulfilled, imbued with the Lord’s Essence. Myriads of Sitas are there, cool and calm in their majestic glory. Their beauty cannot be described. Neither death nor deception comes to those, within whose minds the Lord abides. The devotees of many worlds dwell there.” SGGSJ page 8

“There are beings and creatures in the water and on the land, in the worlds and universes, form upon form.” SGGSJ page 466

3.7 Motion of Sun and Moon

Nothing is static in the universe, stars, planets, meteors, satellites, all move at speeds varying from a few kilometres per second to hundreds of kilometres per second. The Sun revolves around the Milky Way on an almost circular orbit with a speed of about 220km/s. The Sun completes one revolution in about 230 million years. The Milky Way also moves - we are moving towards our nearest neighbour the Andromeda galaxy and both the Milky Way and Andromeda (which make up most of what we call the 'Local Group of galaxies') are moving towards the Virgo Cluster which is our nearest cluster of galaxies.

The Guru Granth Sahib also says:

“The sun and the moon obey His laws. They move billions of miles and never stop.” SGGSJ page 464

4 Biology and Natural Laws

4.1 Temperature

People have intuitively known about temperature for a long time e.g. that fire is hot and snow is cold. Greater knowledge of temperature was gained as people attempted to work with metals through the bronze and iron ages. Galileo invented the first documented thermometer in about 1592 however this was not available in India.

Nevertheless the Sri Guru Granth Sahib Ji teaches that the boiling point of milk is higher than that of water.

“O mind, love the Lord, as the water loves the milk. The water, added to the milk, itself bears the heat, and prevents the milk from burning. God unites the separated ones with Himself again, and blesses them with true greatness.” SGGSJ page 60

“Just like water, which loves milk so much that it will not let it burn - O my mind, so love the Lord.” SGGSJ page 454

4.2 Pollination

The secret of reproduction in plants remained a mystery for a long time. Prospero Alpini stated in 1580 that the plants had male and female sexes. In 1694 Rudolph Jakob Camerarius identified male and female parts in plants. Later in 1763 Joseph Gottlieb Kolreuter conducted fertilization experiments on plants using animal pollinators. It was then that pollination of plants through wind and insects like flies, bees, birds and bumblebees etc was established as a fact. The Sikh Gurus had mentioned this earlier than this when they wrote,

“Such is the result of a bumble bee enjoying fragrance that (by carrying pollen) it causes the trees to bloom and the woods to become lush green and fructify.” SGGSJ page 1190

4.3 The Origins of Life

Accepted theories of the origin of life are that the big bang released large amounts of Hydrogen which combined to form Helium and other heavier gases. Water formed with oxygen combining with hydrogen and water led to the evolution of life.

The Sri Guru Granth Sahib Ji also teaches that the universe started with gases which eventually led to the formation of water in turn giving birth to life.

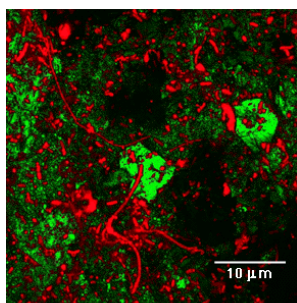
“From the True Lord came the air, and from the air came water. From water, He created the three worlds; in each and every heart He has infused His Light.” SGGSJ page 19

“Know that the creation was formed through air and water” SGGSJ page 1256

“When there was no moon and no sun, then water and air were blended together.” SGGSJ Page 973

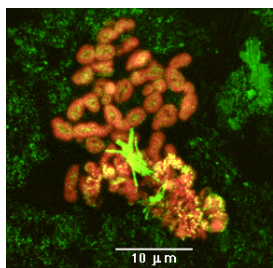
4.4 Life in Rocks

An experiment was done by the Hawai'i Institute of Geophysics and Planetology, with sterilized basalt as a culture medium to see if bacteria could live in the rock in the dark. They put water from deep wells into tubes containing the sterilized basalt, and examined them after various lengths of time for up to one year. The water was not processed in any way to preserve the bacteria that was in it. Under these dark, oxygen-starved conditions, the rock-water interactions are the only source of energy possible. No sunlight reached the capsules, so photosynthesis could not take place. Remarkably, even after a year, bacteria were thriving in this unusual environment. The research shows that bacteria can live kilometers beneath the surface.



(Photo courtesy of Stevens and McKinley.)

This photograph was taken with a special microscope called a scanning laser confocal microscope and the scale is 10 micro metres. The laser reflects off the rock surfaces and shows up green. The living bacteria were dyed with a chemical and appear red in the laser light in both photographs.



(Photo courtesy of Stevens and McKinley.)

The types of bacteria shown in red in these two photographs have not yet been identified (and may be previously unknown species), but the experiment clearly shows that bacteria can live deep underground if deoxygenated water and iron-bearing minerals are present.

This form of life is also mentioned in the Sri Guru Granth Sahib Ji:

“In rocks and stones He created living beings; He places their nourishment before them” SGGSJ Page 10

4.5 The idea of the Atom

The atom was first discovered by Dr. Dalton (1766- 1844) who proposed his atomic theory in 1803. Maxwell called this discovery, “The imperishable foundation of the universe.”

However the idea of a tiny particles of matter invisible to the naked eye have been mentioned in various references in the Sikh holy scripture.

“Even if the mortal could reduce himself to the size of an atom, and shoot through the worlds and realms in the blinking of an eye, O Nanak, without the guidance of a Holy Saint, he shall not be saved.” SGGSJ Page 1360

5 Quantum Principles

5.1 Quantum Field Theory - The Nature of Matter

Science has been used exhaustively to determine the nature and characteristics of matter i.e. whether matter is a wave or a particle. The famous double slit experiment used a set of single electrons (particles) fired one after the other through 2 slits. The result was an interference pattern which is characteristic of a wave and not a particle. This implied that each single electron would go through both slits; through no slits; through just the left slit and through just the right all at the same time!

Quantum field theory explains this by stating that matter is neither a wave nor a particle. It is something more abstract and could be considered as a simultaneous co-existence of all possibilities. This leads to the idea of superposition i.e. all possibilities potentially existing at the same time.

The Sikh scripture mentions the idea of superposition as being an intrinsic part of creation and the creator.

“You have thousands of eyes, and yet You have no eyes. You have thousands of forms, and yet You do not have even one. You have thousands of Lotus Feet, and yet You do not have even one foot. You have no nose, but you have thousands of noses. This Play of Yours entrances me.” SGGSJ page 13

“He Himself is formless, and also formed; the One Lord is without attributes, and also with attributes” SGGSJ page 250

“At the same time, He is both hidden and revealed. For the Gurmukh, doubt and fear are dispelled.” SGGSJ page 1048

Another finding from the famous double slit experiment was that when scientists put cameras at each of the slits to observe the actual slit through which any given electron was passing through they discovered that the electrons behaved like particles and created only 2 bands on a screen

instead of an interference pattern! So matter behaved differently when interacting with thoughts or the mind.

The Sikh scripture also goes further to mention that mind or consciousness and matter are interchangeable and that the spirit of God rests within both.

“You Yourself are conscious of Your Creation.” SGGSJ page 1076

“Wherever I look, I see the Lord pervading there, in the union of Shiva and Shakti, of consciousness and matter” SGGSJ page 21

“The distinction between Shiva and Shakti - mind and matter - has been destroyed, and the darkness has been dispelled.” SGGSJ page 163

“He Himself is mind, and He Himself is matter” SGGSJ page 1236

5.2 Unified Field Theory

When we move beyond Quantum field theory which is already abstract to try and understand the nature of a quantum field we arrive at something which is pure being, something which is beyond the human intellect, something purely abstract and pure existence. At this point quantum physics begins to sound more like dharma.

The Sikh scripture talks about God as being something intrinsic within the whole of creation, a characteristic of the whole of creation which is also beyond our human intellect and understanding.

“The Wisdom of the Undying Primal Being is beyond comprehension” SGGSJ page 212

“He is beyond calculation, beyond measure, uncountable and unfathomable.” SGGSJ page 292

“Even the great Yogis cannot describe Your Glorious Virtues; they are beyond words.” SGGSJ page 346

“He is heard to be one thing, but He is understood to be something else again; He is beyond description and explanation.” SGGSJ Page 498

“In an instant, You are one thing, and in another instant, You are another. Wondrous are Your ways! You are beautiful, mysterious, profound, unfathomable, lofty, inaccessible and infinite.” SGGSJ page 613

Lincoln Barnett says that according to Einstein’s unified field theory “The Universe is revealed as one eternal field in which each star, each atom, each wandering comet and slow wheeling galaxy and flying electron, is seen to be but a ripple in the underlying space-time unity.”

We find similar words written by Guru Arjan Dev.

“He pervades everywhere like an unfathomable ripple. No one can understand His play.” SGGSJ Page 2754

5.3 Entanglement

One of the most unusual truths of quantum physics is entanglement. Entanglement destroys the idea of separateness and space.

For example let us imagine that we create two electrons together and we send one electron to the other side of the universe. If we then do something to one of the electrons, the other will respond immediately which implies that both objects are still one.

Sikhism teaches that that everything came from the same point during the creation of our universe and that the creation is like beads bound together with the thread of God consciousness.

“As one thread holds hundreds and thousands of beads, He is woven into His creation. The waves of the water, the foam and bubbles, are not distinct from the water. This manifested world is the playful game of the Supreme Lord God; reflecting upon it, we find that it is not different from Him.” SGGSJ page 485

“He Himself is the thread, and He Himself is the many beads; through His Almighty Power, He has strung the worlds.” SGGSJ page 604

“The whole creation is strung on Your thread.” SGGSJ page 268

So space or maya is thus just a construct that gives the illusion that we are separate.

“Deep within the self is the Light of God; It radiates throughout the expanse of His creation.” SGGSJ page 126

“In the four sources of creation, and in all speech, You dwell. You are dear to the minds of all.” SGGSJ page 130

“He Himself instils the sense of separation within our hearts; He Himself created the Creation.” SGGSJ page 125

“All the creation is His Body, through and through, He is blended with His creation” SGGSJ page 294

“Fareed, the Creator is in the Creation, and the Creation abides in God” SGGSJ page 1381

Sikhism also derives moral teachings from the idea of oneness or entanglement by teaching that as everything is interwoven and from the same source, we should not indulge in slander of anyone.

“Don't indulge in slander for any reason, for everything is the creation of the Lord and Master.” SGGSJ page 611

6 Conclusion

The truths in Sikhism have been determined through experience of oneness and this essay shows that both science and spirituality can be used to understand truth in its many dimensions.