

# **The Berlin-Brandenburg Academy of Sciences and Humanities**

*Berlin-Brandenburgische Akademie der Wissenschaften*

**El Hassan bin Talal**

**Leibniz Day Lecture**

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## **‘Of Calculus, Music and Ishraq’**

**Professor Stock,  
Members of the Academy,  
Ladies and Gentlemen:**

It is almost certain that any modern calculus textbook will contain very little, if anything, about music and even less about *Ishraq* – illumination – the age-old belief that closeness to God can be attained through the search for truth. But a closer look at our shared history shows that the invention of calculus, for which we honour the memory of Gottfried Wilhelm Leibniz, was the culmination of a long, historical process which emerged from man’s journeying through philosophy, art and religion.

We should not be surprised by this. After all, calculus is the study of interactions between the infinitely large and the infinitesimally small. How better can we encapsulate man’s struggle to find himself and his God? The motivation to develop the language of Calculus was not merely the profane desire to define area or rates of change, but also a philosophical need to comprehend the nature of space and time. Calculus provides a language for expressing the interaction between the abstract concepts of *number* and *infinity* on the one hand, and the mundane world of the material on the other. How well the masters of *Ishraq* would have recognised this idiom in their own quest for ‘unity of being’ in a profane world of material concerns!

This quandary of mathematicians and philosophers was well-expressed by Blaise Pascal, a product of Europe’s 17<sup>th</sup> Century, when he asked: “For after all what is man in nature? A nothing in relation to infinity, all in relation to nothing, a central point between nothing and all, and infinitely far from understanding either.”<sup>1</sup>

The history of human endeavour is full of hopeful parallelisms; events and periods of human enlightenment that find their counterpart in other cultures and at other times. Europe’s 17<sup>th</sup> Century, the Age of Reason and of discovery, had its comparison in the Arab-Islamic world of the 10<sup>th</sup> Century. But I must emphasise that to believe in one’s own self, history and community does not necessarily imply a misunderstanding, disdain or degradation of the other. Learning about our shared human history reminds us that

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<sup>1</sup> Pascal, B (1660) *Pensées* No. 72

synthesis of thought has proved vital to mankind's progress through history. Further, it informs us that we must not fall victim to a purely scientific mindset. I have long sought to place a *humanitarian vision* at the centre of our drive to achieve greatness in the scientific and economic fields. I believe that knowledge of our respective achievements can help to promote this and remind us that we have far more in common than we often realise.

We find so much that is relevant to our troubled world in the history of the development of calculus. The coming together of knowledge and enquiry from India, from Ancient Greece and from the Levant represents a true *alliance of cultures* and a confluence of civilized achievement. The Age of Enlightenment, which has benefited the entire *family of cultures* that comprise our great human civilization, drew from the knowledge and achievements of the past and from present innovations – I might mention Nicomachus of Gerasa, that ancient city just 40 minutes drive from modern Amman, whose Greek multiplication table was the first to use what we now call *Arabic numerals*.

Isaac Newton, Leibniz's contemporary and fellow inventor of calculus, said of his work: "If I saw further than other men, it was because I stood on the shoulders of giants." Thus, the historical process that culminated in this great development of the 17<sup>th</sup> Century, stretches back thousands of years and covers a vast geographical area with contributions from many great minds.

To put this in terms belonging to a more physical science than philosophy, we might consider the idea of a *Genetics of Knowledge*. Just as our human genome teaches us so much about our past and introduces manifold opportunities for a better future, so an appreciation of the evolution of man's search for knowledge across centuries can open a path to a *universal consciousness* that crosses cultures and creeds.

In *Re-Orienting the Renaissance*, we read accounts of the physical transportation of texts from one place to another, of their translation, study and commentary, and even of their re-introduction into societies that had long lost them. As William Dalrymple says, in the mid-12<sup>th</sup> Century, "translations from the Arabic... filled European libraries with a richness of learning impossible even to imagine a century earlier: editions of Aristotle, Euclid, Plato and Ptolemy, commentaries by Ibn Sina and astrological texts by al-Khwarizmi, encyclopaedias of astronomy, illustrated accounts of chess and guides to precious stones and their medicinal qualities".<sup>2</sup>

A steady trade of goods and ideas was maintained between East and West, in *war and peace* – The profound effects of Arab and other Eastern influences on, for instance, the architecture and dialect of Venice are still apparent. But these examples of interchange represent a very small chapter in the largely untold story of man's timeless conversation and exchange. In the words of Fritiof Nilsson Piraten, one of Sweden's most famous literary sons: "There is nothing which has not happened but much that has not been told."

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<sup>2</sup> McLean, G (Ed) (2005), *Re-Orienting the Renaissance*, pg ix

Our need to describe the physical world we inhabit, our desire for order in chaos and our yearning to find meaning beyond the profane have guided us through the ages. Perhaps Titus Burckhardt, a German academic writing on art in the Islamic world, captured the essence of this struggle when he wrote that “the artist who wishes to express the ‘unity of existence’ (*wahdat al-wujud*), or the ‘unity of the real’, has three means at his disposal: geometry, which translates unity into the spatial order; rhythm, which reveals it in the temporal order and indirectly in space; and light which is to visible forms what Being is to limited existences”.<sup>3</sup> Ladies and Gentlemen, let us put this text in the context: To express our human condition is to speak of calculus, music and *Ishraq*.

## Foundations Spiritual and Temporal

Nothing speaks more of man’s common quest for contact with the infinite than his desire to find God and self. The German philosopher Karl Jaspers acknowledged this when he wrote of *Achsenzeit*, the Axial Age. According to Jaspers this period, from 800 BCE to 200 BCE, saw the emergence of similarly revolutionary thinking in India, China and the West. Jaspers believes that during this period, “the spiritual foundations of humanity were laid simultaneously and independently... And these are the foundations upon which humanity still subsists today”.<sup>4</sup>

Jaspers' axial shifts included the rise of Buddhism, Platonism and Confucianism, while Zoroastrianism, another of Jaspers' examples, became crucial to the development of monotheism. The figures who dominated the evolution of thought in this age are common ancestors to all thinking men and women – Elijah, Isaiah, Jeremiah, Deutero-Isaiah, Homer, Socrates, Parmenides, Heraclitus, Thucydides and Archimedes.

From the beginning of man’s spiritual quest, defining the physical was essential to seeking the infinite. As Gordon Strachan reminds us, “...for all ancient cultures, the measurements [of sacred monuments]... defined ratios and proportions which had to be exactly in tune with the harmony of heaven. As above, so below. This was the visual, harmonic and architectural equivalent of the ten commandments... the ratios of the architectural proportions had to be equivalent to the ratios of musical intervals which were considered to be the earthly echoes of the heavenly music of the spheres...”<sup>5</sup>

This quest for physical precision, musical harmony and sacred enlightenment was epitomised in man’s use of the cube for sacred construction. Strachan says its primary importance, “and the musical-vibrational symbolism it represented, was not restricted to the Judeo-Christian tradition. It can also be found in the East in the Hindu temples and, most significantly... in traditional Muslim mosques.”<sup>6</sup> He continues, “... it is this cube, the Ka’aba, which is more important to the rise of the Gothic style, than the cube of the Holy of Holies of Solomon’s Temple or the cube of the New Jerusalem.”<sup>7</sup>

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<sup>3</sup> Burckhardt, T, (1976) *Art of Islam, Language and Meaning*, pg 76

<sup>4</sup> Jaspers, K (1951), *Way to Wisdom*, pg 99-100

<sup>5</sup> Strachan, G, (2005) *Chartres: Sacred Geometry, Sacred Space*, pg 54

<sup>6</sup> Ibid, pg 56

<sup>7</sup> Ibid, pg 57

Strachan believes Chartres Cathedral represents a marriage of Christian and Islamic architecture, mysticism and the skills of medieval geometers and craftsmen. This synthesis has resulted in the creation of a sacred space which still holds power over us and aids our ability to tune into a divine potential.

The importance of holy sites in highlighting our shared consciousness and common history of ideas was emphasised by Burckhardt who commented: "Taken as a whole, the Dome of the Rock amply demonstrates the meeting-point between Byzantine and nascent Islamic Art." This meeting was made possible "by virtue of the 'Platonic' element inherent in Byzantine art, by this we mean a certain aspect of contemplative wisdom, which integrates quite naturally with the Islamic perspective on the Unity of God, both transcendent and immanent".<sup>8</sup>

This deep awareness of our common heritage has led me to call for a recognition of the moral and philosophical authority of holy sites and cities. We must raise religious authority above the mundane. The civilisational ties which we all have with these unique structures must lead to a demand that they do not become pawns in political and ideological struggles.

### **A Synthesis of Meaning**

This synthesis which we can still discern in the architecture of ancient monuments can also be found in the writings of great thinkers. We might just mention the ideas of Al-Farabi and Ibn Sina which were accepted by Spinoza, as they were by Maimonides and St. Thomas Aquinas before him. Here was the continuity of thought and the perpetuation of *Ishraq*, the great luminary philosophy originating in the East. As MM Sharif says, that "Leibniz [had an]...indebtedness to Muslim thought is undoubted... Ibn Sina's influence on him can hardly be doubted for there is a curious parallelism in al-Shifa' and the *monadology* of Leibniz in describing association and memory."<sup>9</sup>

It is difficult not to compare and find synthesis between monadology and the tenets of *Ishraq* which were carried through the ages by sufi scholars and poets. For Leibniz, monad was a symbol of the centre of one's total literary experience. It has been compared to Hopkins's 'inscape' and to Joyce's 'epiphany'.<sup>10</sup> According to Leibniz: "The soul is the mirror of an indestructible universe," while "God alone is the primary Unity, or original simple substance, from which all monads, created and derived, are produced".

How easy it is to find synthesis with a saying of Imam Ali, nephew of the Prophet Muhammad (PBUH), who is revered by Sufi spiritualists and, indeed, all Muslims. He says:

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<sup>8</sup> Burckhardt, T.(1976), pg 14

<sup>9</sup> Sharif, MM (1966), *A History of Muslim Philosophy*, Vol.2, pg 1386

<sup>10</sup> Frye, N (1957), *Anatomy of Criticism*, pg 365-367

*Don't you know that you are a small body,  
While in you the entire great world is folded up!  
You are a 'Manifest Book' through  
The letters of which the hidden secret has become explicit..."<sup>11</sup>*

As partners in our shared humanity, it is tempting to imagine how Leibniz might have prospered in another place and time where the philosophy of *Ishraq* flourished. Doubtless he would have achieved similarly great things in a different language.

My wife's ancestor, Shihabuddin Yahya Suhrawardi, the *Sheikh al-Ishraq* (Master of Illumination) would have well understood Leibniz's struggle to find meaning in the infinite. A wanderer in the Islamic world of the 12<sup>th</sup> Century, Suhrawardi was influenced by the ancient Persian belief in an archetypal otherworld in which each individual and object in the mundane world had an exact counterpart in the heavenly realm.

Carl Gustav Jung's theory of psychic reality fits well into this Mesopotamian context, where 'reality' is perceived as having two dimensions, the *inner and outer*. An example of an archetypal image is that of the original man, represented in western religion by Adam. The image is mirrored in '*irfan* – the Gnosis of Islam – by Ibn 'Arabi's notion of the Perfect Man. As he writes:

*"To man is entrusted the divine safeguarding of the World, and the World will not cease to be safeguarded so long as this Perfect Man shall remain there. God first created the whole world like a mirror which has not yet been polished. In order that He might be perfectly manifested in it, it was necessary that by means of divine order (amr) this mirror should be made clear, and Adam became the very clarity of this mirror and the spirit of this image."*<sup>12</sup>

### ***Ishraq And the West***

As Henri Corbin says, Suhrawardi succeeded in carrying out a "great design: in reviving... the wisdom... of the doctrine of Light and Darkness."<sup>13</sup> This 'Theosophy of Light' (*hikmat al-Ishraq*) finds many parallels in the work of Ibn 'Arabi. As Corbin says, in accomplishing his task, Suhrawardi was conscious of establishing the *Oriental Wisdom*, which Ibn Sina also sought and knowledge of which had reached Roger Bacon by the 13<sup>th</sup> Century.

*Ishraq's* place in the '*Genetics of Knowledge*' was well-drawn by Jalaluddin Rumi in 13<sup>th</sup> Century Persia when he wrote:

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<sup>11</sup> Khomeini, R. (1991) *Sharh-i du'a-yi sahar*, trans. Fihri, S.A. , quoted in Khysh, pg 15

<sup>12</sup> Ibn 'Arabi, *Fusus al-Hikam*, quoted in Lewis, B.; Ménage, V.L.; Pellat, C. & Schacht, J. (eds.), *The Encyclopaedia of Islam* Vol.III, p.1240

<sup>13</sup> Corbin, H (1997), *Alone With the Alone*, pg 19

*“Knowledge has two wings, Opinion one wing: Opinion is defective and curtailed in flight...*

*(But) when he has been delivered from Opinion, Knowledge shows its face to him:*

*That one-winged bird becomes two-winged and spreads his wings...*

*He flies aloft like Gabriel, without disputation!”<sup>14</sup>*

The influence of Sufi thought on the West was discreet but profound in the early Middle Ages. In the Levant, the Crusaders “discovered fairly soon that the Sufis not only honoured the person of Jesus as one of the seven sages of Islam, like all good Muslims, but they were also committed to an interfaith pluralism, which believed that every religion contained some important aspects of one universal truth.”<sup>15</sup>

It is worth reminding ourselves at this point that *Ishraq* describes both the first light of dawn from the East and the enlightenment of eastern thought. But for Suhrawardi, and many other thinkers through the ages, the Orient was not a term of geography but a philosophical pool from which light and energy emanated.

Karen Armstrong, a strong proponent of Jasper’s Axial Age theory, describes Suhrawardi’s immensely complex system of belief as “an attempt to link all the religious insights of the world into a spiritual religion.”<sup>16</sup> Across time and space, *a genetic chain of thought and inner-struggle* stretches out from Axial thinkers and breathes life into the philosophies of thinkers like Leibniz and Suhrawardi.

## **Shared Symbols of Mankind**

Leibniz, like Suhrawardi, believed that symbols were vital for human understanding. As he put it: “In symbols one observes an advantage in discovery which is greatest when they express the exact nature of a thing briefly and, as it were, picture it; then indeed the labor of thought is wonderfully diminished.”<sup>17</sup>

He has been described as the first major European intellectual to be drawn to Chinese civilization. Leibniz believed that Europeans could learn much from the Confucian ethical tradition. Perhaps he was overly-optimistic in his belief that Chinese characters were an unwitting form of his universal characteristic, but his belief in a connection between mathematics and what we now call the universal or collective unconsciousness is laudable.

The ‘*Genetics of Knowledge*’ have continued to make an impression on all aspects of knowledge up to the present day. Although the term ‘collective unconscious’ was originally coined by Carl Jung for use in analytical psychology, an appreciation of its meaning has a long pedigree. Like the Sufi *Sheikh al Ishraq*, Jung believed the unconscious contained archetypes. These symbols, he believed, are manifested by all

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<sup>14</sup> Iqbal, A (1991), *The Life and Work of Jalaladdin Rumi*, pg 263

<sup>15</sup> Strachan, G (2003), pg 25

<sup>16</sup> Armstrong, K (1999), *The History of God*, pg 264

<sup>17</sup> Simmons, G (1992) *Calculus Gems*

people in all cultures. As Karen Armstrong says: “The current enthusiasm for psychoanalysis in the West can be seen as a desire for some kind of mysticism, for we shall find arresting similarities between the two disciplines.”<sup>18</sup> Mythology, says Armstrong, has often been an attempt to explain the inner world of the psyche. Both Freud and Jung turned instinctively to ancient myths to explain their new science.

## Rhythm and Harmony

Rhythm and music have long formed a part of Sufi worship of the divine. *Dhikr*, the remembrance of God commanded in the Qur'an for all Muslims, is a devotional act where worshippers form a circle or other strictly defined, inwardly-focused formation. Aids to remembrance include the repetition of divine names, supplications and aphorisms from *hadith* and the *Qur'an*. In the Sufi *tariqas*, these rituals were enhanced by music and poetry. I have no doubt that Leibniz would have understood the importance of rhythm in these rituals. For him, music was “the pleasure the human mind experiences from counting without being aware that it is counting”.

Ibn Khaldun in his famous *Muqaddimah*, written in the 14<sup>th</sup> Century, described the craft of singing in a similar way, as “scanning sounds according to well-known fixed proportions, which causes any sound (complex) thus scanned to constitute a tune, a rhythmic mode...sounds are in certain proportions (intervals) to each other... Every man desires beauty in the objects of vision and hearing, as a requirement of his nature. Beauty in the objects of hearing is harmony and lack of discordance in the sounds.”<sup>19</sup>

Thus, Ibn Khaldun placed music in a mathematical quest for harmony, as did Leibniz. On this note, I would dearly like to see Aramaic and Syriac cantors brought to perform in the West to show the mathematical, artistic and musical uplift of Eastern spiritual music, a body of musical expression that can speak to us all.

As PB Wadia says in comparing eastern and western music, new and old: “A community is but what its units are; a symphony is but what its constituting notes, melodies, rhymes are. These units, individual men or musical atoms, must be transformed if the communal music in the making today is to serve a high, noble and spiritual goal.”<sup>20</sup>

The Sufi *dhikr* equates to Jung's notion of the mandala archetype, where a circle representing the worldly self of *zâher* is pierced with a radius representing the *tariqa*, the Sufi path to the central point, or *qutb*. Here, the Sufi believes he achieves unity with the ultimate Self of God. As Jung says of the mandala: “Their basic *motif* is the premonition of a centre of personality, a kind of central point within the psyche... and which is itself a source of energy.”<sup>21</sup> This energy “is manifested in the almost irresistible compulsion... to become what one is.”

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<sup>18</sup> Armstrong, K (1999), pg 245

<sup>19</sup> Ibn Khaldun, *Muqaddimah*, Part 2, Chapter V, Section 31

<sup>20</sup> Wadia, PB (1924), “New Standards” in *The New Orient*, Vol. 2, No.2 pg 38

<sup>21</sup> Jung, p.357

## The Age of Questions

Ladies and gentlemen, it is difficult to know what our descendents will make of the *problématique* of ‘*Genetics of Knowledge*’. Have we strengthened the line of enquiry or will we weaken our race with inward deceits and monopolisations of the truth? To quote the Brazilian sociologist and political scientist, Cristovam Buarque, how did we arrive “at the end of the century with yet another question: what has happened to humanity? How could the end of the 20<sup>th</sup> Century be a time of such success and, at the same time, such failure?.. by not asking ‘*What for?*’ but only ‘*How?*’ man has lost his critical perspective of the society that he was constructing; and by constructing it without a critical perspective, he was on the road to disaster.”<sup>22</sup>

In a new century already scarred by tragic conflict, we must maintain faith in our abilities to overcome the myriad challenges facing us. We have at our disposal a heritage of engagement and discovery to guide us through these darker days. We live in a world increasingly governed by a *law of war* which offers few concessions to a *silenced majority*. However, with the benefit of our collective wisdom I hope we can all contribute to a renewed effort to renew harmony and illumination. In the words of Hersch Lauterpacht, can we not build a *law of peace* to govern relations between states and peoples?

Human solidarity is the fundamental ethic which must underlay all our endeavours, from science and the arts to economics and policy-making. I believe that a true synthesis of man’s collective need for the material and our spiritual desire for harmony can provide a basis for a new *International Humanitarian Order*. In the 1980s, I chaired the UN Independent Commission on International Humanitarian Issues (ICIHI). Following the General Assembly’s endorsement of our proposal, we issued a report entitled “Winning the Human Race?” This work engaged with some of our most pressing existential concerns: poverty, militarization, famine, desertification, and terrorism, to name but a few. Over 20 years on, we find that universal wisdom has not overcome material pressures.

So how shall we be labeled by future generations? - The age of Knowledge, the Age of Energy, the Age of Power? We still have time to right the wrongs of recent decades. Globalisation is not simply the spread of capitalism or deeper economic and political ties, but a chance to bring to prominence our shared consciousness. This universal approach implies compassion and altruism, and our willingness to “*stand on the shoulders of giants*”.

## Conclusion

Many initiatives have emerged over the years which focus on restoring shared values. But awareness of the richness of diversity and the complexity of identities has not prevented

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<sup>22</sup> Buarque, C, (1995) *The Gold Curtain*, pg 163



the spread of dangerously simplistic worldviews. As Leibniz discovered during his lifetime, acknowledging and working with difference is far more productive than rigid adherence to a single viewpoint. In the context of the Middle East, peace is not merely the cessation of war; it is a process to be built between people who work for a shared goal. To think in such terms is more natural than restating those particular '*brand names*' that label us by state or creed. Similarly, we must avoid attempts to requisition particular areas of human achievement and accept multiple identities in light of our universal consciousness.

Leibniz is best remembered by philosophers for his theory of *optimism*: his conclusion that our universe is, in a restricted sense, the best possible one God could have made. I wonder if that would have been his conclusion today? Whether we accept this or not, we must not shirk our responsibilities to bring harmony and illumination into the lives of those who depend on us.

To speak of shared values like respect, responsibility and altruism, which have helped to ensure humanity's survival and wellbeing from time immemorial, brings me back to where we started: Illumination is a pool of light in which we all must bathe. Like our ancestors, we have the capacity to build a reflection of the divine on Earth and to work towards harmony in our world.

*Thank you, Ladies and Gentlemen, for the great honour of allowing me to address you on 'Leibniz Day'.*

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