ONE VERSE OF ṚK VEDA (I.164.39)
CONTAINS ALL THEORIES OF MATHEMATICS


His Holiness
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VEDIC SCIENCE

Fulfillment of **MODERN SCIENCE**

ऋचो अक्षरे परमे व्योमन् यस्मिन् देवा अधि विश्वे निषेदुः यस्तन्न वेद किमृचा करिष्यति य इत् तद् विदुस् त इमे समासते

ṚICHO AK-KSHARE PARAME VYOMAN YASMIN DEVĀ ADHI VISHWE NISHEDUḤ YASTANNA VEDA KIM ṚICHĀ KARISHYATI YA IT TAD VIDUS TA IME SAMĀSATE

Every academic discipline unfolds knowledge of one specific area of Natural Law. Maharishi Vedic Science℠ unfolds knowledge of the Veda, the most basic element of creation, the lively blueprint of all the Laws of Nature, eternally existing in the unmanifest basis of the whole manifest universe.

Maharishi explains that Veda means pure knowledge, which exists in that transcendental state where consciousness is completely self-referral, when the awareness knows itself alone.

The *Ṛicho Akshare* verse of Ṛk Veda describes how the totality of Natural Law, found in this self-referral state of Nature’s functioning, gives rise to the diversity of creation. These universal dynamics find expression in the principles discovered by the modern disciplines.

The *Ṛicho Akshare* charts present the entire range of knowledge in terms of its source, the transcendental level of consciousness of the knower. This opens the possibility for the knower to capture the totality of knowledge in his own awareness.

When individual human consciousness opens to the field of pure knowledge, it becomes a lively field of all possibilities. Then life is lived in perfection—spontaneously in accord with Natural Law. This complete knowledge of Natural Law and a simple approach to it for everyone is the basis of our aspirations to create Heaven on Earth.

Discovery of all the theories of all the disciplines of modern science within the structure of this *Ṛicho Akshare* verse of Ṛk Veda explains why the human mind, identified with the transcendental field of consciousness, spontaneously receives the support of the infinite organizing power in which reside all the impulses of Creative Intelligence, the Laws of Nature responsible for the orderly administration of the whole manifest universe.

Now, through Maharishi Vedic Science and Technology℠ of Consciousness, it is possible for everyone to align his awareness with the infinite organizing power of Natural Law and gain mastery over Natural Law.

MATHEMATICS

	ऋचो अक्षरे ṚICHO AK-KSHARE The verses of the Veda exist in the collapse of fullness (the *kshara* of ‘A’) . . .	परमे व्योमन् PARAME VYOMAN . . . in the transcendental field, self-referral consciousness, the Self, . . .	यस्मिन् देवा YASMIN DEVĀ . . .in which reside all the *Devas*, the impulses of Creative Intelligence, the Laws of Nature . . .	अधि विश्वे निषेदुः ADHI VISHWE NISHEDUḤ . . . responsible for the whole manifest universe.	यस्तन्न वेद YASTANNA VEDA He whose awareness is not open to this field . . .	किमृचा करिष्यति KIM ṚICHĀ KARISHYATI . . . what can the verses [of the Veda] accomplish for him?	य इत् तद् विदुस् YA IT TAD VIDUS Those who know this level of reality . . .	त इमे समासते TA IME SAMĀSATE . . . are established in evenness, wholeness of life.
SET THEORY	The principles of set theory (*Ṛichā*) describe the progressive unfoldment of greater and greater infinite totalities from the null set. This process of generating sets is based on the collapse of a finite or infinite totality of sets to a point value (*kshara* of ‘A’), a single element of a new set.	The infinite totalities and processes described by set theory transcend the boundaries of finite localized expressions in space and time and must be located in the infinite, unbounded nature of consciousness.	Set theory has at its basis axioms *(Devas)*, which encapsulate the structuring dynamics of these infinite totalities and processes. These axioms embody both the organizing power that creates the mathematical universe from the null set, and the organizing power that structures mathematical knowledge on the basis of the logical analysis of collections of objects.	The organizing power embodied in the axioms of set theory is capable of generating all known mathematics. All mathematical structures can be located in the set theory universe, and all theorems of mathematics are in reality theorems of set theory.	If one's awareness is not open to the infinite nature of consciousness, then the meaningful content of mathematics is limited to its finitary or constructive aspects, as expressed in the formalist or constructivist approaches to the foundations of mathematics.	When the symbolic expressions of set theory are examined from the purely finitary viewpoint of formalism, there is no intuitive basis for the consistency of mathematical knowledge. Furthermore, without nonconstructive methods, one cannot formulate many of the most basic concepts in such fundamental fields as analysis and topology.	The infinitary perspective at the heart of set theory has given rise to powerful technologies with which mathematicians have solved problems of importance to all of mathematics. Using these techniques, set theorists have transcended the limitations of their own field by establishing the independence of a broad class of fundamental propositions.	Set theory establishes a common language and structural foundation for all of mathematics. This, together with the powerful methods of independence proofs, provides a grand unification of mathematics, in which even contradictory propositions coexist in a single, coherent whole.
LOGIC	The fundamental laws of logic (*Ṛichā*) emerge from the analysis of the semantics of language; that is, from the analysis of the way in which a complex sentence can be systematically reduced to its truth value, “true” or “false” (*kshara* of ‘A’).	The structure of formal logic transcends the specific objects and relations referred to by language. This structure has its basis in the self-referral process of the intellect quantifying its own discriminative and orderly functioning.	The rules of logical inference *(Devas)* are universal principles of human intelligence used for validating mathematical proofs. They govern the flow of intelligence that sequentially unfolds the stages in a proof, and thereby provide objective criteria for the rigorous development of mathematical knowledge.	The rules of logical inference are responsible for the universal objectivity of mathematics through the validation and sequential organization of the full range of mathematical knowledge. Thus the rules of logical inference ensure that the advance of mathematics is invincible.	Before the systematic analysis of the laws of thought, mathematics was based solely on intuition and empirical observations; there were no reliable criteria of right knowledge, and thus there was no way to objectively verify arguments that purported to develop mathematical truths.	Without the systematic procedures of logic, there could be no systematic development of mathematical knowledge; mathematics would be reduced to isolated fragments of knowledge based on opinion or derived through trial and error.	The language and principles of formal logic, based on the mathematical analysis of universal deductive processes, bring the rigor of objective validity to the development of mathematical knowledge, provide a structure for the communication of knowledge, and link new knowledge to old.	In every branch of mathematics the same system of formal logic can be used to structure the development of mathematical knowledge. Thus knowledge of logic provides a consistent and unified foundation for the study, development, communication, and application of all mathematics.
ALGEBRAIC NOTATION	Algebraic notation uses symbolic expressions (*Ṛichā*) to formulate the language of mathematics. An algebraic symbol represents all possible mathematical objects that satisfy a specific collection of properties. Thus algebraic notation collapses the wholeness of all possibilities into a symbol (*kshara* of ‘A’).	The collapse of mathematical objects into a symbol takes place in the awareness of the mathematician. It is the mind of the mathematician that connects the appropriate mathematical meaning to a specific symbol. For example, mathematicians may associate the symbol *x* with all possible solutions of an equation.	Mathematicians create basic rules of syntax (*Devas*) to formulate the symbolic representations of mathematical statements. These rules allow mathematical ideas to be expressed in a compact and precise form.	Using these rules of syntax, the whole range of mathematical knowledge can be expressed in algebraic notation; this range includes the axioms of all mathematical theories, all the theorems of these theories, and all the proofs that deduce these theorems from the axioms.	If one is unable to maintain the connection between a symbol and its meaning, one is restricted to the use of ordinary language or to the formal manipulation of meaningless symbols. This makes it difficult to express abstract knowledge precisely or meaningfully and makes the process of mathematical proof extremely cumbersome.	Without this understanding of algebraic notation, the process of generalization by abstraction in modern mathematics would be obstructed, and none of the theories of modern mathematics could have been developed.	Mathematicians who maintain a fluid connection between algebraic symbols and their meaning are able to use algebraic notation to capture the essence of mathematical concepts in a compact, easily handled form. This enables them to clarify crucial issues in a mathematical problem and to reason on more abstract and powerful levels.	Algebraic notation provides a common symbolic language for the exact expression, development, and unification of all mathematical knowledge. The ability to communicate mathematical knowledge in a precise and unambiguous way, using this universal notation, allows for unrestricted progress in all areas of mathematics and its applications.
THEORY OF THE CONTINUUM	The theory of the continuum (*Ṛichā*) is based upon the mathematical description of the collapse of an infinite sequence of intervals to a point (*kshara* of ‘A’); this collapse generates an infinite decimal expansion, thereby quantifying the homogeneous continuum as a set of real numbers.	The concepts and techniques of set theory underlie the construction of real numbers, permitting one to define and manipulate the infinite sequences of intervals, and to collect the resulting infinite decimals together into an uncountable set with an algebraic structure and a natural ordering.	The continuum is composed of an integrated diversity of structures *(Devas)* based in set theory. Fundamental are the algebraic structures of addition and multiplication and the geometric structure of a line. This geometric structure is based on the natural ordering and the topological completeness of the set of real numbers.	The integration of algebraic operations with geometric continuity in the continuum of numbers makes it possible to represent and to completely quantify any continuous process using transformations (functions) of the continuum within itself.	Before set theory formalized the concept of the infinite, there was no means to investigate the rich diversity of the continuum. For example, numbers were limited to a countable set of algebraic and transcendental numbers, and certain basic facts in geometry, assumed for thousands of years, could not be proved.	Without set theory one could not construct the uncountable set of transcendental numbers, nor properly investigate topological properties of the line such as completeness and connectedness, the concept of Lebesgue measure at the basis of the theory of integration, and the great variety of sets and functions essential to analysis.	The quantification of the continuum by set theory provides a foundation for modern analysis and for all branches of mathematics dealing with continuous structure, such as functional analysis, differential topology, differential geometry, global analysis, and algebraic geometry.	The theory of the continuum unifies the discrete perspective of algebra with the continuous viewpoint of geometry, allowing an integrated application of the methods of algebra and geometry in all areas of mathematics that study continuous structure and processes.
ALGEBRA	Algebraic theories *(Ṛichā)* are derived from axioms governing the structure of operations and relations on sets. The axioms of each theory restrict attention from all possible structures to those that satisfy the axioms *(kshara* of ‘A’).	Set theory is the foundation for all areas of algebraic study. It provides the abstract conceptual framework in which one can consider all structures with all possible operations and relations, as well as the class of structures satisfying a given collection of axioms.	Each algebraic theory has its own transformations and constructions (*Devas*). The transformations are set-theoretic functions between algebraic objects that preserve algebraic structure. The algebraic constructions, such as subobjects, products, and quotients, have their source in the constructions of set theory.	The simplicity and power of algebraic constructions and transformations make algebra ideal for creating and classifying a wide range of mathematical examples. For instance, analysis uses the algebraic structure of the continuum to construct function spaces, and topology uses algebraic structure to classify shapes.	Before the development of the abstract algebraic viewpoint, as formalized in set theory, mathematical investigation was restricted to concrete examples. One could not give an axiomatic description of the abstract algebraic structures underlying specific examples.	Without this axiomatic description, it would be necessary to prove theorems separately for each specific structure. Furthermore, there would be no means for constructing, connecting, and classifying the vast range of structures used in modern mathematics.	Algebraic methods, grounded in set theory, have led to the discovery of deep properties of algebraic structures, such as the classification of finite simple groups. In addition, problems of analysis, topology, and geometry are often solved by first uncovering their inherent algebraic structure and then applying the powerful techniques of algebra.	Algebraic methods permeate all areas of modern mathematics by providing an abstract viewpoint that brings to light the common abstract patterns of relationship and structure inherent in a wide diversity of mathematical systems.
ANALYSIS	The fundamental concept in the theory of analysis (*Ṛichā*) is the limit process structured within the continuum. A limit process collapses an infinite totality of objects, such as points, sets, functions, or linear operators, to a unique limit (*kshara* of ‘A’).	The unified structure of the continuum provides the foundation for analysis. The interaction of the algebraic structure of the continuum with the neighborhood systems provided by topology makes the full value of the limit process available to analysis.	The limit process structured within the continuum is the basis for the two fundamental processes of calculus, differentiation and integration (*Devas*). These two processes enable one to formulate all possible differential and integral equations, which quantify the mathematical laws governing continuous change.	Differentiation and integration give rise to operators in the setting of function and distribution spaces. The techniques of analysis in these spaces are used to study and solve the related differential and integral equations quantifying the abstract laws governing the diverse phenomena of nature.	Before the theory of the continuum was developed, there was no basis for rigorous proof in analysis. Consequently, there was confusion regarding fundamental questions, such as the existence of continuous, everywhere nondifferentiable functions and the validity of infinite Fourier expansions.	Without the limit and the fully developed theory of the continuum, neither the variety of infinite dimensional function and operator spaces nor the techniques for handling them were available to resolve delicate questions, such as those arising in the theory of singular integrals and the solution of partial differential equations.	After the limit had been correctly defined and the structure of the continuum fully analyzed, one could define differentiation and integration, and develop real, complex, and functional analysis as the proper setting for the study of both classical and modern problems related to natural phenomena.	The limit process provides a master key to the quantitative study of natural law. Application of the limit process of analysis in the diverse areas of applied mathematics and science provides a unified perspective on all processes of change in nature.
TOPOLOGY	The theory of topology (*Ṛichā*) describes and quantifies the fundamental properties of shape and form using a system of open sets. This system can be organized into open neighborhood systems, collections of sets which represent the sequential collapse of the topological space onto each of its points (*kshara* of ‘A’).	Set theory is the abstract foundation of topology. Through the application of set-theoretical principles, a formless set is given shape by identifying as the system of open sets a collection of subsets satisfying the axioms of topology.	All the basic structural concepts of topology (*Devas*), such as connectedness, compactness, and dimension, are expressed in terms of the fundamental operations of set theory. For example, connectedness is defined in terms of the unions and intersections of open sets.	In mathematics, all shapes and forms can be analyzed and characterized in terms of topological properties. Furthermore, topological concepts are essential for defining and understanding continuous transformations between shapes.	Before the set-theoretic approach of topology was developed, the concept of form was limited to that of Euclidean and projective geometries. This limitation made it very hard to distinguish between intrinsic and extrinsic topological and metric properties of spaces.	Without the infinitary processes of set theory, it was not possible to apply topological concepts such as continuity and compactness in abstract settings, nor to construct such important spaces as infinite products or classifying spaces.	Topologists who use the full potential of set theory are able to investigate deeply all structural properties of spaces. This use of set theory in topology has made possible major developments in topology, analysis, and even in set theory itself.	With the set-theoretic approach of topology, mathematicians can locate fundamental qualities of shape and form in all mathematical structures. This approach is the basis for the development of integrated theories, such as measure theory, topological group theory, algebraic geometry, and ergodic theory.
CATEGORY THEORY	All mathematical activity can be derived from a few fundamental constructions (*Ṛichā*) described by category theory. Each of these constructions arises from the collapse of all possible constructions of a particular kind, encoded in a functor, to a point value called the universal element of the functor (*kshara* of ‘A’).	The action of all functors takes place within the metacategory of all categories, whose objects are categories and whose morphisms are these functors. As it includes all categories, this metacategory is so large that it is not itself a category; at the same time it gives rise to all categories through its internal dynamics.	In any category or metacategory, the objects are completely characterized by their dynamic relationship with all other objects of the category. This relationship is described using commutative diagrams comprised of transformations called the morphisms *(Devas)* of the category or metacategory.	All mathematical truths can be expressed in the category-theoretic language of commutative diagrams and morphisms. Moreover, all mathematical structures can be located within the metacategory of all categories using the method of extracting universal elements from suitably chosen functors.	Before the discovery of the foundational concepts of universal element and natural transformation between functors within the metacategory, important problems in mathematics, particularly in algebraic topology and homological algebra, remained unsolved and difficult to approach.	Without the unified foundation given by the metacategory of all categories, category theory could be misunderstood as a mere generalization of mathematical theories, lacking sufficient mathematical content to be a mathematical theory itself.	The unique viewpoint of category theory has resulted in new approaches to old problems and has unified apparently unrelated mathematical disciplines. Category theory has, for example, provided important models in the theory of programming languages and has established a framework for using algebraic techniques in topology.	Through the metacategory of all categories, category theory provides a foundation for all mathematics which complements that provided by set theory. With the concept of transformation as a unifying theme, this new foundation integrates the rich diversity of mathematical theories into a single coherent wholeness.