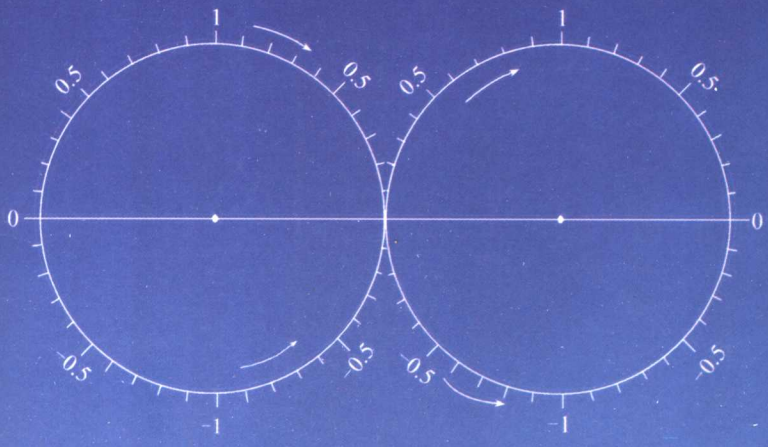
哲理数学概论

INTRODUCTION TO PHILOSOPHICAL MATHEMATICS

孟凯韬 著



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内 容 简 介

本书论及哲理数学的基本理论及其在人文社会科学、中医学及国家宏观决策等诸多领域的应用. 哲理数学的基本理论包括基本属性论、关联偏差论、中心变量论、辩证关系论和元系统论, 其中, 前四论是基础. 元系统论是核心, 主要论及自然系统、社会系统、符号系统诸种属性之本原.

本书适合哲学、数学、中医学和社会科学诸学科工作者及国家高、中级公务员阅读, 可作为大学文科和中医药学研究生和本科生的教材.

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孟凯韬，教授，西北大学哲理数学研究所所长，国家自然科学基金委员会中医药重大研究计划终审专家组成员. 1943年12月生于陕西省周至县.1992年荣获国务院颁发的政府特殊津贴.

孟凯韬从上高中时开始，逐步走上科学研究道路. 1985年以前致力于图算学和速算法的研究，先后出版了《农业实用图算》、《乘除速算法》和《多项式与多位数乘除开方新法》，并做出“世界通用区时及地方时钟表”、“中国标准时及地方时钟表”等9项发明创造，获得中国专利. 从1986年起，在科学泰斗钱学森先生的关怀和支持下，致力于数学与思维科学、人文社会科学和中国传统文化(包括中医学)的交叉研究. 由于钱老推荐，1990年又得到数学泰斗苏步青先生的鼓励和支持. 两位泰斗使他走上原始创新之路：1991年由科学出版社出版《思维数学引论》,创立“思维数学”；1999年由中国科学技术出版社出版《哲理数学基础》，创立“哲理数学”. 自从进入21世纪以来，力图进一步完善“哲理数学”，不仅形成包括基本属性论、关联偏差论、中心变量论、辩证关系论、元系统论在内的、独立的理论体系，而且建立了阴阳五行逻辑和河图、洛书公式体系，破解了中医界几千年悬而未解的理论之谜. 根据这个公式体系，不仅可以得心应手地反推出中医经典名方，而且可以探索新的处方；还可对中医的治疗方法从逻辑检验的角度进行严格的证明或发现其不足之处. 此外，还曾发表关于科学治国及其方略、科技评价体制改革、反对学术腐败、人才成长规律和综合评价等方面的论文数十篇. 其中有些入选《世界学术文库》、《中国当代思想文库》、《中国科技发展精典文库》、《中国改革开放的理论与实践》、《理论前沿的思索》、《21世纪100个交叉科学难题》等十多种理论文集.

孟凯韬从1978年以来，曾获得省部级奖励4次. 其中，《哲理数学基础》2004年获得陕西省哲学社会科学优秀成果一等奖.

孟凯韬的事迹20世纪70年代后期就曾见诸新华社《内参》、《新华社新闻稿》、《人民日报》、《陕西日报》等新闻媒体，90年代中期再度成为新闻人物.《科技日报》和新华社于1994年4月3日和1995年12月1日分别以“在磨难中成长·思维数学家孟凯韬”和“孟凯韬创立思维数学——中国数学家又一重大贡献”为题对内和向全世界报道. 新华社的报道还为美国、菲律宾等许多国家和地区的报纸所转载,因而产生强烈的反响. 孟凯韬的传略和事迹也见于《世界优秀专家名典》、《世界华人杰出专家》、《中国当代发明家辞典》、《思维辞典》、《中国当代数学家与数学英才大辞典》、《中国当代社会科学专家辞典》、《中国当代杰出管理专家辞典》等辞书和《诺贝尔奖百年百人》、《中国优秀科研成果百例》、《中国高新技术成果要览》、《中华名流人物访谈录》、《科学技术回顾与展望》等文献.

前　言

数学由于记数和计算的需要而产生，随着生产和科学技术的发展而发展. 时至今日，它已成为整个科学技术的基础. 而且，是否成功地运用了数学成为一门科学是否完善的标志. 正如恩格斯所说，一门科学只有在成功地运用了数学之后才算达到完善的地步. 然而，由于受形式逻辑的束缚，传统数学远远不能适应人文社会科学及复杂性科学研究的需要，因而“哲理数学”应运而生.

“哲理数学”是一门研究自然、社会和人生在深层及在宏观上存在的联系和数量关系的科学，是与传统数学根本不同的一种新数学. 它区别于传统数学的本质特征在于实现了哲学思维与数学思维、辩证逻辑与形式逻辑、定性研究与定量研究、传统文化与现代科学的有机结合. 因此，它可以克服形式逻辑带给传统数学的局限性，使数学思维进入一切研究领域，包括上层建筑、人文社会科学和中医学等传统数学思维很难进入的领域.

因为对立统一规律是宇宙的根本规律，所以，不论问题怎样复杂，最终都归结为同一性和对立性.因此，同一性和对立性的定量研究是哲理数学核心之所在. 引入主导属性明晰度、关联偏差、中心变量明晰度等概念就旨在为此奠定基础. 这些概念所涉及的量一般不可实测，而靠思维去把握，因而具有模糊性，这与模糊数学无异. 所不同的是，模糊数学只从一个方面进行考察，哲理数学则从既对立又统一的两个方面进行考察. 从对立统一的两方面去考察，就导致数学思维发生质的飞跃，由单纯的定量发展到定性与定量相结合，而以正负号定性、以绝对值定量. 事物之间的同一性和对立性也由正负号揭示出来. 在此基础上，进一步可以计算出同一和对立的程度，因而也使哲学思维发生质的飞跃，由单纯的定性发展到定性与定量相结合.

哲理数学的理论框架是以元系统、主导属性明晰度、关联偏差和中心变量明晰度等四个最基本的概念为理论基石构建起来的. 它的基本

理论包括基本属性论、关联偏差论、中心变量论、辩证关系论和元系统论. 其中, 前四论为基础, 元系统论是核心. 其主要内容在于探索自然系统、社会系统和符号系统诸种特性的本原. 诸如人类社会何以形成、自然界各种生物何以具有相对稳定性、社会矛盾的根源是什么, 等等, 都属于它的研究范畴.

基本属性论主要从属性的角度研究事物之间的同一性和对立性. 首先基于隶属度的概念提出主导属性明晰度的概念, 根据事物之间的主导属性明晰度的乘积之为正、为负和为 0 将其间的关系区分为具有正差、形成反差和具有中差, 并以此为基础给出同一度和对立度的计算公式. 同时研究具有相同基本属性的任意三个事物两两之间在上述三种情况下对立度的比较.

关联偏差论主要从主体与功利客体的关联性研究主体之间的同一性和对立性. 首先基于关联度的概念提出关联偏差的概念, 根据与同一个功利客体相关联的主体之间的关联偏差的乘积之为正、为负和为 0 将其间的关系区分为具有正差、形成反差和具有中差, 并以此为基础给出同一度和对立度的计算公式. 同时研究与同一个功利客体相关联的任意三个主体两两之间在上述三种情况下对立度的比较. 它实际上是数学化了的社会矛盾论.

中心变量论主要研究相关的变量具有相同的函数关系的事物之间的同一性和对立性. 首先基于二元一次函数自变量与因变量之间的关系提出广义隶属度和中心变量明晰度的概念, 根据事物之间的中心变量明晰度的乘积之为正、为负和为 0 将其间的关系区分为具有正差、形成反差和具有中差, 并以此为基础给出同一度和对立度的计算公式. 同时研究相关的变量具有相同的函数关系的任意三个事物两两之间在上述三种情况下对立度的比较. 它主要用于经济领域的问题的研究.

辩证关系论主要研究事物之间同一性与对立性的相对性及相容性和平衡性的相对性, 并基于同一度和对立度对中立度加以界定, 提出通过对同一度、对立度和中立度进行比较界定同一、对立和中立的法则. 同时研究三元促进和制约逻辑及二元和五元促进-抑制逻辑(即阴阳五行逻辑)的诸种关系, 给出相应的公式.

元系统论主要研究元系统之间及其内部在形式上和性质上的联系,

并着重研究元系统的连续性、相似性、相关性、对称性、对立性、协同性和感应性. 系统之间及其内部在形式上的联系归结为交、并、差、外积、对偶积等五种运算, 在性质上的联系归结为同、合、冲、中等四种运算.以此为基础, 进一步可以界定元系统之间及其内部的同一度、和合度、冲突度与中立度.

哲理数学之不同于传统数学, 根本在于思想方法的变革. 由于它以唯物辩证法贯彻始终, 将定性与定量研究融为一体, 因而大大地拓宽了数学的应用空间. 一般地讲, 只要涉及定性, 按照哲理数学都可进行定量研究; 只要存在数量关系, 按照哲理数学就可写出相应的计算公式. 哲理数学不仅可以解决许多按照传统数学方法很难——甚至无法进行定量研究的问题, 而且对于一些用传统数学方法可以解决的问题, 有时也比其更加简便. 对于哲学而言, 由于哲理数学将一些基本哲学概念数学化, 因而使哲学思维趋于精确, 使一些哲学命题可以像数学命题那样进行论证, 同时使一些仅靠思辨很难搞清楚的问题昭然若揭, 因此也大大地拓宽了哲学的应用空间.基于哲理数学所建立的阴阳五行逻辑和河图、洛书公式体系揭示出五行生克阴阳消长相关性、五行生克和乘侮主客体强度变化规律、阴阳升降与消长的关系, 以及病理情况下五行生克阴阳盛虚相关性, 破解了中医界几千年悬而未解的理论之谜, 使得中医辨证论治的思维过程可以用公式加以表达, 使得处方可以用公式推导出来, 同时使中医的治疗方法可以从逻辑检验的角度得到严格的证明. 在此基础上, 还可进一步建立许多公式体系, 从而全面实现中医理论数学化, 为中医规范化、现代化和走向世界奠定基础. 然而, 哲理数学的应用远不止此. 在社会学、政治学、经济学、法学、系统学、人才学、科学计量学、管理学、生态学和国家宏观决策等诸多领域也可得到应用, 并可显示出独特的作用. 相信随着它的理论体系的不断完善, 它的应用范围还将进一步扩大. 如果说传统数学是自然科学和技术科学的基础, 那么可以说, 哲理数学最终将成为人文社会科学和中医学的基础.

本书以《哲理数学基础》为基础, 而且, 既是对《哲理数学基础》的补充和修正, 又是对它的升华和发展.《哲理数学基础》作为一种探索性研究成果, 其粗糙性自不待言, 不足甚至错误之处亦在所难免. 作者本着自我否定的精神, 对《哲理数学基础》重新进行审视, 扬其所长、

去其错误、补其不足，特别是对同一、对立等最基本的哲学概念针对不同情况从定量角度加以严格界定，据以建立哲理数学的理论体系，同时探索它在各个方面的应用，于是写成本书.《哲理数学基础》中之“自然集合”，在本书中改称为“元系统”.

本书共分九章：第一章是对哲理数学的公理体系、理论框架及其应用前景等的概括介绍；第二章至第七章论及哲理数学的基本理论；第八章论及用哲理数学解决复杂性科学定量研究问题的思路、步骤及对系统的平衡性、稳定性和调控效度等的定量研究；第九章论及哲理数学在中医学和国家宏观决策等诸多领域的应用.

因为哲理数学研究具有原创性、前瞻性和交叉性，而且是距离很远的多个学科的交叉，所以很难取得共识. 加之评价体制存在诸多弊端，因而开始极其艰难，从研究伊始到《哲理数学基础》问世一直未获得立项支持. 但自进入 21 世纪以来，由于国家对科技政策作了很大的调整，尤其是注重原创性和学科交叉性，因而得到科技部的大力支持，于2000年、2002 年和 2004 年先后列入国家攀登计划特别支持项目、国家重大基础研究前期研究专项和国家重点基础研究发展计划(“973”计划). 不仅如此，下自省教育厅领导，上至党和国家最高领导人，都对哲理数学研究给予关注和支持. 因此，哲理数学研究比以往任何时候进展都快. 本书与《哲理数学基础》相比，不仅在理论深度上上了一个台阶，形成自己的体系，在应用上有突破性进展，而且效率提高了近一倍.

值此本书定稿之际，作者由衷地感谢上述各级领导，感谢对哲理数学研究给予指导、支持和帮助的老一辈科学家、朋友和同事，特别是科学泰斗钱学森先生、数学泰斗苏步青先生和我们西北大学哲理数学研究所的顾问孙克定、张岱年、季文美、冯征、谢韬、王梓坤、林群、张岂之、张棣先生. 作者在将哲理数学应用于中医学的过程中，得到中医后起之秀牛志纲的帮助，书中所涉及的部分经典处方和素材为其所提供，而且是他首先发现用公式推导处方的可能性，也在此表示感谢.

由于作者水平所限，且无前人的研究成果可资借鉴，错误和不妥之处在所难免，恳请读者多加批评指正！

孟凯韬

2004 年 12 月 16 日

Preface

Mathematics, which originated from the need for memorizing numbers and making calculations, is developing with the growth of production and science and technology, and has now become the foundation for all of science and technology. Further more, whether or not a kind of science can properly use mathematics indicates whether it has reached its perfectness or not. Just as Friedrich Engels put it, only by having successfully applied mathematics can the science reach its perfectness. However, the traditional mathematics, owing to the restraint of formal logic, is far from meeting the demand for the research of humane social studies and complex natural sciences, hence comes into being the "philosophical mathematics".

"Philosophical mathematics" is a kind of science which deals with the deep and macroscopic relations between society and human beings as well as the complex relations between quantity and quality. It is a new kind of mathematics totally different from traditional mathematics in the characteristics that it integrates philosophical thinking with mathematical thinking, dialectical logic with formal logic, qualitative research with quantitative research, traditional culture with modern science. Therefore it can surmount the limitations imposed on traditional mathematics by formal logic, and make mathematical thinking enter the area of all studies including superstructure, humane social studies as well as traditional Chinese medical science where the traditional mathematical thinking can hardly enter.

Because the law of unity and opposites is the fundamental law of the universe, all things conform to it no matter how complex they are. Therefore, the quantitative study of the identity and opposite is the core of philosophical mathematics, and introducing the notions of distinct degree of leading attribute, correlative deviation and distinct

degree of central variable will lay a solid foundation for it. The quantity related with the above notions generally can not be measured in practice, rather, they should be grasped by thinking, which is of indistinct nature, similar to fuzzy mathematics, with the difference that fuzzy mathematics views things one-sidedly; while philosophical mathematics, two-sidedly, that is, it views things from the angle of unity and opposite, which therefore leads to a qualitative leap in mathematical thinking from single, quantitative development to integration of quality with quantity, in which quality is determined by positive and negative signs; while the quantity is determined by absolute value; and the identity and opposite in things are also revealed by positive and negative signs. On this basis it is possible to further calculate the degree of identity and opposite, and make philosophical thinking produce a qualitative leap from single, qualitative development to the combination of quality with quantity.

The theoretical framework of philosophical mathematics is constructed with the following four basic concepts as its theoretical cornerstone: basic system, distinct degree of leading attribute, correlative deviation and distinct degree of central variable. Its basic theory includes the doctrine of basic attribute, doctrine of correlative deviation, doctrine of central variable, dialectical relations and doctrine of basic system. Among them the first four doctrines are the foundation with basic system as its core, the main content of which is to probe the origin of attribute of natural system, social system and symbol system, such as how the hum an society came into being; why all things in the nature have relative stability and what is the source of social contradictions and the like. All these belong to the category of its research.

The doctrine of basic attribute mainly deals with the identity and opposite of things in their attributive perspective. First, on the basis of the concept of subordinate degree, it presents the notion of distinct degree of leading attribute. According to the product of distinct degree of leading attribute of things being positive, negative and zero, their relations may be divided into having positive difference, form-

ing negative difference and having neutral difference, and on the basis of them it presents a calculation formula of identity degree and opposite degree; and at the same time, makes a comparative study on the opposite degree of two things among the three things with almost the same basic attribute under the above three conditions.

The doctrine of correlative deviation mainly deals with the identity and opposite between subjects from the correlation of subject to the object of material gain. First, based on the concept of correlation degree it presents the notion of correlative deviation. According to the product of correlative deviation between subjects related to the same object of material gain being positive, negative and zero, their relationship may be divided into having positive difference, forming opposite difference (or contrast), having neutral difference. On this basis it presents a calculation formula of identity degree and opposite degree; at the same time, it makes a comparative study on the opposite degree between two subjects of any three subjects related with the same object of material gain under the above three conditions, which actually is a doctrine of social contradiction of mathematicization.

The doctrine of central variable mainly deals with the identity and opposite among the things of the related variables with the same functional relations. First, based on the relations of self-variables and cause-variables of binary linear function, it presents the notion of general subordinate degree and distinct degree of central variable. According to the product of distinct degree of central variable among things being positive, negative and zero, their relations may be divided into having positive difference, forming opposite difference(contrast) and having neutral difference and on this basis it presents a calculation formula of identity degree and opposite degree; and at the same time makes a comparative study on the opposite degree of two things among any three things of related variables with the same functional relations under the above three conditions. This doctrine is mainly applied to economic problems.

The doctrine of dialectical relations mainly discusses the relativ-

ity and consistency of identity and opposite among things and the relativity of equilibration. And on the basis of the degree of identity and degree of opposite, it defines the degree of neutrality, and through the comparison of degree of identity, degree of opposite and degree of neutrality, defines the rule of identity, opposite and neutrality. It also deals with the ternary logic of promotion and restriction, as well as the binary and quinary logic of promotion-restraint (logic of YIN YANG and five elements) and their various relations, at the same time offers a relevant formula.

The doctrine of basic system mainly focuses on the connection in form and quality among basic systems and their interiors, with emphasis on basic system's continuation, similarity, correlation, symmetry, opposition, cooperation and perceptivity. The formal connection between systems and their interiors may have five calculations: intersection, union, difference, external product and dual product; their qualitative connection is of four calculations: sameness, suit, clash and neutrality. Taking these as foundation, we may further define the degree of identity, degree of harmonious balance, degree of collision and degree of neutrality between basic systems and their interiors.

Philosophical mathematics differs from traditional mathematics in the fundamental change in the way of thinking. Owing to the fact that it takes materialistic dialectics as its guide line and integrates qualitative research with quantitative research, it greatly broadens application field. Generally, all things concerned with quality can be studied in quantitative approach through philosophical mathematics. So long as quantity relationship exists, its relevant calculation formula may be put out in terms of philosophical mathematics. Not only the problems, which can hardly, or even can never be made quantitative research by traditional mathematics, can be resolved by philosophical mathematics, but also the problems which can be resolved by traditional mathematics sometimes will become more easier and convenient if philosophical mathematics is applied. As for philosophy, because philosophical mathematics expresses some basic philoso-

phical concepts in mathematicization, and therefore makes philosophical thinking tend to be more precise, makes some philosophical propositions be proved and demonstrated as easily as mathematics. At the same time some problems which can hardly be expressed clearly by means of thinking and arguing are made abundantly clear by using philosophical mathematics. The application field is therefore broadened to a great extent. The formula system of logic of YIN YANG and five elements with Chart He and Book Luo based on philosophical mathematics brought to light the dependency of growth and decline of YIN and YANG of inter-promotion and inter-restriction in five elements, the changing law of intensity of subject and object of inter-promotion, inter-restriction, over-restriction and reverse-restriction in five elements, the relation of insufficiency-hyperactivity with growth-decline of YIN and YANG, the relation of ascending-descending with growth-decline of YIN and YANG, as well as dependency of YIN YANG ascending and descending under pathology circumstances. All these give an answer to the puzzles which have confused us in medical science and have not been resolved in theory for thousand years, and make it possible to express in formula the thinking process of determination of treatment based on pathogenesis obtained through differentiation of symptoms and signs in traditional Chinese medicine therapy, that is prescriptions can be deduced in formula. In addition, the treatment for disease in traditional Chinese medicine may be strictly proved by logical examination; and on this basis a lot of formula systems may be further established. Therefore it is possible to make traditional Chinese medicine theory mathematicization and modernization, which lays foundation for standardization and going to the outside world. However, the applications of philosophical mathematics are far beyond the above-mentioned, they are also applied in the following fields, such as sociology, politics, economics, science of law, research system, research of talented person cultivation, scientific metrology, management, ecology as well as macroscopic decision of the state and showing their unique and significant role. We believe that with the

theoretical system reaching its perfectness, philosophical mathematics will be applied in a wider field. If traditional mathematics is said to be the foundation of natural science and science of technology, philosophical mathematics may be regarded as the foundation of humanities and social science as well as traditional Chinese medicine.

Preface

The book, which takes "The foundation of philosophical mathematics" as its base, is not only its complement and revision, but also its development and sublimation. As an exploring research, "The foundation of philosophical mathematics" is not without its faults or mistakes. However, the author is ready to make a careful examination over it in a self-negative approach, develop its advantages and cast off its defects and shortcomings, and make up for them. Special attention is paid to the basic philosophical concepts of identity and opposite, which should be strictly defined according to different situations and perspectives. This book is written in view of probing different applications. The natural set in "The philosophical mathematics" is renamed "basic system" in this book.

The book consists of nine chapters: The first chapter makes an introduction to the axiom system, theoretical framework and application perspective of philosophical mathematics; the second through seven chapters are about the basic theory of philosophical mathematics; the eighth chapter discusses how philosophical mathematics resolves the problems of way of thinking about the complex scientific research of quantity, its steps and balance to system; the ninth chapter makes a study on the applications of philosophical mathematics in traditional Chinese medicine and macroscopic decision of the state and the like.

Owing to the fact philosophical mathematics is characterized by its original creativity, good expectations and intersections, especially the intersection of almost irrelevant subjects, people can hardly reach a common understanding. In addition, there exist some improper practices in evaluation system, "The foundation of philosophical mathematics" has not been supported from the start of its research.

However, due to the regulations of the state policy on science and technology since the new century beginning, especially on the original creativity and intersections among different subjects, the study of "philosophical mathematics" has been given enormous support from the Ministry of Science and Technology. It was listed as the item of special support for plan of scale new scientific heights of China, the special item of prophase research for great basal research of China, development plan of emphasis basal research of China ("973" plan) in the year 2000, 2002 and 2004 respectively. Further more, it also has got the support from the authorities of the Party and State as well as from the Department of Education of Shaanxi Province. Without their help it was impossible to accomplish the work, and make it more improved in theory and system than the book "The foundation of philosophical mathematics" in such a short period of time.

Finally, at the time the book will be finished the author would like to express his heart-felt thanks to the authorities, veteran scientists and celebrities who have rendered enormous help to the work, especially to the leading scientist Mr. Qian Xuesen, great mathematician Mr. Su Buqing, Thanks are also given to the advisors to the Institute of philosophical mathematics, they are Mr. Sun Keding, Mr. Zhang Dainian, Mr. Ji Wenmei, Mr. Feng Zheng, Mr. Xie Tao, Mr. Wang Zikun, Mr. Lin Qun, Mr. Zhang Qizhi and Mr. Zhang Di. The author also thanks doctor Niu Zhigang, a promising young scientist in traditional Chinese medicine, who provided part of the classical prescriptions and material cited in this book, and first found that prescriptions can be deduced in formula.

Owing to the author's limitation of learning and the lack of reference from predecessors, faults and mistakes are unavoidable in this book, therefore any suggestions and corrections from readers are very welcome.

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