

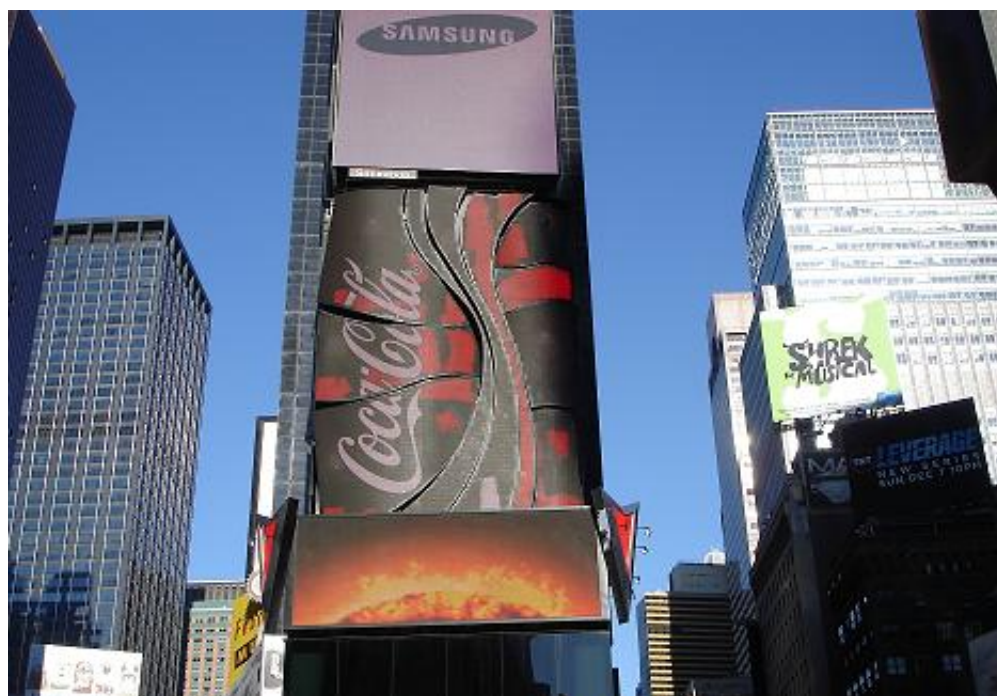
# Academia Arena

## 学术争鸣

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# Academia Arena

## 学术争鸣

Academia Arena is published bi-linguistically with English and Chinese for the scientists and Engineers. The journal founded in January 1, 2009 aims to present an arena of science and engineering. The Editor-in-Chief, Associate Editors-in-Chief and Editors have backgrounds in Philosophy, Science, Technology, Cosmology, Mathematics, Physics, Chemistry, Biology, Medicine, Civil, Electrical, Mechanical Engineering, etc. Papers submitted could be reviews, objective descriptions, research reports, opinions/debates, news, letters, and other types of writings.

学术争鸣于2009年元月1日在美国纽约马斯兰德出版社发刊，主要目标为提供科学家与工程师及社会工作者学术辩论的发表园地，专业领域包含哲学、科学、技术、宇宙学、数学、物理、化学、生物学、医学、土木、电机、化工、机械工程，等，编辑群将以最专业客观的立场为所有投稿作者服务。

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# Academia Arena

## 学术争鸣

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2	<p><b>Determinants Of Farm And Off –Farm Income Among Farmhouseholds In South East Nigeira</b></p> <p>Ibekwe, U.C; C.C. Eze; C.S. Onyemauwa; A. Henri-Ukoha; O.C. Korie and I.U. Nwaiwu Department of Agricultural Economics, Federal University of Technology, P.M.B. 1526, Owerri, Imo State, Nigeria. E-mail: <a href="mailto:csonyemauwa@yahoo.com">csonyemauwa@yahoo.com</a></p> <p><b>Abstract:</b> Agriculture has been considered as one of the important sectors that could help and improve the income distribution problem and its poverty implications in South Eastern Nigeria. This has led to the focus of this study on the determinants of the farm and off farm income among the farm households in South East Nigeria and Imo State in particular. Primary data were collected and ordinary least squared regression model was used to analyze the data collected. Results showed that: Farm size, age, education, occupation and hours spent on farm are important explanatory variables that influenced</p>	<a href="#">Full Text</a>	2

	<p>both farm and off farm incomes. [Ibekwe, U.C; C.C. Eze; C.S. Onyemauwa; A. Henri-Ukoha; O.C. Korie and I.U. Nwaiwu. <b>Determinants Of Farm And Off –Farm Income Among Farmhouseholds In South East Nigeira.</b> Academia Arena 2010;2(11):11-14]. (ISSN 1553-992X). (<a href="http://www.sciencepub.net">http://www.sciencepub.net</a>).</p> <p><b>Keywords:</b> Determinants, Farm, Off-farm, Income, Diversification, Push factors</p>		
3	<p style="text-align: center;"><b>21 世纪新儒学---量子色动力学</b></p> <p style="text-align: center;">白科大 <a href="mailto:y-tx@163.com">y-tx@163.com</a></p> <p><b>摘要：</b>21 世纪新儒学被徐光宪先生定格在 1959 年后的这 50 年，让 21 世纪新儒学理科与文科交融叠加，走进北京大学。也走进了上海，走进了上海师范大学。</p> <p>[白科大. <b>21 世纪新儒学---量子色动力学.</b> Academia Arena 2010;2(11):15-33]. (ISSN 1553-992X). (<a href="http://www.sciencepub.net">http://www.sciencepub.net</a>).</p> <p><b>关键词：</b>儒学 味夸克 夸克海</p>	<a href="#">Full Text</a>	3
4	<p style="text-align: center;"><b>惯性力与加速系的物理学</b></p> <p style="text-align: center;">（一评广义相对论）</p> <p style="text-align: center;">谭天荣</p> <p style="text-align: center;">青岛大学物理系青岛 266071, <a href="mailto:ttr359@126.com">ttr359@126.com</a></p> <p><b>内容提要：</b>本文指出：对于相对论，适用于加速系物理学的数学工具不是黎曼几何，而是平直的四维时空的曲线坐标运算。在这一前提下，证明了加上了惯性力的牛顿第二定律对一系列特殊的加速系成立，从而在狭义相对论的框架内给出了加速系的物理学方程的不变性，正如惯性系的物理学方程具有“洛伦兹不变性”一样，加速系的物理学方程具有一种“准洛伦兹不变性”。最后，本文指出在这一工作完成之前，狭义相对论作为一个理论体系是不完整的。</p> <p>[谭天荣. 惯性力与加速系的物理学. Academia Arena 2010;2(11):34-40]. (ISSN 1553-992X). (<a href="http://www.sciencepub.net">http://www.sciencepub.net</a>).</p> <p><b>关键词：</b>曲线坐标；加速系的物理学；准洛伦兹变换；惯性力场张量；惯性场论；爱因斯坦</p>	<a href="#">Full Text</a>	4
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	<p>青岛大学物理系青岛 266071, China, <a href="mailto:ttr359@126.com">ttr359@126.com</a></p> <p><b>内容提要：</b>本文指出，广义相对论有两个论据不成立，一个是惯性力与引力不可分辨，另一个是惯性力不能完全抵消引力，从而证明整个广义相对论是不合逻辑的。另一方面，本文在惯性场论的基础上，一方面通过引力与电磁力的对比，另一方面通过经过改写的等效原理，建立了一种新的引力场论，它具有如下特征：第一，等效原理是它的逻辑结论；第二，通过“引力场张量”的概念，它与牛顿引力理论紧密衔接；第三，它的数学结构简单，与其他自然力的场论相比并没有特别迥异之处。</p> <p>[谭天荣. 对万有引力的再考察. Academia Arena 2010;2(11):41-46]. (ISSN 1553-992X). (<a href="http://www.sciencepub.net">http://www.sciencepub.net</a>).</p> <p><b>关键词：</b>张量分析；惯性力；万有引力；广义相对论；等效原理；自然引力论</p>		
6	<p><b><i>Klebsiella</i> sp has taken lead among uropathogens in outpatients of University of Benin Teaching Hospital, Benin City. Nigeria-An observation</b></p> <p>1 Osazuwa F, 1Mordi RM, 2 Osazuwa E 3 Taiwo SS 4 Alli OAT, 4 Ogbolu DO, 4 Akanni EO, 5 Anukam KC</p> <p>1 Department of medical microbiology, University of Benin Teaching Hospital Benin City .Nigeria  2 Department of Pharmaceutical microbiology, Faculty of pharmacy, University of Benin Benin City .Nigeria  3 Department of Medical Microbiology, College of health sciences, Ladoke Akintola University of Technology Osogbo.Nigeria  4 Department of Biomedical sciences, College of health sciences, Ladoke Akintola University of Technology Osogbo.Nigeria  5 Department of medical laboratory sciences, Faculty of Basic medical Sciences University of Benin, BeninCity.Nigeria</p> <p>Correspondence to: Osazuwa favour Email: <a href="mailto:osazuwafavour@yahoo.com">osazuwafavour@yahoo.com</a></p> <p><b>Abstract:</b> Against the background of reports of changes in the prevalence of uropathogens, this study aimed to determine the prevalence of asymptomatic bacteriuria among out-patients of a tertiary hospital, the most prevalent uropathogen, and the distribution of uropathogens among both genders. Clean-catch midstream urines were collected from 1,011 out-patients consisting of 412 males and 599 females. Significant bacterial isolates were identified in the urine samples using standard techniques. Female patients had significantly higher prevalence of asymptomatic bacteriuria (<math>p &lt; 0.05</math>). <i>Klebsiella</i> sp was the most common uropathogen (33.3%) as well as in both genders of patients. Other pathogens recovered includes <i>Escherichia coli</i> (32.3), <i>Staphylococcus aureus</i> (17.6%), <i>Candida albicans</i> (7.5%), Coagulase negative <i>staphylococcus</i> (3.9%), <i>Proteus</i> sp (3.2%), <i>Enterococcus faecalis</i> (1.1%), <i>Pseudomonas</i> (0.7%) and <i>Providencia</i> sp (0.4%). An overall prevalence of (27.6%) of asymptomatic bacteriuria was found and <i>Klebsiella</i> sp was the predominant uropathogen in both genders of out-patients.</p> <p>[Osazuwa F, Mordi RM, Osazuwa E, Taiwo SS, Alli OAT, Ogbolu DO, Akanni EO, Anukam KC. <b><i>Klebsiella</i> sp has taken lead among uropathogens in outpatients of University of Benin Teaching Hospital, Benin City. Nigeria-An observation.</b> Academia Arena 2010;2(11):47-51]. (ISSN 1553-992X). (<a href="http://www.sciencepub.net">http://www.sciencepub.net</a>).</p> <p><b>Keywords:</b> Asymptomatic bacteriuria, prevalence, uropathogens, <i>Klebsiella</i>, outpatients</p>	<p><a href="#">Full Text</a></p>	6
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==== 我们宇宙诞生于在普朗克领域 Planck Era 新生成的大量原初最小黑洞  $M_{bm} = m_p$   
 $= (hc/8 G)^{1/2} 1.09 \times 10^{-5} g$  的合并, 而不是“奇点”或“奇点的大爆炸”====  
 June/2010

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**【Abstract】**。In this article, based on some general laws of astronomy, physics and many classical theories, the calculated results can prove that our present expansive Universe was impossibly born from Singularity or from the Big Bang of Singularity but from the Big Crunch of pre-universe in Plank Era. According to the principle of time symmetry, suppose before the birth of our universe, there could be a final Big Crunch of pre-universe. Once the final Big Crunch of pre-universe reached to Planck Era, i.e. time  $t = [k_1 (2G/C^5)]^{2/3} (3c)$ ,  $t = -0.5563 \times 10^{-43} s$  and temperature  $T = 0.734 \times 10^{32} k$ , every Planck particle ( $m_p$ ) simultaneously reached 3 states: 1. Reached Planck Era; 2. The gravitational linkage between the closest particles broke off and the collapse stopped at the state of no gravity; 3. Every particle ( $m_p$ ) at that moment would exactly become a minimum gravitational black hole ( $M_{bm} = m_p = 1.09 \times 10^{-5} g$ ). Just those 3 states could effectively stop pre-universe continuously collapse to singularity, and let all  $M_{bm}$  explode in Planck Era. The strongest explosions of every  $M_{bm}$  in whole pre-universe synchronously formed a so-called the Big Bang. After that, the new and bigger  $M_{bmn} = 2M_{bm}$  of longer lifetime could certainly occurrence due to decrease in density and temperature caused by the Big Bang. Newborn  $2M_{bm}$  became the embryos of our present universe. It was the process of genesis of our present Universe. The collisions and combinations of all newborn  $M_{bmn} = 2M_{bm}$  would create an “Original Inflation”, and form the present expansion of our universe. The whole process changed from the disappearance of old pre-universe to the genesis of new universe in Plank’s Era was not reversible. Other important conclusions got in this article are those: Our universe has been a real universal black hole (UBH), which accords with all laws of general black holes (BH); Hubble law is just the expansive law of our universe to plunder energy-matters outside; the new and simple explanations and demonstrations to ” Original Inflation”, etc.

[Dongsheng Zhang, **The Complete Demonstrations To Our Universe Impossible To Be Created From Singularity**. Academia Arena 2010;2(11):52-71]. (ISSN 1553-992X).  
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### 解开八卦图

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摘要：老子创立了道教,入世无为。孔子创立了儒教出世,有为。及具体地设出了阴阳金 木 水,火,土五行来演化万物运动上升到哲学高度。可惜他们总体上一个从宏观,一个从微观上分析看待问题,对伏羲画的八卦图没有真正理解,继没有找到道的来源,也没有解释出八卦图所表示出事物的意义,因此几千年来八卦的作用始终没有在科学技术上发挥巨大的作用。

孙纯武. 解开八卦图. Academia Arena 2010;2(11):72-77]. (ISSN 1553-992X).  
<http://www.sciencepub.net>).

**关键词：**八卦图图解 来源 功能作用

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**Development and validation of extracurricular instructional package in social studies**

[Full Text](#)

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	<p style="text-align: center;">Okoro, C.O. Faculty of Education, University of Port Harcourt, Port Harcourt, Rivers state, Nigeria</p> <p><b>Abstract:</b> The purpose of this study is to develop extracurricular activities for social studies instruction and to compare learning outcomes in the extracurricular activities and the conventional groups. To achieve these objectives two research questions and three hypotheses were formulated. Four instruments were developed. The validated extracurricular instructional package((EIP) was presented to the experimental group while the control group was taught the same social studies topics using the conventional approach. the major findings were that (1) JS1 Students taught with extracurricular instructional packages relationship develop more cooperative attitude to work (2) exhibited cordial relationship with others (3) developed positive attitude to work. Recommendations were made: Teachers work load should be restructured to accommodate their involvement in extracurricular programs (2) More flexible time-release from teaching or in structuring the allow time for activities during school day. [Okoro, C.O. <b>Development and validation of extracurricular instructional package in social studies.</b> Academia Arena 2010;2(11):78-84]. (ISSN 1553-992X). (<a href="http://www.sciencepub.net">http://www.sciencepub.net</a>).</p> <p><b>Keywords:</b> extracurricular instructional package, social studies</p>		
10	<p style="text-align: center;"><b>An Assessment of The Effects of Problem Solving Instructional Strategies on Students' Achievement and Retention in Chemistry with Respect to Location in Rivers State</b></p> <p style="text-align: center;">B. J. Obomanu, &amp; Jacobson Barineka Nbina Department of Curriculum Studies and Educational Technology Faculty of Education, University of Port Harcourt P.O. Box 3 Choba, Rivers State E-mail: <a href="mailto:drnbinajacobson@yahoo.com">drnbinajacobson@yahoo.com</a>; Tel: 08033136895</p> <p><b>Abstract:</b> The main purpose of this study is to determine how problem solving instructional strategies would affect students' achievement and retention in Chemistry with particular reference to River State. A pre-test, post-test, non-equivalent control group design was adopted. Two research questions and two hypotheses were respectively answered and tested. Purposive and stratified random sampling was used to select 428 SS II students from two rural and two urban local government areas of Rivers State. These students were randomly assigned to the two treatment groups. Problem solving with Model and Feedback – Correctives (PF), Problem solving with Model Only (PM), and the control Problem Solving by The Conventional Method (PC). The model used is a Generic Problem Solving Inquiry Model developed by Hungerford (1975). A researcher developed and moderated instrument, Chemistry Achievement Test (CAT) and lesson plans were used for the study. Data collected were analyzed using Mean, Standard Deviation (SD) and some gains of achievement and retention and that the hierarchical order of achievement is PF, PM and PC. No significant differences were observed in the post-test mean scores of urban and rural subjects in the achievement is PF, PM and PC. No significant differences were observed in the post-test mean scores of urban and rural subjects in the achievement and retention tests administered in the course of the study. Based on the findings, it is recommended that both rural and urban Chemistry teachers use problem solving instructional strategies, particularly that in which use of a model is supplemented with feedback-correctives in teaching. [B. J. Obomanu, &amp; Jacobson Barineka Nbina. <b>An Assessment of The Effects of Problem Solving Instructional Strategies on Students' Achievement and Retention in Chemistry with Respect to Location in Rivers State.</b> Academia Arena 2010;2(11):85-90]. (ISSN 1553-992X). (<a href="http://www.sciencepub.net">http://www.sciencepub.net</a>).</p> <p>Key words: Instructional Strategies, Students' Achievement, Chemistry</p>	<a href="#">Full Text</a>	10
11	<p style="text-align: center;"><b>全息照相与再现的微观机制</b> 杨发成 新疆 克拉玛依市 瑞达中心 834000</p>	<a href="#">Full Text</a>	11



	<p>e-mail: <a href="mailto:yangfacheng2006@163.com">yangfacheng2006@163.com</a> , <a href="mailto:yangfacheng6467@sohu.com">yangfacheng6467@sohu.com</a></p> <p><b>摘要：</b>本文从粒子观点出发，运用惠更斯包络面概念、以及点光源辐射产生球形包络面观点，以相干性很好的激光作为光源，对全息照相和全息照相记录的再现进行了全新的理论分析，从而证明，光不具有波动性。那些象波动特征的光学现象，是大量光粒子与实物体之间的一种相互作用，其结果遵守宏观统计规律。 [杨发成. 全息照相与再现的微观机制. Academia Arena 2010; 2(11):91-95]. (ISSN 1553-992X)</p> <p><b>关键词：</b>点光源；球形包络面；全息照相；全息照相再现；同心圆簇；杨氏干涉仪群</p>		
12	<p><b>Comparative Analysis Of The Allocative Efficiency Of Cassava Producers That Use External And Internal Inputs In Imo State, Nigeria</b></p> <p><b>Nwaiwu I.U<sup>1</sup>., Ohajianya D.O<sup>1</sup>., Ibekwe U.C<sup>1</sup>. Amaechi E.C.C<sup>2</sup>.; Emenyonu C.A<sup>1</sup>., Onyemuwa C.S<sup>1</sup>., Henri-Ukoha A<sup>1</sup>. Kadiri F.A.</b></p> <p>1. Department of Agricultural Economics, Federal University of Technology, Owerri Imo State, Nigeria.</p> <p>2. Agricultural Management and Extension Department, Imo State Polytechnic Umuagwo. E-mail- <a href="mailto:niuche2004@yahoo.com">niuche2004@yahoo.com</a>; <a href="mailto:dohajianya@yahoo.com">dohajianya@yahoo.com</a>;</p> <p><b>ABSTRACT:</b> The current unsustainable farming practices, high demand for staple food crops especially cassava, observed low productivity and inefficient resource allocation by farmers motivated this study to comparatively analyse the allocative efficiency of cassava producers that used external inputs and those that used internal inputs in Imo State. A random sample of 100 each of the external and internal input user farmers were collected from a pre-survey sample frame of 400 farmers drawn from across the three agricultural zones of Imo State. Data on the farmers' socio-economic characteristics and the value of factors used and output produced were collected using structured questionnaire. The analyses were done using descriptive statistics and production function analytical tools. A critical analysis of the result of the production function indicates that the Cobb-Douglas production function best explained the relationship. Finally, the computation of the allocative efficiency of the two categories of farmers showed that both categories did not allocate resources efficiently. Therefore it was recommended among others that more efficient resource allocation procedure be sought for and subsequently disseminated to the farmers through the various change agents. [Nwaiwu I.U., Ohajianya D.O., Ibekwe U.C. Amaechi E.C.C.; Emenyonu C.A., Onyemuwa C.S., Henri-Ukoha A. Kadiri F.A. Comparative Analysis Of The Allocative Efficiency Of Cassava Producers That Use External And Internal Inputs In Imo State, Nigeria. Academia Arena 2010;2(11):96-102]. (ISSN 1553-992X). (<a href="http://www.sciencepub.net">http://www.sciencepub.net</a>).</p> <p><b>Key Words:</b> Sustainable; Allocative; External Input; Internal Input; Efficiency</p>	<a href="#">Full Text</a>	12
13	<p><b>光在不同环境中运动的基本规律</b> 杨发成 新疆 克拉玛依市 瑞达中心 834000 e-mail: <a href="mailto:yangfacheng2006@163.com">yangfacheng2006@163.com</a> , <a href="mailto:yangfacheng6467@sohu.com">yangfacheng6467@sohu.com</a></p> <p><b>摘要：</b>光的运动，它无非是在真空中或非真空区域两种情况。反射和折射，其实是一个事物的两个方面。光在反射过程中，反射角等于入射角时，反射光束中的光线数量最多最密集；但并不是所有的反射光线都遵循古典反射定律，还有很多反射光线是沿任意方向的，只不过那些光线数量很少而显得非常弱。作者研究认为，折射光线与反射光线是同时产生的，不同颜色光在同一透明物质中的“速度”不同而引起相应折射角不同。[杨发成. 光在不同环境中运动的基本规律. Academia Arena 2010;2(11):103-109]. (ISSN 1553-992X).</p> <p><b>关键词：</b>光的运动；光的折射；光的双折射；光的反射；偏振光</p>	<a href="#">Full Text</a>	13

## Effect of instruction in Metacognitive self-assessment strategy on Chemistry Students self-efficacy and achievement

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**Abstract:** This study examined the effect of instruction in metacognitive self assessment strategy on senior secondary school students' Chemistry self-efficacy and achievement. The study also explored the interaction effect of instruction in metacognitive self assessment strategy and gender in their Chemistry self-efficacy and achievement. The study was guided by five research questions and four hypotheses. A non-equivalent control group pretest and posttest design involving one treatment and one control group was adopted. A total of 192 SS 2 students from Port Harcourt Education zone were used for the study. The Self Assessment Instructional Programme (SAIP) was developed, validated and used for the study. Three instruments: Chemistry Achievement Test (CAT), Self Assessment Scale (SAS) and Chemistry Self-efficacy scale (CSS) were adopted, validated and used for data collection. The results suggested that instruction in the metacognitive self assessment strategy improve the students' chemistry achievement and self-efficacy.

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**Keywords:** Metacognitive; self-assessment strategy; Chemistry; self-efficacy

### 1. Introduction

Chemistry is one of the major branches of science. There are various applications of Chemistry in home or industry. There is an increasing impact of growing knowledge in the subject of chemistry on our social and economic life. A poor chemistry foundation at the secondary school will jeopardize any future effort to enhance achievement in the subject. The study of chemistry at the secondary school level helps students in developing basic skills, knowledge and competence required for problem solving in their environment. According to Ohodo (2005) chemistry contributes generating to the attainment of the aims of education and specifically helps individuals to develop effective process skills, critical thinking and competences required for dealing with observation, classification, measurement, counting numbers, recording, communication, prediction, hypothesis, inference, experimentation, interpretation of data, research, controlling variable and generalization etc. At the secondary level, the foundation of chemistry education is laid as they are taught the underlying principles.

The poor achievement of learners in chemistry has been variously explained. According to Usman and Memeh (2007), the factors that negatively affect chemistry achievement include students' background problems; students lack of interest and/or negative attitude towards chemistry; teacher related factors like poor teacher preparation; inadequate qualified chemistry

teachers, inadequate instructional materials and application of poor teaching methods. In Nigeria efforts are being made by researchers, government and nongovernmental organization to improve both cognitive, affective and psychomotor outcomes in chemistry. For instance, a good number of research efforts have been made to diagnose the problems associated with the teaching and learning of chemistry in order to proffer solution that lead to better achievement. Recommendations have been made regarding the teaching methods, instructional materials, home and school related environmental factors that could enhance achievement in chemistry. However, as evidence available indicates, achievement in chemistry at the secondary school remains low and unimpressive. The federal government of Nigeria is not left out in this effort to revamp interest in the study of science, especially chemistry and improve achievement in the subject.

Chemistry teachers mainly adopt instructional strategies that are mainly teacher directed and do not encourage deeper students involvement and self-regulation (Zimmerman, 1990). Self-regulated learners are self-propelled and independent learners, who possess relevant skills which enhance their ability to construct knowledge, assume responsibility for their own learning and realises that learning is a personal experience that requires active and dedicated participation (Peters, 2000, and Kuiper, 2002). This perception of the role of the learners in the learning

process is changing the views of educational researchers on the role of the teacher in the learning process. Instead of viewing teaching as teacher exposition followed by students practice, effective teaching may be achieved by integrating a self-regulating strategy such as metacognitive self-assessment in the process. The constructivists approach to learning locates understanding within the learners, not with the teachers. It is the learners who must learn and therefore must take the responsibility for learning. According to Kuiper, (2002), learning is based on an appropriate self-reflection which leads to meaningful knowledge construction.

Trends in research in some western Countries tend to suggest that metacognitive self-assessment strategy enhances learners' self-regulated behaviour and academic achievement. Metacognitive self-assessment is a self-monitoring approach in which learners get involved in the assessment of their own progress and deficiencies in the process of learning (Rivers, 2001). As learners monitor their own learning, they learn to check their own responses and become conscious of errors or answer that do not make sense. Schunk (1996a) opined that metacognitive self-assessment is simply judging the quality of one's work. It is a process of assessing the quality of work done based on evidence and explicit criteria. This suggests that self-assessment is goal oriented. To achieve the desired goal will require the active involvement of the learners in the process and the development of skills.

Research findings have suggested that learners who possess relevant skills in metacognitive self-assessment and are aware of these skills are more strategic in pursuing learning and achieve better in their academic endeavour (Kuiper, 2002; Rivers 2001). When learners are exposed to the skills of self-assessment of their progress, they achieve more. As Bandura (1997) and Schunk (1996a) observed positive self-assessment encourages students to set higher goals and commit more personal resources to learning the task. However, negative self-assessment arises when learners embrace goals that conflicts with learning or select goals that are unrealistic or adopt strategies that are ineffective or exert low effort. Rivers (2001) observed that when skills in metacognitive strategies are acquired, they become potentially powerful stimulants to higher achievement. Literatures reviewed indicate that most of the studies that investigated the efficacy of self assessment are foreign to Nigerian culture and most of them were in English comprehension, prose and reading. This created the need to design a

study to determine the extent instruction in metacognitive self assessment strategy would enhance the Chemistry achievement of senior secondary school students.

Self-assessment has been associated with individual learners' perceived self-efficacy. Learners who are exposed to metacognitive self-assessment skills have been suggested to persist more on difficult tasks, be more confident about their ability and take greater responsibility for their learning tasks (Daley, 2002; Kuiper, 2002). Self-efficacy has been described as a set of belief an individual has about his/her abilities or capabilities in specific performance domain (Bandura, 1994). Individuals' self-efficacy belief influences choice of task, the amount of effort expended and level of persistence in the selected task. Thus learners who possess a repertoire of learning skills are more likely to be efficient learners with high self-efficacy. Successful learners seem to control and direct their thinking process, ask themselves questions and try to organize their thought. They have learnt how to go about their learning and possess relevant cognitive strategies they can apply as necessary. On the contrary, low self-efficacy belief is associated with conditions of learned helplessness, a severely debilitating belief that one has no control over one's learning (Pajares and Miller, 1994).

In spite of efforts by educational researchers to improve school achievement especially Chemistry, less attention has been paid to the affective component of the learner such as their perceived self-efficacy. This study therefore sought to determine the extent the acquisition of metacognitive self assessment skills could affect the Chemistry self-efficacy of senior secondary school students in Delta North education zone of Delta state.

Studies on gender differences in Chemistry achievement have continued to yield inconsistent results (Usman and Memeh, 2007). The results of some studies indicate that male students achieve significantly better than girls (Kador, 2001; Usman and Ubah, 2007) whereas some other studies reveal no significant difference in the achievement of the two genders (Loofa, 2001). Where these differences exist between boys and girls, it has usually been attributed to unequal exposure of males and females to experiences relevant to Chemistry learning. This is occasioned by the traditional cultural attitude towards the female gender which restricts them from activities considered masculine (Okeke, 1990). This difference in cultural attitude towards males and females in access to environmental stimulations has

been reported to influence their self- efficacy in favour of the boys (Eze and Agboma, 2008). This study therefore sought to examine the extent exposure to metacognitive self assessment strategy interact with gender to affect senior secondary students' Chemistry self-efficacy and achievement. The findings of this study will be beneficial to educators in designing instructional strategies that will help lay a solid foundation for Chemistry at the secondary level of education.

This study was guided by the following research questions and hypotheses:

### 1.1 Research Questions

1. To what extent does the acquisition of skills in metacognitive self assessment strategy depend on instruction in the strategy?
2. What is the difference in the Chemistry achievement of those exposed to metacognitive self assessment strategy and those not exposed as measured by their mean scores on Chemistry achievement test (CAT)?
3. To what extent do the Chemistry achievement of males and females differ as a result of instruction in metacognitive self assessment strategy?
4. What is the difference in the Chemistry self-efficacy of students exposed to instruction in metacognitive self assessment strategy and those not exposed as measured by their mean scores on the Chemistry self-efficacy scale?
5. To what extent do the Chemistry self-efficacy of males and females differ as a result of instruction in metacognitive self-assessment strategy?

**1.2 Hypotheses:** The following hypotheses that guided the study were tested at 0.05 levels of significance.

1. There is no significant difference in the mean Chemistry achievement scores of students exposed to metacognitive self assessment strategy and those not exposed as measured by their mean scores on CAT
2. There is no significant interaction effect of instruction in metacognitive self assessment strategy and gender on students' achievement in Chemistry
3. There is no significant difference in the mean self-efficacy scores of students exposed to metacognitive self assessment strategy and those not exposed as

measured by their mean scores on Self-efficacy scale (SES)

4. There is no significant interaction effect of instruction in metacognitive self assessment strategy and gender on students' Chemistry self-efficacy.

## 2. Methods

The design adopted for this study was quasi-experimental. Specifically, the study was a pre-test and posttest non-equivalent control group design involving one treatment and one control group. In fact classes were used for the study in order not to disrupt administrative arrangement of the school. This became necessary as the study lasted for eight weeks.

The population of the study comprised of all the senior secondary school (SS II) students in Port Harcourt education zone. The participants in this study comprised of 192 SS II students drawn from the area of study. This is made up of 91 boys and 101 girls. Their average age is [0.4 years. To compose the sample for the study, the researcher adopted a multi-stage sampling technique. First, two local government areas were randomly sampled through a toss of the coin. In each local government area, two secondary schools with at least two streams of SS II students were randomly selected. The secondary schools in each of the local government areas were then randomly assigned as treatment and control schools. In each school, one intact class was randomly sampled to participate in the study. Treatment was implemented only in the treatment schools where the students were instructed in the skills for using metacognitive self assessment strategy in solving mathematical problems.

This was independent of the normal Chemistry classes by the regular classroom teachers. The students in the control group had their normal Chemistry classes with their regular class teachers who were only requested to encourage the students to be serious in studying Chemistry for better achievement.

### 2.1 Instrument for the study

Three researchers' developed instruments were used for the study. They are Chemistry Achievement Test (CAT), Self-Assessment Scale (SAS), Chemistry Self-efficacy Scale (CSS).

**2.1.1. Chemistry Achievement Test:** This is a teacher made achievement test constructed by a panel of qualified and experienced teachers and under the supervision of two specialists each in Chemistry education and measurement and

evaluation. Ten questions were generated based on the selected Chemistry contents the students were taught in the second term of 2008/09 session. The test was not a multiple choice type since the emphasis was on the process of working out the answer and not just the test is 50. The test items were generated based on the test blue print developed and face validated by 'the two specialists in Chemistry education and two others in measurement and valuation. This was done to ensure the content validity of the achievement test. The test items generated were again given to the same specialists to ensure their suitability in terms of appropriateness of language and clarity, and the level of the students. Each test item has a maximum score of 5 marks. The highest score obtainable from the test is 50.

The CAT was trial tested on 18 SS 2 students in Obio/Akpor Local Government Area. The score obtained from the test was used to determine the reliability of the test. Since the test was not dichotomously scored, the internal consistency reliability estimate was determined using Cronbach Alpha method. The obtained reliability estimate is 0.92. An inter-rater reliability was determined using Kendall's co-efficient of concordance procedure. This was done using the scores of three different scorers who used a validated marking scheme as a guide. The obtained Kendall's co-efficient of concordance estimate is 0.94. This shows a high positive relationship among the scores given by the different scorers. Since the same MAT was used as pretest and posttest, the test was re-administered after two weeks and a test retest analysis conducted to determine the stability of CAT over time. Pearson correlation method was adopted and a test retest reliability estimate of .93 was obtained.

**2.1.2 The Self-Assessment Scale (SAS).** This instrument was designed to assess the extent students possess the self-assessment skills relevant for Chemistry problem solving. It is a five point Likert rating scale which ranges from very high extent (VHE= 5), High extent (HE =4), Moderate extent (ME = 3), low extent (LE= 2) to Not at all (NAA = 1). The items of the scale were generated based on review of literature and the researchers' personal experiences. The scale has two parts. Part A relates to the personal data of the subjects whereas part B sought for information on the self-assessment skills the students possess and apply in learning Chemistry. The instrument required the subjects to self-report on the extent they use the skills in the process of solving Chemistry task. The SAS was face validated by subjecting it to peers

review. Two educational psychologists and one measurement expert reviewed the items to ensure appropriateness and clarity. It was thereafter trial tested to further determine its appropriateness and suitability and to test the reliability. The Cronbach alpha method was adopted to determine the internal consistency of the items. The internal consistency reliability estimate of 0.86 was obtained. In order to determine the stability of SAS over time the instrument was re-administered after two weeks and the data obtained were correlated with the earlier data using Pearson product moment correlation method. The test retest reliability estimate of 0.79 was obtained.

**2.1.3. Chemistry Self-Efficacy Scale (CSS).** This instrument was developed by the researchers and used in measuring the perceived Chemistry self-efficacy of the students. It is a four point rating scale with the responses option ranging from strongly Agree (SA= 4), Agree (A 3), Disagree (D= 2) to strongly disagree (SD). Negative items statements were reverse scored. The instrument has two parts. Part A sought for personal information of the respondents whereas part B sought for information relating to the self-efficacy belief of the respondents on Chemistry teaming and problem solving. This instrument was peer reviewed by presenting it to two educational psychologists and one in measurement and evaluation. It was trial tested and the data obtained used in testing the internal consistency reliability estimate. This was done using Cronbach alpha procedure and the reliability estimate obtained is 0.84. The instrument was also tested for stability as it was used for pretest and posttest. The data obtained through a re administration of the instrument after two weeks were correlated with the data obtained earlier using Pearson product moment correlation method and the stability estimate of 0.82 obtained.

## 2.2 Treatment Procedure

Before the commencement of treatment, the SAS, CSS and CAT were administered in this order after a lesson period interval. These were administered by the regular classroom teachers in both the treatment and control schools. In the treatment schools, one of the researchers who had good background in secondary Chemistry posed as a guidance counselor and implemented the treatment using a validated self-assessment instructional programme (SAIP). The treatment was independent of the normal Chemistry classes though illustrations were drawn from Chemistry content that were not part of the scheme of work for the second term of 2008/2009 session. The researchers

made use of available free periods on the time table for instruction in the self-assessment strategy. The treatment was designed to last for eight weeks with one session per week. Each session lasted for 35 minutes. Those in the control group had their normal Chemistry classes, however, their teachers were requested to encourage them to be working hard in Chemistry.

The SAIP emphasized skills that will enable the students to set learning goals and to assess every step they take as they work towards the goal. Using SAIP, the instructor guided that students to use the metacognitive self-assessment strategy as they work through a Chemistry problem. The instructor models the process and engages the students in the practice of the skills. Elaborative feedbacks were given and the instructor evaluated every stage in the process.

At the end of treatment the class teachers administered the SAS, the CSS and the CAT to the students in both treatment and control group to obtain the post treatment data. This was done two weeks after treatment.

### 2.3 Method of Data Analysis

The data generated were collated, organized and analyzed using mean and standard deviation in order to answer the research questions and a two way analysis of covariance for testing the hypotheses. The homogeneity of regression

assumption that underlies the use of ANCOVA was tested for in this study. It was assumed in this study that the difference between the population regression coefficient of the treatment and control group is not significant ( $P < .05$ ). This was confirmed as the observed  $f$  value for the population regression coefficient for the treatment and control groups are 1.94 and 1.65 for MAT and SAS respectively. These were significant at .18 and .27 respectively and therefore not significant at .05 levels. In order to determine the extent of students' metacognitive self assessment acquisition and self-efficacy before and after treatment, the following decision rules were applied. Mean rating between the ranges of 0.50-1.49, 1.50-2.49, 2.50-3.49, 3.5-4.49 and 4.50-5.00 were interpreted as not at all, low extent, moderate extent, high extent and very high extent respectively. Also, Mean rating within the ranges of 20-29.9, 30-49.9, 50-69.9 70-80 were interpreted as strongly disagree, disagree, agree and strongly agree respectively.

### 3. Results

The results of the study are presented in the Tables as shown below:

**Research Question One:** To what extent is the secondary students' metacognitive self assessment skills acquisition dependent on instruction in metacognitive self assessment?

**Table 1: Mean Pretest and Posttest scores of treatment and control groups on SAS**

Groups	Pretest	Posttest	Mean gain score
Treatment Mean	1.46	4.42	2.96
N	97		
Std. Deviation	.48	.85	
Control Mean	1.07	1.38	0.31
N	97		
Std. Deviation	.68	.78	

Results in Table I show the pretest posttest mean ratings on the extent of metacognitive self assessment skills acquisition of the secondary students in the treatment and control groups. The students in the treatment group had pretest mean rating of 1.46 with a standard deviation of .48 and a posttest mean rating of 4.42 with a standard deviation of .85. The posttest mean rating indicate that the extent of acquisition of the skills was high. This is also shown by the pretest posttest mean gain of 2.96. Students in the control group had a pretest mean rating of 1.07 with a standard deviation of .68 and a posttest mean rating of 1.38 with a standard

deviation of .78. The pretest posttest mean gain was 0.31. These data show that the extent of acquisition of metacognitive self assessment skills was low for the control group. The low standard deviations for the treatment group and control group show that their ratings clustered closely around the mean.

**Research question two:** What is the difference in the Chemistry achievement of those exposed to self assessment strategy and those not exposed as measured by their mean scores on the Chemistry achievement scores?

**Table 1.2: Pretest, Posttest means Chemistry scores of treatment and control groups**

Groups	Pretest	Posttest	Mean gain score
Treatment Mean	14.96	43.43	28.57
N	97	97	
Std. Deviation	2.80	3.48	
Control Mean	15.60	24.22	8.62
N	95	95	
Std. Deviation	3.58	3.10	
Total Mean	15.14	33.93	17.79
N	192	192	
Std. Deviation	3.18	8.46	

Data on Table 2 indicate that the students in the treatment groups had a pretest mean score of 14.96 with a standard deviation of 2.80 and posttest mean score of 43.43 with a standard deviation of 3.48. Their pretest posttest mean gain score is 28.57. The students in the control group had a pretest mean score of 15.60 with a standard deviation of 3.58 and a posttest mean score of 24.22 with standard deviation of 3.10. Their pretest posttest mean gain score is 8.62. These results

indicate that the students in the treatment group benefited from the self assessment skills instruction as can be observed from their higher posttest achievement scores in the Chemistry achievement test.

**Research Question Three:** To what extent do the Chemistry achievement of males and females differ as a result of instruction in metacognitive self assessment strategy?

**Table 1.3: Posttest means and standard deviations of students on MAT (Treatment x Gender Levels)**

Groups	Gender	Pretest	Posttest	Mean gain score
Treatment	Male	43	43.44	3.94
	Female	54	43.42	3.10
Control	Male	48	24.98	3.52
	Female	47	23.45	2.38

Results on Table 4 indicate the posttest Chemistry mean scores of male and female students. Males in the treatment group had a posttest mean score of 43.44 with a standard deviation of 3.94, whereas the females in the group had a mean score 43.42 with a standard deviation of 3.10. The males in the control group had a posttest mean score of 24.98 with a standard deviation of 3.52 whereas the females in the group had a mean of 23.45 with a standard deviation of

2.38. The results show that both males and females in the treatment group outperformed the males and females in the control group in the Chemistry achievement test.

**Research Question Four:** What is the difference in the self-efficacy of students exposed to metacognitive self assessment strategy and those not exposed as measured by their mean scores on the Chemistry self-efficacy scale?

**Table 5: Pretest Posttest means scores and standard deviations of students on CSS**

Groups	Pretest	Posttest	Mean gain score
Treatment Mean	52.01	76.89	24.88
N	97	97	
Std. Deviation	11.05	12.96	
Control Mean	48.38	47.81	-.57
N	95	95	
Std. Deviation	3.78	4.02	
Total Mean	50.22	62.51	12.29
N	192	192	
Std. Deviation	8.47	17.46	

Result on Table 4 show that the students in the treatment group had pretest mean self-

efficacy score of 52.01 with a standard deviation of 11.05 and posttest mean self- efficacy score of

76.89 with a standard deviation of 12.96. For those in the control group, they had a pretest mean self-efficacy score of 48.38 with standard deviation of 3.78 and a posttest mean score of 47.81 with standard deviation of 4.02. The students in the treatment group had a pretest and posttest mean gain score of 24.88 indicating enhanced self-efficacy probably due to the treatment received

whereas those in the control group had pretest-posttest mean loss of -.57 suggesting a slight deterioration in their self-efficacy.

**Research Question five:** To what extent does the Chemistry self-efficacy of male and female students differ as a result of instruction in metacognitive self assessment strategy?

**Table 5: Posttest mean scores of male and female students in MSS (Treatment x Gender)**

Groups	Gender	Pretest	Posttest	Mean gain score
Treatment	Male	43	77.33	13.17
	Female	54	76.56	12.91
Control	Male	48	47.06	3.50
	Female	47	48.58	4.40

Results on Table 5 show the posttest self-efficacy mean ratings of males and females in the treatment and control groups. Males in the treatment group had the mean ratings of 77.33 with standard deviation of 13.17 whereas males in the control group had a mean of 47.06 with standard deviation of 3.50. Females in the treatment group had a mean of 76.56 with standard deviation of 12.91 whereas the females in the control group had a mean of 48.58 with standard deviation of

4.40. These results imply that both males and females in the treatment group experienced high self-efficacy at posttest stage whereas both males and females in the control group experienced lower self-efficacy at the posttest stage.

**Hypothesis One:** There is no significant difference in the mean Chemistry achievement scores of students exposed to metacognitive self assessment strategy and those not exposed.

**Table 6: Analysis of Covariance (ANCOVA) on students posttest achievement scores on CAT (treatment and gender)**

Source	Type III sum of squares	Df	Mean square	F	Sig
Correct Model	17779.578a	4	4444.894	415.722	.000
Intercept	8109.797	1	8109.797	756.493	.000
Pretest	9.003	1	9.003	.842	.360
Experimental	17340.873	1	17340.873	1621.857	.000*
Gender	24.797	1	24.797	2.319	.129**
Experimental x Gender	20.7313.043	1	20.731	1.939	.165**
Error	1999.401	187	10.692		
Total	240780.000	192			
Corrected Total	19778.979	191			

\*Significant at 0.05 levels \*\* Not Significant at 0.005 level of significant.

Data on Table 6 indicate that treatment as main factor has a significant effect on the students' Chemistry achievement. This is shown by the obtained f-value of 1621.857 which is significant at .000 and also significant at 0.05 levels. The null hypothesis of no significant difference in the mean achievement scores of the students in the treatment and control group is therefore rejected. In other words, there is significant difference in the mean scores the students in the two experimental groups as a result of instruction in self assessment skills.

**Hypothesis Two:** There is no significant effect of instruction in metacognitive self assessment strategy and gender on students' achievement in Chemistry.

Results on Table 6 also indicate that the interaction effect of instruction in metacognitive self assessment skills and no significant. This is shown by calculated f-value of 1.939 which is significant at .165 levels and therefore not significant at 0.05 levels. The null hypothesis of no significant interaction effect of instruction in self assessment skills and gender on students' Chemistry achievement is upheld. This suggests



that the effect of treatment on the students' achievement did not depend significantly on the gender of the students.

**Hypothesis three:** There is no significant difference in the mean self-efficacy scores of students exposed to instruction in metacognitive self assessment skills and those who were not exposed.

**Table 7: Analysis Covariance (ANCOVA) on students posttest Chemistry self-efficacy (Treatment x Gender)**

Source	Type III sum of squares	Df	Mean square	F	Sig
Correct Model	48605.196a	4	12151.299	235.299	.000
Intercept	51705.328	1	51705.328	1002.328	.000
Pretest	7932.279	1	7932.279	153.733	.000
Experimental	46553.556	1	46553.556	902.238	.000*
Gender	27.208	1	27.208	.527	.469**
Experimental x Gender	73.201	1	73.201	1.419	.235**
Error	9648.799	187	51.598		
Total	710250.000	192			
Corrected Total	58253.995	191			

Results on Table 7 reveal that treatment as main factor produced a significant effect on the students' Chemistry self-efficacy. This is indicated by the calculated f-value of 902.238 which is significant at .000 and also significant at 0.05 levels. This implies that instruction in self assessment skills significantly enhanced the Chemistry self-efficacy of the students. Consequently, the null hypothesis of no significant difference in the Chemistry self-efficacy of those in the treatment and control group is rejected. An alternate hypothesis of a significant difference in the Chemistry self-efficacy of the two groups is therefore, accepted.

**Hypothesis Four:** There is no significant interaction effect of instruction in metacognitive self assessment strategy and gender on students' Chemistry self- efficacy.

Results presented on Table 7 further show that there is no significant interaction effect of treatment and gender on the students' Chemistry self-efficacy. This is because the calculated f-value of 1.419 which is significant at .235 levels is not significant at 0.05 levels. The null hypothesis of no significant interaction effect of treatment and gender on the students' Chemistry self-efficacy is therefore accepted. This suggests that the effect of the treatment did not significantly depend on the gender of the students.

#### 4. Discussion

The results of this study have shown that instruction in metacognitive self assessment strategy enhanced the achievements of the students in Chemistry. Data on Table 6 indicate that the

students exposed to instruction in self assessment skills performed significantly better in the Chemistry achievement test than those in the control group. The non significant effect of the interaction of the instruction in self assessment strategy and gender further shows that acquisition of the skills in self assessment skills accounted for the better achievement of those in the treatment group. The findings of this study support the findings of related earlier studies by Kuiper (2002), Rolheiser and Ross (2002) and Rivers (2001). Their findings suggest that good learners engage in the process of assessing the quality of their work based on evidence and set criteria. They get involved in active self- appraisals and management of their thoughts. As they monitor their own learning, they learn to check their own responses and become aware of errors or answers that do not fit. Acquisition of the self assessment skills could have permitted the students to gain control of their learning activities and were therefore able to learn the processes in Chemistry problem solving.

Result in Table 6 also shows that gender is not a significant factor in the students' Chemistry achievement. This finding contradicts some earlier studies. For instance, Jahun and Momoh, (2001), and Usman and Uba,(2007) observed a significant difference in Chemistry achievement based on gender. However, the findings of the study by Olagunju (2001) support the non significant difference in Chemistry achievement reported in this study. The acquisition of self assessment strategy by both males and females in the treatment group could have removed gender related disadvantage in Chemistry learning. These skills in self assessment encourage self-regulated learning

and could have motivated both genders to actively participate in the Chemistry learning process.

The findings of the study showed that the interaction effect of instruction in self assessment skills and gender on students' mean achievement scores in Chemistry was not significant. The findings supported the results of a similar study by Eze (2003). In the study, Eze found no significant interaction effect between instruction in elaborative interrogation strategy and gender. In this study, the findings indicate that both gender benefited almost equally from the self assessment instruction. This implies that the contribution of gender to the effect of treatment on the dependent measures was not significant.

Results on Table 7 show that instruction in metacognitive self assessment strategy has a significant effect on the Chemistry self-efficacy of the secondary school students involved in the study. The students in the treatment group who received instruction in self assessment strategy had a significantly higher Chemistry self-efficacy than those in the control group. The findings of this study may be explained in line with the study of Zimmermann (1990, 2000), and Pajeres and Miller, (1994) which observed that learning skills acquisition enhances self-regulated learning behaviour which in turn ensures motivation and confidence as a learner engages in learning tasks. The confidence to approach learning in an independent manner which promotes the belief in one's ability to execute a given task may invariably lead to enhanced self-efficacy. It has been noted that learners who possess a repertoire of effective learning skills are more likely to be efficient learners who develop high self-efficacy. The instruction in self assessment could have been the reason for the higher self-efficacy demonstrated by those in the treatment condition.

Data on Table 7 also show that gender had no significant influence on the Chemistry self-efficacy of the secondary school students. The non significant difference on the Chemistry self-efficacy of the males and females especially in the treatment group would be attributed to the effectiveness of instruction in self assessment strategy which possibly equipped them with relevant learning skills that makes learning Chemistry appealing. When the relevant skills were mastered, it is possible that the male and female students saw Chemistry as a subject that can be learnt through systematic and sustained effort. The interaction effect of instruction in self assessment and gender on the Chemistry self-efficacy of the students was not significant. This supported the results of a similar study by Eze (2003) which found no

significant interaction effect between learning strategy instruction and gender on perceived self-efficacy. The findings of this study showed that both males and females benefited from the strategy instruction. In this study, evidence on Table 7 show that the contribution of the two genders on the effect of the self assessment instruction on the students Chemistry self efficacy was not significant.

## 5. Conclusions

The results of this study show that instruction in metacognitive self assessment strategy significantly improved the Chemistry achievement of secondary school students and also significantly enhanced their self-efficacy. This suggests the need for teachers to equip senior secondary school students with relevant self assessment skills effective for Chemistry learning. Such skills which have been observed to enhance confidence in task execution also improve their self-efficacy and keep them focused and concentrated on a given mathematical task. The result of the study further indicated that the difference in the mean Chemistry achievement scores and the mean Chemistry self-efficacy scores of male and female students exposed to the self assessment skills instruction were not significant. These indicate that both male and female students benefited from the self assessment instruction and as such both genders can explore the skills in self assessment to enhance their Chemistry achievement and self-efficacy.

## 6. Recommendations

Classroom teachers should therefore be equipped with self assessment strategy so that in the teaching learning process, they would be able to transfer these skills to the students who need them to pursue their own learning purposefully and independently. This will help the students who are deficient in some areas of Chemistry to acquire the necessary skills needed for efficient and effective learning of the subject.

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## Determinants Of Farm And Off –Farm Income Among Farmhouseholds In South East Nigeira

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**Abstract:** Agriculture has been considered as one of the important sectors that could help and improve the income distribution problem and its poverty implications in South Eastern Nigeria. This has led to the focus of this study on the determinants of the farm and off farm income among the farm households in South East Nigeria and Imo State in particular. Primary data were collected and ordinary least squared regression model was used to analyze the data collected. Results showed that: Farm size, age, education, occupation and hours spent on farm are important explanatory variables that influenced both farm and off farm incomes.

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**Keywords:** Determinants, Farm, Off-farm, Income, Diversification, Push factors

### Introduction

There has been substantial growth over the past decade in household employment outside own farming (Ibekwe, 2001, Nwaru, 2007). At present, due to the increasing share of off-farm incomes, they cannot be considered as marginal (Ibekwe, 2001). Economies in transition are gradually shifting toward a market economy and this shift has been driven in part by push and pulls factors. Though many farm households do not produce for the market and therefore cannot enjoy the benefits of the market economy evidence suggest that non farm activities in the non farm sector include, manufacturing and services both in self employment and wage employment and also in the agricultural sector wage employment.

Despite the growing importance of farm and of farm activities very little is known about the role they play in the income generation strategies of farm households in developing economies like Nigeria. This paper thus has two objectives. The first is to analyze the determinants of farm households in Imo state to undertake farm and non – farm activities. We postulate that the income from these activities will depend on the farm households, assets financial and human resources. The second objective is to explore the implications of income diversification strategies. It is important to note that promotion of non farm activity is not necessarily improvement in the income distribution unless specific policy interventions are provided.

The common view of the rural sector is that of a sector driven almost entirely by agriculture. Thus rural income is equated with farm income. Policy makers view policies to combat rural poverty as policies to enhance farm productivity (World Bank, 1996). Despite this narrow view, there is

growing evidence in the South Eastern Nigeria that rural sector is much more than farming (Nwaru, 2004) Reardon, et al (2007), summarized the evidence of the nature, importance, determinants and effects rural non farm activity on farm households in developing countries. They showed the growing importance of rural non farm activities which accounted for 25% of employment and as much as 40% of the incomes generated in rural Latin America. In the South Eastern Nigeria, there are two dominant occupations in the rural areas, viz, farm and non farm activities but there is not much research in the diversification and determinants of farm households' farm and off farm incomes.

### Materials and Methods

The study was carried out in Imo State, South East Nigeria. Imo State is divided into three agricultural zones namely, Okigwe, Orlu and Owerri Zones. Imo State has a high atmospheric temperature which varies slightly within the year. The mean daily maximum temperature is about 30°C with the highest temperature recorded between February and April (AISAN, 1984). The mean annual rainfall ranges from 2, 400mm in the South to about 1,900mm in the North.

A multi stage random sampling technique was used in the study. The survey consists of the three agricultural zones in Imo State. A list of local government Areas in the three agricultural zones was compiled. From this list of Local Government Areas a list of farm households was made for each Local Government Area. From this list of farm households compiled which has 100 farm households for each Local Government Area, 30 farm households were randomly selected for Orlu and Owerri agricultural Zones while 40 farm households were also randomly

selected for Okigwe agricultural zone due to large number of farm households and farming activities in Okigwe agricultural zone. This gave a sample size of 100 farm households as respondents.

Information gathered included that on self employment, wage employment, farm and off farm activities that do not generate wage or salary earnings, non farm income outside own farming activities among others. Data collected were analyzed using descriptive statistics and ordinary least squared (OLS) method of regression for non farm incomes. The implicit model of the regression is as follows,

$$Y = f (X_1, X_2, X_3, X_4, X_5, X_6, X_7, e)$$

Where;

Y	=	Total farm income or total non – farm income (in Naira)
X <sub>1</sub>	=	Age of household head (years)
X <sub>2</sub>	=	Number of years spent in school (years)
X <sub>3</sub>	=	Farm size (in hectares)
X <sub>4</sub>	=	Occupation (Dummy: 1 for full time farming and 0 for otherwise)
X <sub>5</sub>	=	Household size (Number of persons)
X <sub>6</sub>	=	Farm Investment (in Naira)
X <sub>7</sub>	=	Number of hours spent on farm (hours)
e	=	Stochastic error term.

Different functional forms were tested and the lead equation which is double–log function was selected on the basis of F-ratio, t-ratios, number of statistically significant exogenous variables and a-priori expectations.

### Results and Discussion

The aggregate household income estimated in the study area was N216, 319.17 for farm income and N153, 428.24 for off-farm income. The total household farm income was found to be N369, 737. 41. This result is similar to that estimated by Ibekwe (2001). The result showed that farm income was 58.50 percent of total farm household income while non-farm income was 41.50% of the total farm household income. This shows that farm income was the most important source of income for the farm household income. However, the fact that off-farm income forms 41.50 percent of farm households income was an evidence of the growing importance of off-farm income in the study area. This has implication for viewing the role of non farm incomes as complementary by policy makers.

This result is similar to that of Reardon et al (1998) which noted that some households are “pushed” to diversify their activities to non farm sector to cope with external shocks to their farming activities. This is because It often pays more than farming and generates cash. The estimated farm and non farm income function are presented in table 1.

**Table 1: Estimated farm and off –farm income functions**

Variables	Farm income	Off-farm income
Intercept	-945584	-1628230.0
Age of Household head (X <sub>1</sub> )	-0.0641* (0.0209)	-0.0616* (0.0267)
Education of household head (x <sub>2</sub> )	0.8190 * (0.0227)	0.0749 * (0.0261)
Farm size (x <sub>3</sub> )	0.1737 * (0.0413)	-0.0143 * (0.0069)
Occupation (X <sub>4</sub> )	0.0552 * (0.0169)	-0.0106 * (0.0413)
House hold size (x <sub>5</sub> )	0.0917 * (0.0308)	-0.0521 (0.0473)
Farm investment (X <sub>6</sub> )	0.0655 (0.0591)	-0.0748 (0.0667)
Value of farm out put	0.0914 * (0.0297)	-0.0054 * (0.0197)
<b>R<sup>2</sup></b>	<b>0.7244 15</b>	<b>0.7853</b>
<b>F – ratio</b>	<b>7705 *</b>	<b>21.4545*</b>

Source: Field Survey Data, 2009

\* = Significant at 5%

Figures in parenthesis are standard errors

### Estimated Farm Income Function

The F-ratio was statistically significant at 5 percent level of significance which was the level chosen for this study. This implies that the estimated farm income function was adequate for use in prediction and analysis. The  $R^2$  implied that 72 percent of the variation in farm income was explained by the independent variables.

Land was a very important resource in the study area. Due to the fragmented nature of farm holdings, an increase in farm size in form of land consolidations will increase farm income through better economies of Scale (Ibekwe, 2001; Nwaru, 2004). The small size of farm holdings has been one of the factors that are driving people out of farm business and has been regarded by many authors as one of the push factors (Readon, et al, 1998). Education was significant and positively correlated with farm income. This conforms to Alimba (1995). Education and training produce a labour force that is skilled. Unskilled agricultural wage labour is supplied by rural households. This has implication for poor wages and low income.

The age of household head was significant and negatively correlated with farm income. This may be due to the fact that the older the farmer the less productive the farmers will be. This equally has implication for farm productivity. Occupation of household head was significant and positively correlated with farm household income. Variation in types of activities pursued by households has been shown to be related to the income level of the farm household (Ibekwe 2001). Hence non farm incomes are forms of diversification of incomes and insurance against risks of set back in farm income.

Farm household size was significant and correlated with farm income. This may be due to the fact that increase in farm household size means increase in family labour. This has implication for availability of labour during peak periods of farm activities. Farm investment is positively correlated with farm income and significant at five percent. Farm investment can lead to improve productivity through employment of modern farm technologies. The variable, hours spent on farm work was significant and positively correlated with farm income. This means that increased hours of farm work contributes to improved farm income due to hard and efficient work. This has implication for off farm activities (Alimba and Akubuilu, 2005)

### Estimated Off-farm Income Functions.

The F- ratio for off farm income was significant; the  $R^2$  was 0.7843 and also significant at five percent. This means that the regression equation

has correctly specified the non zero relationships in the specified off farm income model.

The age of household head was significant at five percent and also negatively correlated with off-farm incomes. This is in line with a-priori expectation since the older the farmer the more likely he is to receive lower income in the employment market outside the farm.

The parameter, education was significant and positively correlated with off farm income. Farm households with more education tend to pursue non-agricultural self employments such as handicrafts, commerce, tools, machinery repairs and agro processing (Lanjouw, 1999). Education and training produces a labour force that is mobilized, more skilled, prone to risk taking and adaptable to the needs of a changing economy (Eboh and Ocheoha, 2002). Farm size was negative and significant at five percent. This conforms to a priori expectation. Increase in off farm activities will definitely reduce income from farm activities. This has implication for diversification of resources from farm activities which in turn will lead to reduced farming scale and consequently reduced farm income.

Occupation is negatively correlated with off farm income. This may be due to the fact that off farm activities compete with farm activities in terms of household resources. Household size is not significant and it is also negatively correlated with farm household income. Also the parameter farm investment was not significant but was also negatively correlated with off-farm income. These are in line with a priori expectation as they play little or no role in off farm employment the variable hours spent on the farm was significant but negatively correlated with off farm income. This is also in line with a priori expectation as more hours spent on farm means less hours available for off farm employment and consequent income.

### CONCLUSION:

We have shown the importance of off farm activities in South East Nigeria. At present more than 40% of the income from farm households came from off farm activities, this suggests that the off farm activities should no longer be considered as "marginal" as they have so often by policy makers. The reasons to diversify income are various. Agricultural activities are the most important source of income among the farm households accounting for 58.50 percent of the total farm household income. Within this category the most important source of income is income from crops. Households also were engaged in many different activities in both farm and off farm.

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## 21 世纪新儒学---量子色动力学

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**摘要:** 21 世纪新儒学被徐光宪先生定格在 1959 年后的这 50 年, 让 21 世纪新儒学理科与文科交融叠加, 走进北京大学。也走进了上海, 走进了上海师范大学。

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**关键词:** 儒学 味夸克 夸克海

### 一、21 世纪新儒学初识

高国梁先生是北京一位 30 岁左右的年青学者, 学文的, 但对理科也感兴趣, 特别是对王锡玉老先生用周易、玄子物理等代替现代科学解释水变油核反应、宇宙暗物质、地震预报之类很推崇。他问笔者: 三旋理论类似现代几何科学方法, 和王锡玉老先生的理论区别在哪里? 能不能整合起来?

高国梁先生问出了 21 世纪之声。21 世纪已过去了 10 年, 中国有成千上亿像王锡玉、高国梁这样的老中青同胞, 不管是学理的还是学文的, 近 60 年来, 不辞辛劳, 像愚公移山一样追求基础科学的创新。应该说, 我们都是一个战壕的战友, 却分成相反方向在前进。原因是十年文革, 正是量子色动力学在国际上创建和巩固时期, 但我国大学和中学几乎停止公开招生, 我国失去的不仅是知识的增长, 而是和这一科学关口的碰撞。

层子模型应该说, 也是量子色动力学的先声, 但时代让我们高举的是斗争哲学, 国内科学共同体对西方 1963 年提出的夸克模型, 1964 年扩张的夸克颜色模型, 敢于说“不”。十年文革后虽说拨乱反正, 已追上了国际科学共同体的步伐。王锡玉老先生是上世纪 80 年代初气功和人体特异功能浪潮中, 我们就认识的学者。以此观察, 如果把从古到今, 人类科学共同体开拓的方向看成坐标, 在前面说的时代背景因素引导下, 王锡玉老先生无疑是开倒车的大能人, 三旋理论无疑是愚不可及开顺车的跋涉者, 两者的整合只能一条路: 与时俱进。

正是在这种强音下, 有人说: 利用我们的无产阶级专政的权威和民主集中制, 21 世纪的“新儒学”应该是: “对比百家, 独尊量子色动力学”。但正如中科院理论物理所著名超弦理论家朱传界研究

员, 在《写在“2006 年国际弦理论会议”前夜》的文章所说: 弦理论在中国, 在超弦的第一、第二次革命, 以及随后的快速发展中, 中国都未能在国际上起到应有的作用。我们在研究的整体水平上, 与国际、与周边国家如印度、日本、韩国, 甚至和我国台湾地区相比都有一定的差距。那为什么不高举弦理论而“独尊量子色动力学”呢?

因为我国并不急需要弦理论, 而是应该补课。只要量子色动力学的课补好了, 从王锡玉到弦理论都能整合起来, 而且弦理论也会有实验基础。

儒学的精神是整合, 但在 20 世纪的新儒学中, 并没有很好地理解。所以, 与时俱进和循规蹈矩是两派并存的。而 20 世纪, 科学是生产力, 已被邓小平等中国共产党人所认识。但 20 世纪的新儒学, 并没有认识到文科和理科整合的意义。新儒学大师一般以文科自居、自傲。甚至有人以各种美名, 挑动文科和理科之间的“战争”, 影响到下一代的培养。如有人说, 不少中国学生对“场”的理科概念: 梯度、旋度、散度, 只停留在定义式上, 应用尤其不熟练。中国学生虽然中学的代数运算技巧、三角变换技巧, 非常扎实。但留学国外, 让老外瞠目结舌的是, 对大学里的那些蕴含着大智慧的高等工具, 却有强烈排斥倾向。除了基本的微积分运算之外, 中国学生的数理思维能力, 还停留在中学巅峰时期的水平, 甚至还差些。

以“整合”代换斗争哲学, 例如汉朝董仲舒等以儒学整合经济, 有人说, 是他们看到中国虽然早有相当的城市化和商业市场、货币、手工业, 但汉朝当时为防止人民逃漏税, 政策允许密告的人, 可得到没收的财产中相当大的一部分, 因此全国到处都有人告密, 这样做便破坏了工商业的机制, 故生产的事业只好转入农村。但在农村生产, 工业产量并不大, 而且须要有集散物品机制功能的全国性经



济网络。因为农村工业产量不大，物品集散的机制可以形成全国性的经济网络。而儒学实用的爱人、秩序、宽信说教，正好得以整合和组织起全国为—的经济交换网，即使政治可分裂、内乱、割据、外族征服，经济网络可破裂，但时间都不会很长。因为区域与区域间的互相依赖，使得经济网络必须重新建立。又如以爱人、秩序、宽信等儒学整合文化，汉初各地精英经过察举制度，可汇集在中央。中央又有学校；学成后可回到各地教书。上层文化统一的功力，如董仲舒编的《春秋繁露》构建，规模之大，兼包自然与人事，如此这类成果构成了跨时代、跨地域的文化传播大格局。

儒学整合各种层面大系统，兼容并蓄，兼括并至，无所不包。各地不同的人群，也愿意留在这个大系统中，使得几千年来中国人，一直以儒学自居。21世纪，世界逐渐走到庞大的全球性格局，以中国儒学整合构建天下国家的经验，而非拒绝与对抗，人类恐需经历世界性的可能又是另外一个大的天下国家时代。如果我们能利用已有的无产阶级专政和民主集中制，“对比百家，独尊量子色动力学”，不是更好？那又什么是量子色动力学呢？

量子色动力学是把握世界，基本粒子并不基本，最能体现出理论、实验、实践、革命性的百家争鸣的学科，它有四大特点。有人把它简称为是，一种能管强相互作用的理论；有人把它简称为是，描述夸克之间通过交换胶子而相互作用的相对性量子场论；有人把它简称为是，描述色胶子场运动的理论，其中包括对色荷和色荷流（荷的流动）的响应。数学上看，色动力学是对电动力学的推广。由于量子理论在色动力学的的所有方面的所有应用都很重要，因此通常也称为量子色动力学。这些定义都对，但要更全面又简称，可定义为是有四大特点的一种能管强相互作用的理论，或者有四大特点的描述夸克之间通过交换胶子而相互作用的相对性量子场论，或者有四大特点的描述色胶子场运动的理论。这四大特点是：

#### 1、与时俱进和循规蹈矩，两派并存

弗兰克·维尔切克是2004年诺贝尔物理奖的得主，2010年4月湖南科技出版社出版他的《存在之轻》一书，介绍了他和夸克首创者、1969年诺贝尔物理奖的得主盖尔曼之间的分歧。在该书44页上，维尔切克说他第一次遇见盖尔曼就真切地感受到这一点。因为盖尔曼对维尔切克改进部分分子模型不以为然；维尔切克说盖尔曼，讽刺他的研究“是不要夸克了？”还说诺贝尔物理奖得主费曼的部分分子研究是笑话，是污染科学。也许正是这种分歧，影响到我国科学界的一些老一代科学家，如崔珺达教授著书讲，夸克实验遭到严重困难。层子模型依据的是哲学，而非物理实验；在1966年北京科学

讨论会上，层子科学家们说，层子在基本方面类似夸克，但夸克可能是不存在的。从而崔珺达教授反对夸克，也反对层子模型。

然而维尔切克喜新不厌旧，轻松摆平盖尔曼。他说：“盖尔曼和费曼都有正确的一面：质子内有夸克，也其他东西”。正是维尔切克的这种喜新不厌旧，继往开来，与时俱进，成为量子色动力学的一大特色，也成为21世纪的新儒学的一大特色。

那么中国“兵败”层子模型吗？中科院光电所周天龙高工，2001年在《科学中国人》优秀论文选（2）等上发表《电子模型》，声称质子由919个正电子和918个负电子组成，是原始科学创新，可以解决物理学前沿很多难题。电子模型要挑战夸克模型，电子模型可获得诺贝尔物理学奖。中国崔珺达--周天龙现象有多少？互联网论坛打开就可知。当然层子科学家们，大多数现在已经承认夸克，且很多层子科学家也在研究弦理论。中国科学家为主，完成在北京正负电子对撞机上进行的北京谱仪实验，观测到的命名为“X—一八三五”等新粒子，在国际知名期刊《物理评论快报》等上发表，并引起国际高能物理界的极大兴趣。因为“X—一八三五”粒子可能是胶子球或常规介子等。三旋理论是中国本土量子色动力学的多年自主的业余科学研究，中国科学院学部联合办公室、中国工程院学部办公室等主办的《世界科技研究与发展》双月刊，1999年第6期发表《三旋理论展望》的长篇综述探索报告，这些都是值得肯定的。

但由于量子色动力学与时俱进和循规蹈矩解释，两派并存，影响到了国内教学、出版、科普等对量子色动力学的完整介绍，出于稳妥或保守起见，一般只偏重循规蹈矩的解释。

#### 2、变革质子不变，是扩张变革原子不变

如果变革分子、原子后，仍然是分子、原子，并属化学能、电能、核能、机械能；那么变革质子、电子后，仍然属质子、电子，就归“量子色动能”。从量子色动力学结构信息提取的量子色动能，效率是高于从量子电动力学等结构信息提取的化学能、电能、核能、机械能。其原理类似把原子激光理论的有粒子数反转与无粒子数反转，扩张到电子、质子内部，量子色动能也可称为“量子色动激光器”、“量子色动化学”、“量子色动几何”、“真空能”。马成金先生发现以钾、钠元素配置的引发剂土“夸克球”加水，发现的也许是这种可控的量子色动激光器。核能不管是裂变还是聚变，还是属于相对论性量子场论和量子电动力学、电动力学的范畴。它是原子电子能级和核子的跃迁。大型正负电子、质子对撞机，及其“软”辐射、“硬”辐射，是电子、质子内部的粒子能级跃迁。从“软”辐射、“硬”辐射发现的其内产生的各种“色荷云”，解释钾、

钠元素配置的引发剂土“夸克球”的超能反应，探索的“量子色动能”，“弱力能源”等问题，研究操纵的是 21 世纪量子色动力学大潮的去核化、去石油化的能源走向。例如以钾、钠元素配置的引发剂土“夸克球”不加油，可以使水循环流动喷燃，这里量子色动能发出的 16400 大卡的高热值（添加剂除外），不是加碳的直接原因。

### 3、广义色荷，纠缠环圈及多重自旋编码

三旋理论计算非常复杂，但有两种简便处理方法。一是“李后强方法”。这类从数学上描述大分子的空间构象---类似酶和蛋白质的大分子链，无论链线弯曲、封闭等类似丝卷的无规行走，或“树近似”的凝胶渗流等，如能找出局部链节或链段聚合标度，以此形态和整链形态缩影作比较判断，可分为线型链、支化链和网状链等具有明显的简单的分形特征。类此具体联系类圈体自旋：如一个物体作平动，取其一标记点的轨迹，可以看成一条流线，用这种思想处理类圈体三旋的 62 种自旋状态，李后强教授的大分子链无论链线弯曲、封闭等类似丝卷的无规行走，或“树近似”的凝胶渗流等分形特征分类标记，就能扩张进来。

二是“杨振宁方法”。杨振宁的规范场，是把球面自旋扩张为相因子和广义电荷，最后自旋各态，变成了虚拟的粒子加进计算。学杨振宁方法，类圈体三旋的 62 种自旋状态，既可以编码各种味夸克、色夸克，也能变成虚拟的粒子加进计算。量子色动力学广义色荷，纠缠环圈及多重自旋编码，这也类似 21 世纪的新以太论。因为维尔切克说，量子维度上的运动所带来的变化不是位移，即这里没有距离的概念，而它是自旋的变化。这种“超速度平移”，将给定内在自旋的粒子变成不同的粒子。量子中国始末是以物质无限可分扩张“一尺之捶，日取其半，万世不竭”开始，到庞加莱猜想证明应用结束，半个世纪以来，新中国官民结合、军民结合，从一开始就一竿子到底揭示了超对称色动自旋之谜。这就是弦论走到了庞加莱猜想，庞加莱猜想正题是球面拓扑，逆题是环面拓扑，正对应弦论的开弦和闭弦的球量子数和圈量子数两种拓扑结构。而圈量子的自旋对称性是三种自旋，共 62 类自旋态。在希尔伯特时空点外、点内，这种量子维度被称为量子色动自旋，也叫三旋理论。

### 4、实践论和矛盾论分类学，全球启动

量子色动力学难的不是它的理论---交换信息，而是它的实验---结构信息。这里复杂的是，两个入射的夸克和反夸克，还可以通过交换胶子，变成另外一对夸克和反夸克。夸克和反夸克有 6 种不同的味，胶子有 8 种不同的色，6 种不同味的夸克和反夸克又各有 3 种不同的色。胶子对夸克的色荷可以简单响应，也可以兼具响应和变换。夸克和

胶子是质子内部的东西，用电子轰击质子，由于在不同尺度下量子力学不确定性的影响，超级闪光纳米显微镜抓拍到的就会有不同的细节，分辨率高，会发现似乎一个夸克解析成一个夸克和胶子，或者胶子分解成一个夸克和反夸克。分辨率不高，质子内的夸克和胶子的一些小实体或部分分子会模糊不清，虚粒子云包裹了每个部分分子。虚粒子云还有借助渐进自由有反屏蔽作用。这里实践论和矛盾论都有了分类学的水岭---矛盾就矛盾，有“拓扑斯”的专门逻辑描述；但最终还是要大型强子对撞机及其“喷注”和“碎片”现象的演示。如果建造大型正负电子对撞机，需要过 10 亿欧元，那么建造大型强子对撞机，就需要过 100 亿欧元，这必须全球启动众多的科技强国和大国来出钱、出高端科学家和成千上万大型的电脑及网络，才能完成。这类似又进入一个“平天下”的新时代。

## 二、循规蹈矩量子色动力学解释

### 1、量子/色/动力学

夸克是带有色荷的，胶子场是夸克间发生相互作用的媒介。这让人想起电子是带有电荷的，传递电子间相互作用的媒介是电磁场（光子场）。关于电荷的动力学早已有了量子电动力学，它发展于上世纪三四十年代。以它为例来理解质子内的色相互作用。电磁场的麦克斯韦方程的量子化。就是量子电动力学。如果说，量子电动力学是研究电子和光子的量子碰撞（即散射）；那么，量子色动力学就是研究质子内夸克和胶子的量子碰撞。

胶子是色场的量子，就象光子是电磁场的量子。胶子质量一半为 0，光子质量都为 0，但它们自旋都为 1，是传递相互作用的媒介粒子，都属于规范粒子。两个电子发生相互作用，是靠传递一个虚光子而发生的。强子夸克模型，所有的重子都由 3 个夸克组成，所有介子都由一对正反夸克组成。为与泡利不相容原理一致，重子内的 3 个夸克，分别处于不同的状态。

夸克和电子内部，存在一种新的自由度，夸克和电子分处于该自由度的不同状态。电子内部的弦论是磁单极子弦图像，这不说。而重子作为整体，并不显示这种内部自由度的性质。这种情形，与颜色的情形十分相似---红、蓝、绿 3 原色，组合为无色；一种颜色和它的互补色，组合为无色。把强子的这种内部自由度，称为色自由度，夸克具有色荷，但电子没有。夸克和反夸克的色是互补的，3 种不同色荷的夸克，组成的重子是无色的，正反夸克组成的介子，也是无色的。循规蹈矩量子色动力学的特点是：

1) 渐进自由。是说当传递的能量、动量非常大时，强相互作用就减弱到渐进于没有强相互作用

的自由状态。这是强相互作用类似宇宙的高能量状态，在低温下的一种表现。

2) 色禁闭，在实验中，人们不能见到自由的夸克和胶子。因为理论把  $SU(2) \times U(1)$  弱电统一理论和  $SU(3)$  量子色动力学组合起来，就是  $SU(3) \times SU(2) \times U(1)$  标准模型，但它不是统一的模型。因为它含有三个相互独立的耦合常数，还有一些参数要通过实验来规定。电子以极大的能量深入到质子内部时，遭遇到的不是“软”的质子靶，而是和电子类似的点状“硬”核。比约肯提出的标度无关性，能解释强子深度非弹性散射的异常现象、喷注现象以及夸克的色禁闭问题。

## 2、循规蹈矩量子色动力学的历史与人物

1975年，H·乔基和格拉肖提出  $SU(5)$  大统一理论，统一描述了弱、电磁、强相互作用，耦合常数为一个。 $SU(5)$  有 24 个规范场，即 8 个胶子场，3 个中间玻色子场，1 个光子场，多的 12 个 X 和 Y 规范场有待证明。并由此推出，质子会衰变成介子和轻子，并计算出质子寿命小于一万四千亿亿年，可实验证明大于三万三千亿亿年，没有得到社会的承认。

1) 1954年，杨振宁和他的合作者米尔斯，将对易的  $U(1)$  规范群对称性定域化方法，推广到非对易的  $SU(2)$  规范对称性，建立了定域化的杨-米尔斯规范场理论。如把颜色自由度的  $SU(3)$  非对易规范对称性定域化，也可得到与颜色  $SU(3)$  联系在一起的杨-米尔斯场。这就称为色动力学。杨-米尔斯非对易规范场，包含的规范场粒子，如色动力学中的胶子，具有自相互作用和理论的可重整化性。计算中的高能无穷发散总能，被重整化到几个实验观测中去；而会得到与实验符合的结果。

2) 20世纪60年代中期，在量子色动力学建立之前，著名物理学家比约肯猜测到高能轻子散射下，会出现标度不变，便被美国斯坦福电子加速器中心 (SLAC) 的电子在核子上深度非弹性实验证实。这种标度不变是在核子中的成分自由运动的暗示。这是量子色动力学渐近自由的先期的实验暗示。

3) 20世纪70年代中期，高能物理学家们发现很难用当时流行的散射矩阵模型来解释深度非弹性散射实验数据，费曼由此提出了部分子模型。但问题的真正解决要等到渐进自由的发现。三位理论物理学家格罗斯、维尔切克和玻利泽的计算，表明夸克相互作用强度随能标的增加而减弱，这种奇特的现象解释了在实验数据中发现的标度率。因此，在高能下相互可以用微扰方法来很好地处理。但是在低能下相互作用强度很强，微扰方法就失效了。

至今量子色动力学仍然是一个没有被完全解决的问题。

4) 20世纪60年代中期，我们国内科学家是率先把夸克作为实体来看待的，并建议用层子代替夸克，称这物体最小单元，可惜层子这一名称，没有在这个世界上流行开来。而那时认识夸克，除了具有自旋、电荷等量子数，还具有所谓的味道。至今已经发现的夸克有  $u, d, s, c, b, t$  六种味道。实际上开始时所认识的三种味道的夸克，是其中的  $u, d, s$ 。它们的质量小，现代被称为轻夸克。夸克的反粒子，被称为反夸克。每种味道的夸克，都有对应的反夸克。反夸克的量子数全部是反的。夸克是物质结构向小尺度方向探讨。

5) 1964年，格林伯格引入了夸克的“颜色”概念——三个夸克全同，那就给它们来个编号或着上“颜色”(红、黄、蓝)，从而不再违反泡利原理了。这样一来，每味夸克就有三种颜色，夸克的种类一下子由原来的6种扩展到18种，再加上它们的反粒子，那么自然界一共有36种夸克，它们和轻子(如电子、 $\mu$ 子、 $\tau$ 子及其相应的中微子)、规范粒子(如光子、三个传递控制夸克轻子衰变的弱相互作用的中间玻色子、八个传递强(色)相互作用的胶子)一起组成了61种自旋态世界。加上希格斯质量粒子，就是62种自旋态世界，这得到了不少实验的支持，并发展成量子色动力学。

6) 20世纪90年代中期，塞伯和威滕用他们发展的四维空间量子场论，证明磁单极凝聚也会导致夸克幽禁。夸克幽禁口袋模型，实际可看成截面是圈态，再把圈态作自旋，如作体旋的结果。圈态收缩是圈线，这和弦理论有联系。如夸克，被认为绑在弦的两端，而这条弦却难以断裂。即使一旦断裂，断裂处生成一对正反夸克，原来的强子碎裂为两个新的强子，从而自由的夸克从来不可能出现。而既然胶子带色荷，胶子之间也会有色磁吸引力，从而色力线被拉紧呈平行状，就像一个带电电容器两板，因为有平行的电力线因而彼此有吸引一样，夸克之间也有类似这种吸引力——格点规范理论的面积定律，证明夸克之间有线性禁闭势存在。李政道的截面真空色荷反屏蔽圈态模型，如作体旋，是口袋模型；再作截面是弦模型。

## 3、循规蹈矩量子色动力学与弦论图像。

弦论电磁场，电力线图像用力线描述。两个相反的色荷之间有力线相连接。弦论量子色动力学，力线不像两个相反电荷之间的电力线那样分散在空间，而是集中在两个色荷的连线上形成一根弦。如果把这种情况，与穿入第二类弦论超导体中的磁力线相比，这时磁力线受超导体的排斥而形成细管。弦论规范场力线的弦中，带有正比于弦的长度的能量，当两个色荷之间的距离增加趋于无穷时，弦所带的能量也将趋于无穷。在此以前弦可以断裂，产生一对

新的相反的电荷。每段弦的两端都有一对相反的色荷。无论是哪种情况，都不能把两个色荷分开到大的距离。因此这个图像给出了弦论色禁闭。

1) 对这个弦论图像的一个支持，来自格点规范理论。在格点规范理论中，连续的时空被离散的格点所代替。弦论规范场和与它作用的费密场，分别定义在联接相邻格点的线和格点本身所组成的点阵上。拉氏函数满足离散格点上的规范不变性。当两个格点间的距离  $a$  趋于零时，格点规范理论趋于连续时空的弦论规范理论。

与连续时空弦论规范理论的渐近自由相对应，在格点规范理论中，如果固定某个物理量的数值，则耦合常数  $g$  随格点间的距离  $a$  减小而减小。在  $a$  趋于零时，格点规范理论可以用弱耦合展开，它趋于连续理论的微扰论。在  $a$  大时， $g$  的值大。应当用强耦合展开，即展开成的幂级数。在强耦合极限下，可证明非交换群格点规范理论中，两个色荷之间的力线，聚集成弦，因而有色禁闭。

2) 为证明连续理论有色禁闭，还需要证明在耦合由强变弱时，色禁闭的性质不消失。在电子计算机上用蒙特-卡罗法，对格点数不多的点阵进行研究的结果表明，对于一段中间的  $g$  值计算结果，可以同时与色禁闭的弦和连续理论的渐近自由微扰展开式一致。这个结果支持连续时空的弦论规范理论，有色禁闭的性质。格点规范理论的研究没有发现在  $g$  变小的过程中，存在解除色禁闭的相变。虽然如此，连续时空弦论规范理论的色禁闭，还只是一种有某些根据的猜测，至于强子谱的研究更是处于开始的阶段。

3) 循规蹈矩量子色动力学与超对称大统一理论是，超对称认为在超对称变换中，把玻色场换成费米场，费米场换成玻色场，有一类场论体系能够保持不变。这类场论体系称为超对称场论体系，它还可以通过变换引进引力场。但困难有，在夸克以下，特别是引进引力子，还没有众多的观察现象来证明。超弦理论则认为，随着对粒子层次的深入，不应还把粒子看作一个数学上的点，而应看成长度大致为  $10^{-33}$  厘米的极短弦上各种振动的表现形式，然后用这种弦元素构造宇宙。

4) 循规蹈矩量子色动力学虽说能够预测质子和中子的质量。可是实际方程是非常令人困惑难解的。据 2010 年报道，一个欧洲的研究团队，现在介绍了用量子色动力学来计算粒子质量的最大型的计算努力，方法包括将空间与时间作为某四维晶格的一部分，其中的离散点，则沿着行列以一定的

间隔排列。他们解决了一些晶格，越来越精细的方程，并用它们的结果来推断与闭联集世界相关的解式。他们计算的质子、中子及其它“轻强子”（同时组成夸克的其它粒子，但它们的生命周期非常短暂）的质量，与通过实验所测得的质量相符合，证明了弦论标准模型，正确地描述了质子、中子及其它轻强子的质量的由来。因此它对可见宇宙（包括太阳、地球、我们自己以及所有我们周围的物体）质量的 99%，可进行预测。

夸克模型是基础，量子色动力学是继往开来。夸克模型是第一，量子色动力学是第二。杨振宁和李政道争第一，第二，整得冤冤不解。没意思。实际“谁笑在最后，谁笑得最好”，所以第一，强；第二，也雄。例如，盖尔曼是上世纪 50 年代的科学天才，维尔切克是上世纪 70 年代的科学天才。上世纪 50 年代 27 岁的盖尔曼，就成为美国加州理工学院教授。他凭着 50 年代的科学实验，1961 年预言的两个新粒子存在，3 年就被实验发现了。接着 1963 年他提出了夸克模型。10 年后，维尔切克还是大卫·格罗斯教授的一个研究生的时候，1973 年他就和格罗斯一起创立了夸克反屏蔽的“渐进理论”，成为量子色动力学的奠基人之一，也一起获得 2004 年的诺贝尔物理学奖。

格罗斯在理论物理，尤其是规范场、粒子物理和超弦理论等方面有一系列杰出的研究成果。他是杂化弦理论的发明人之一。1985 年当选为美国科学与艺术学院院士，1986 年当选美国国家科学院院士。2006 年当选国际弦理论会议主席。格罗斯的光辉也许盖过了维尔切克。但格罗斯的理论太超前，他的超弦理论、杂化弦理论发明，由于实验更难做，在我们国内更难普及。然而维尔切克轻松解释弦理论，说弦就是量子力学里的波函数，而且还把弦扩张成网格理论，成为 21 世纪新以太论的先声。这说明，在世界科学发现的竞争中，是继往开来，有第一，也有第二；第一是新发现，具备有价值，第二在此基础上的新发现，也具备有价值。

但类似刘武青等先生，他们作为业余学者，却相信科学发现只有第一，没有第二；只有第一才是新发现，才具备价值。这种观点来自哪里呢？除杨振宁和李政道外，也许还来自国内老一代科学家的误导。例如有人说，“1929 年年底，赵忠尧把论文交给了密立根。但两三个月过去了，密立根也没有发表任何意见。原因在于，这项实验结果让他感到很吃惊，也与他的预期不相符，他不太敢相信这一结果的正确性。赵忠尧有点急了，因为在科学发现的竞技场上，是只有第一没有第二的，科研成果披露的先后往往决定着—项研究的命运”。

然而事实是，法拉第发现电磁纠缠是第一，麦克斯韦以类似流体数学方程，释解电磁纠缠，预言

电磁波存在,成为第二。普朗克发明量子论是第一,爱因斯坦以解释光电效应,把量子粒子论扩张到微观的真实中,成为第二。玻尔、薛定谔、海森堡、狄拉克继续完善量子论,成为第三、第四。都在世界称雄。科学发现只有第一,没有第二的误导,使国内难出大师,也毒害了大批的“科学愤青”,他们把推翻前人的科学发现以抬高自己的创新,作为回应库恩科学革命范式不恰当的号角。当然,也事出有因。类似量子电动力学革命中的分裂,是爱因斯坦离开了量子革命阵营,钻进了统一场论的研究中。而量子色动力学革命中的分裂,是盖尔曼离开了超弦革命阵营,钻进了复杂系统论的研究中。

但作为旗帜,盖尔曼代表循规蹈矩量子色动力学,维尔切克代表与时俱进,两派会存在下去。而且反过来,已经影响到了我们国内的教学、出版、科普。例如类似大多数见诸文本的量子色动力学解释,说半个世纪多年的科学实践进展,已使强相互作用的研究,尤其是对量子色动力学(QCD)的研究,已经形成一个庞大的学科方向,或已成为一个单独的学科,即强子物理。但这只是人类对夸克之间的相互作用的确立,仅是由一种非阿贝尔群规范场论描写强子之间和原子核之间的相互作用。因此开展对QCD的理论研究和实验研究,只是导致对微观各种形态物质的基本构造有最终的理解和认识,只是能够利用QCD对大量的、丰富多彩的强子物理现象,从地球上的核物理现象到早期宇宙的物质形态,从物质微观结构到宇宙尺度的星系结构,有定量的理解和定量的预言,只是最终去发现和确立自然界的基本规律。

但是以上说法,有作茧自缚之嫌。因为从QCD导出的理论研究和实验研究,还可以对宏观化学能、电能、核能和机械能等工程理论和实验,进行的回采。并在宏观水平上提取量子色动能,和对医学、生物、生理等现象联系量子色动能,而成为对在我们面前仍有许多未能得到解决问题,甚至是一系列根本问题,求得解决的思路。

因此循规蹈矩的QCD介绍,就显得死气沉沉,好像QCD真和新儒学的复兴无关、无缘。这是不真实的。例如前面QCD循规蹈矩把散射实验中的夸克说得很有规律,实际并不是这样。例如除专门论述“量子夸克”的书籍外,很少有人提到“海夸克”,连维尔切克也是这样。因为这是结构信息,每次散射实验也许都不一样。海夸克是夸克海,即在显微镜下的图像,夸克沉浸在不断变化的低能胶子、夸克和反夸克的“海”中。质子内部存在大量的软夸克和软胶子,是QCD理论理解最艰难的问题。但循规蹈矩的QCD,却轻描淡写在教导我们。

### 三、21世纪新儒学何时走进孔

子学院

现在来说,为什么21世纪新儒学是量子色动力学?也许这里的疑问很多,如儒学是文科,量子色动力学是理科,难道文科和理科没有区别?儒学是中国人创建的,量子色动力学是外国人建立的,难道中国人做的学问要让外国来做?而且还要“对比百家,独尊量子色动力学”,这还了得?量子色动力学既然存在与时俱进与循规蹈矩两派,还能做“独尊”的科学?等等。要回答这些问题,首先要回答儒学的精神是什么?

1、我们今天说,儒学的精神是整合。量子色动力学也含有整合,两者是一脉相承的。

为什么呢?儒学之起源,史无定论,但儒学称为儒家学,起源于东周春秋时期,和法家、墨家、道家、阴阳家等诸子百家并列,是千真万确的。那时儒家虽然影响最大,但并没有形成汉代以来那么大的生产力。汉人与儒学难分难解,就在于从汉朝开始,儒家学整合政权、整合经济、整合文化、整合宗教、整合人伦、整合社会等,才有天下国家的意识、内涵。这要提到汉代董仲舒等人,向汉武帝提出“罢黜百家,独尊儒术”的主张,并能实行之,在以后世代立下许多汗马功劳,才真正有儒学之说的大地位,才成为中国文化之主脉的。

1) 以此分析20世纪的新儒学及其当前儒学发展的主要取向。

中国儒学,或说传统儒家思想,向近代转化,或说与近代西方文化连结、融通起来,有人说是从康有为开始的。康有为对孔教有一个全而简的说法:“孔子之道,其本在仁,其理在公,其法在平,其制在文,其体在各明名分,其用在与时进化。”他认为,“仁”以“通”为第一整合,而“通”的体现就是“平等”。这是康有为把儒家孔、孟思想与近代西方民主政治学说和哲学理论联系在一起的创新,虽然生搬硬套、牵强附会、幼稚可笑,但也不可否认,他读懂了“整合”中多少包含着某些为使传统儒学向现代转化的探索和努力。

20世纪20年代以后,由于清皇朝已被推翻。在西方文化冲击下,如何汇通儒学与西方文化,如何继承和发扬儒学的优秀传统,以保持民族的自主精神等问题,这时涌现出了以接续儒学道统为己任,以服膺宋明儒家心性之学为主要特征,会通西学,谋求儒学现代化的一个思想流派,学界称之为现代新儒学。以梁漱溟、熊十力、牟宗山等人为代表的新儒家,形成了新陆王学(新心学)。以冯友兰为代表的新儒家,形成了新程朱学(新理学)。梁漱溟尊孔崇儒于中西印三种文化形态中,断言调和持中的儒家文化最有前途。冯友兰则以实际实

际两世界构筑庞大的新理学体系。但他们的整合都是有限的，并背离儒学“整合”大意，且遇上了中国革命走向社会主义趋势的硬道理。因为，孔子、孟子在修身与治国方面，提出的实践规范和原则，虽然都是很具体的，但同时又带有浓厚的理想主义成分，是更多地寄希望于人的本性的自觉。当代新儒家第二代、第三代的学者们，虽好似更会汇通中西文化，热爱中华传统文化，努力以现代精神诠释儒家思想理论，使之适应现代社会，其用心良苦，精神也实在令人钦佩，但大多数人也仍然是以文科来读儒学“整合”大意和中国趋势走向社会主义的硬道理的。

当然也有挺身而出，从理科转身文科来“整合”的旗手。如鲁迅和郭沫若先生。鲁迅先生从医学转身文学，呼唤革命，拥护中国共产党。郭沫若先生从医学转身革命，参加了中国共产党。共产主义是一种政治信仰或社会状态。作为一种社会状态，与社会主义和资本主义等的区别在于共产主义社会的财富是按需分配的，每个人都尽其所能为社会作出贡献，而依照自己的需求索取。即共产主义社会是在高度发达的社会生产力的基础上，实行各尽所能、按需分配。而儒学的先驱在我国古代，设想的“大同”社会，就与共产主义社会有一定相似之处。为了这种“整合”，在上世纪最黑暗的40年代，郭沫若先生写了一本书叫“地下的笑声”，其中有一篇类似科幻小说的故事，写在上海文庙，孔子与马克思约会，两人在那里就“大同”社会与共产主义社会有一定相似之处，进行了讨论。但到1966年文革开始，郭沫若先生在《人民日报》公开宣布，他的类似东西应该通通烧毁。

笔者热读《马恩列斯论共产主义社会》一书还是在少年时代。1959年以后，那时毛泽东同志已经少提及《马恩列斯论共产主义社会》这本书了。但在家乡那个偏僻的农村，笔者却得到这本书，那是一个在外工作的叔父下放回农村，送给笔者父亲的。《马恩列斯论共产主义社会》由人民出版社于1958年8月正式出版，约17万字。1958年8月人民出版社第一版发行后，上海、沈阳、武汉、重庆等地先后重印，仅上海人民出版社于这年9月便印刷了20万册。有人说，编印这样一部书，明显与当时大跃进和人民公社化运动中，所设想的社会发展建设思路有关。这本书在当时的影响十分广泛。可惜的是，人民公社化运动这样的探索，实践已经证明是走了弯路。识字不多又老实巴交的父亲不会对这本书有兴趣，笔者却饿着肚子一字一句去读它。那时共产主义各尽所能、按需分配

的原则还被处于社会主义阶段实行的各尽所能、按劳分配原则所代替。

如果说，梁漱溟、熊十力、马一浮、钱穆、冯友兰、贺麟等他们，都在汇通中西方文化的前提下，来解释儒学，发展儒学，乃至建立起某种新的儒学体系。但都是重视文科。儒学当然世代扩张的也是文科。从文科的意义上来说，儒学提取的是一种精神力量，即一个国家，政权不变，人民不变，也能让它发挥更大的“能量”。即儒学及其儒学整合的本质是提取“能量”。这里有精神能量，相对必然就有物质能量。从大跃进和人民公社到改革开放以来，实践探索告诉我们，中国不变，人民不变，执政党不变，甚至一个单位、一个部门不变，只要与时俱进，生产力也会发生大变，释放出巨大的“能量”。

而就是在这近半个世纪里，量子色动力学已经诞生和成长起来。

如果说，人类提取的化学能、电能、核能、机械能，瞄准的是原子和原子核的不变与可变，那么由于核污染、核恐怖和石油的碳污染、高碳化，似乎变革原子和原子核的不变与可变已经走到尽头。而量子色动力学则昭示出，质子不变与可变的变革，可以提取更大的去核化、去石油化的能源，这就是量子色动能。共产主义各尽所能、按需分配的原则和量子色动能的对应，是关于“夸克球”的设想。据新华社1997年9月3日伦敦报导，欧洲核子研究中心的科学家提出“夸克球”的设想，认为若能制成此物质，可给人类提供巨大的能源。例如，我们中国类似首台核电蒸汽发生器那样，能自主研发、设计和制造成功量子色动能电百万千瓦级蒸汽发生器，并能形成批量生产量子色动能电站，及内部装的最为关键的量子色动激光器主设备那样的规模，各尽所能、按需分配向全球投入用于量子色动能电领域的产能扩建和技术提升，那么儒学的“平天下”，真的可以想象。即这里的“平”以是“和平”、“和谐”为第一要义，解说为“和平天下”、“和谐天下”，而不以“打”为第一要义。从这一点上联系儒学的精神是“整合”和儒学的本质是提取“能量”来说，量子色动力学如果来回在社会和质子变革求稳中，寻求启示和探索“整合”与提取“能量”，这正是21世纪新儒学量子色动力学，和旧儒学及20世纪新儒学的区别。

2) 人文儒学与理科儒学，类似“科学中国人”的语法之争。

人文与理科应用是有矛盾的。1981年，笔者调到刚恢复的盐亭县科协工作，8月初盐亭全县发生大水灾，很多地方的棉田被淹，县科协常务副主席梁明全和县农业局农艺师常俭朴同

志，写出抗灾保棉技术的科普材料，在县政协的支持下，县科协准备办一份铅印科普小报，该刊上正可发表此文。受广东杂志《科学广东人》专栏和《科学美国人》杂志刊名的影响，这份科普小报就以《科学盐亭人》的刊名向县委宣传部申报审批。县委宣传部同意后，《科学盐亭人》科普小报印出来了，在向灾区分发的过程中，县长兼科协主席的何惠同志才通知梁明全同志说不能发，说是县委常委会的决定。科协的同志感到莫名其妙。笔者与县委常委。组织部长杨尚礼同志察看灾情走在一起时，杨部长又问起这件事情，才知是县委统战部、办公室等几个老秘书、老大哥秘书，说《科学盐亭人》刊名语法都不通，发出去丢盐亭县的脸面，闹到县委常委会上去了。我们和这些老秘书、老大哥秘书都是熟人，平时对他们谈儒说圣都尊敬，不想他们逗硬起来不饶人。实际这事早有争论，科协的同志说：“科学盐亭人”是一种去“的”语法结构，如“红的花”，可以说成“红花”，类此，“科学盐亭人”就类似“学科学、用科学的盐亭人”，而且在《发刊词》也说了。他们不同意，说没有先例。科协又拿出广东杂志《科学广东人》专栏和《科学美国人》杂志给他们看，他们又说盐亭不是广东、美国，如要用去“的”结构，就到广东、美国去办！

县委宣传部办公室主任李芳同志，是县委书记李兴元同志的爱人，她通知县科协申报被审批后，他们就闹到县委书记李兴元和县长何惠同志那里去。他们人少能量大，为平息机关的争论，在县委常委会李兴元和何惠同志作出停发决定。事情了解清楚后，有人建议按儒学的“长幼有序”处理，老秘书、老大哥秘书在县委搞文字工作多年，是老师，是长者，我们尊重，科协同意不用此刊名。但应说明，“科学盐亭人”的刊名及里面内容，并没有政治错误，现在是大灾抗灾的非常时期，抗灾救灾比脸面重要，抗灾保棉技术等科普材料应该发下去。这样梁明全同志去找何惠同志谈后，何惠同志本身是科协主席，也感到有事他也应承担一定的责任，于是就向这几个老秘书、老大哥秘书作了解释：为抗灾救灾，这期创刊号还发出去，下不再用《科学盐亭人》刊名，“一河水”才消下去。上世纪末，国家《科学中国人》创刊，科协的同志立即给当时的主编写信，说明盐亭的这个情况，请他们也考虑类似这些老秘书、老大哥的意见。如果真要办，我们也表示祝贺。“科学中国人”毕竟长大了。

2) 徐光宪院士和《物质结构》一书的贡献。

三个夸克全同，来个编码或着上红、黄、蓝“颜色”就不全同，也不再违反泡利原理。化解人文与理科儒学联系的矛盾，最好是学量子色动力学。徐光宪院士的《物质结构》一书作出了启示。1959年该书要出版，庐山会议批彭德怀同志刚过，“物质无限可分”问题也许使徐先生好是很难。因为1953年，毛主席就谈过物质结构的问题。主席说：“墨子在公元前5世纪就提出‘端’是组成物质的最小成分，比外国人提得早。”主席还提及《庄子》一书中“一尺之棰，日取其半，万世不竭”这句话。

“物质无限可分说”的讨论，是把21世纪新儒学量子色动力学过早地落脚到了20世纪，也是把中国特色的量子色动力学和中国的传统文化联系起来。因为量子色动力学寻找微观与宏观之间“语言”不通的沟通，类似朗兰兹纲领预言数学某些表面上与毫不相干的领域之间可能存在的“语言”不通而能沟通的联系一样。徐先生的《物质结构》书第一章的绪论，绕不开这个问题。这又被转化为是一道语法难题：

A、按普朗克的量子论，“一尺之棰，日取其半，万世不竭”最后应该打“？””，即表示不可分。

B、但按当时社会的斗争形势，最后应该打“。””，即顺其意，表示物质是无限可分的。

C、如按薛定谔的“死猫活猫”量子论、玻尔的互补量子论，海森堡的测不准量子论，最后应该同时打“。？””。即类似“可分”和“不可分”的矛盾，可以同时并列在一个物质点。这是在“宇宙极问”中常遇到的拓扑斯逻辑问题。

量子色动力学可以用3种编码或对应红、黄、蓝3种“颜色”，也能表达一个物质点的不全同。但一个物质点不只3种编码。例如，笛卡尔的三个坐标还有3维编码。爱因斯坦的相对论加上时间，扩张为4维编码。杨振宁---米尔斯规范方程的广义电荷，正负又是两种编码。也许那时全国许多人文或理科的儒学家们，对“一尺之棰，日取其半，万世不竭”最后应该如何打标点的事情，与量子力学的编码联系，根本很少去想。一个物质点的多重编码或堆垒编码，是一个多重纠缠或堆垒纠缠的量子态问题，也类似21世纪新以太论，落脚到了20世纪，虽然希尔伯特空间早有很好的表述，但希尔伯特仅是一种数学语言，并没有提出物理语言。

应该说徐院士是精通当时的量子力学的，但徐院士更是一个聪明人。他一定知道量子纠缠，就有量子退相干。退相干是对量子态的一种测量。测量结果真实可靠，就没有正确与错误之分。如薛定谔的“死猫活猫”量子纠缠，退

相干一定是死猫或活猫，没有退相干再是“死猫活猫”纠缠的测量结果真实可靠。那么联系“一尺之棰，日取其半，万世不竭”的多重编码或堆垒编码纠缠的退相干，徐院士的老本行就是科学实验和科学测量的观察。这是理科的退相干，对文科的退相干是当时社会的实际，这无疑是“物质无限可分说”。所以徐院士避开了引用庄子的原话，而说是惠子讲的。且用白话文来解说，这是物质无限可分割的意思。

这样徐院士就避开了语法讨论难题，且一变双关。因为徐院士并没有丢掉一个物质点的多重编码或堆垒编码的暗示，他接着点到了墨子叫“端”的不能再可分的编码。这与普朗量子论中的“量子”，被认为是物质和能量不可再分的结构单元，是对应的。其次，也许会精通儒学经典或传统文化的人联系到惠子也有类似“点外无外，点内无内”不可分的话，而使“一尺之棰，日取其半，万世不竭”具有两种类似“可分”和“不可分”的矛盾，可以同时并列在一个物质点的拓扑逻辑里。这是徐院士的智慧，即使这也许只类似夸克编码或着色，是虚讨论。但徐院士有超前的科学思维，是不能否认的。即使当时徐先生并不知道后来盖尔曼的味夸克、夸克味；也不知道更后来维尔切克等渐进自由的色夸克、夸克色、海夸克、夸克海。

徐光宪院士《物质结构》一书一版再版，到1978年已是第7次再版，成为经典教科书的事实，说明理科退相干以实验事实说话。文科退相干以社会实际需求说话，是与时俱进的。所以1959年徐先生接下来，就能话锋一转，开始批判神权、统治阶级、唯心论对古代朴素的不可分的原子论的非难，和对辩证唯物主义关于物质与运动不可分割的攻击。从而也摆正和暗示了物质是无限可分论与当时社会实际的关系。但徐先生的这种把握，是有度的。例如除开“绪论”一章外，《物质结构》全书里面都是围绕当时已知的科学实验事实和成熟的数学运算，在讲解物质的结构的。这就很好解决了儒学理科和文科的分家问题，给21世纪中国新儒学量子色动力学的创立树立了一个好榜样。也指导了后来我国的层次模型研究。50年后的2009年，徐先生获得全国最高科技奖，是当之无愧的。

21世纪新儒学被徐光宪先生定格在1959年后的这50年，让21世纪新儒学理科与文科交融叠加，走进北京大学。也走进了上海，走进了上海师范大学。

## 2、从马成金定律到朗兰兹纲领

2009年1月，量子信息与健康上海论坛第二届大会在上海师范大学隆重召开。来自全国的代表，

医学领域的最多，并集中北京、上海、南京、深圳等发达地区。观他们带来和介绍的电磁波等高新信息医疗仪器设备，以及发表的学术论文，其高度没有超过量子电动力学、电动力学的范围。只有上海代表，原国防科工委新能源试验开发基地副总工程师、上海恒变新能源研究所所长许驭先生，他向大会代表们公开讲述他与王洪成的“水变油”技术研究联系的亲身经历，其高度涉及到了量子色动力学的一些内容。这和2010年6月《中国科技财富》和7月《中国科学》等杂志的长篇报道差不多。但正如《中国科学》介绍，此项“氧核冷裂变”新能源项目的核心技术对外还是保密的，“不能讲、不敢讲”。有人把这称为许驭“不能讲不敢讲定理”，或许驭定理。许驭先生的解释是：“在任何国家，无论国家拨款的原始创新，还是民间自发自费的千辛万苦原始创新，一旦事关国家兴衰成败，都会被列为国家级保密项目；自觉遵守国家保密法规并作出了重大贡献，国家绝对不会亏待个人；相反，如果在一定时期不谨慎造成泄密，除了给国家造成损失，个人的人身安全也无法得到保障”。科学有实验原则，还有保密原则，这是肯定的。如今天的原子弹。氢弹制造技术是保密的。但原子弹、氢弹的原理即使公布世界数十年，也不是哪个国家说制造就能制造的。这里有很多的技术细节也是关键。相反，原子弹、氢弹的原理的公布和大家继续探讨，也许在对和平利用核能的技术细节上，还有推动作用。于是在量子信息与健康上海论坛第二届大会上，马成金定律也同时被公布了。

马成金定律也被称为“水不变油”定律。马成金先生的解释是：在常温、常态和常规的化学操作下，不含相应的碳元素，纯水是不能变为汽油、柴油等油料物质的。相反，一大碗的纯水，只加极少量的食盐和金属钾配制的引发剂小颗药丸，水立即喷射出火花和白色的烟雾，很快满碗水都烧干。即水能燃烧。这是1984年马成金先生在四川盐亭县科协公开做的水“燃烧”喷射实验，盐亭县科协主席张应芄是主持人。由于实验具有爆炸性和有毒气体排放，县科协劝阻他不要做这种危险的实验。马成金先生说，水“燃烧”喷射药剂，主要是想献给国家造武器弹药。但正如严谷良先生对马成金说：“武器弹药用不着研究，国家有的是研制武器弹药的高级人才”。如得有关部门的允许和条件，马成金实验，任何大学或实验都能重复。

有人把马成金先生发现的以钾、钠元素配置的引发剂，称为土“夸克球”，或可控的“量子色动激光器”。有人把马成金先生比作中国的贝克勒尔。他们讲，19世纪末，如果说贝克勒尔对天然放射性物质铀盐的发现，掀开了20世纪原子物理学的序幕，那么20世纪末马成金的发现，是掀开21世纪



中国新儒学量子色动力学的序幕。因为马成金定律涉及的工作，虽然1993年《绵阳日报》有过披露，但解密钾、钠、氧、碳、氢元素之间的量子色动几何和量子色动化学原理，是在2009年量子信息与健康上海论坛上才开始逐步公开的。从马成金定律到许驭定理，2009年以后国内的互联网论坛和杂志，作了大量的报导。发表了如：《两大科学发现的引路人》、《氧核冷裂变----改变世界的新能源技术革命》、《评刘延勋水变油卡宾乃春猜想》、《许驭氧核裂变解密水不变油水燃烧》、《从比约肯到量子色动化学》、《费伦教授与量子色动化学》、《访问李新洲解读拓扑斯与朋远来》等大量文章。

贝克勒尔的铀盐，并不等于原子弹、氢弹的爆炸，也不等于原子核物理学、量子力学、量子动力学的诞生。贝克勒尔仅仅是发现了一种与它们有联系的自然放射性现象。同样，马成金配制的钾、钠元素土“夸克球”引发纯水的喷射燃烧，沾到一些类似“真空能”的边，但也并不等于大型强子对撞机、正负电子对撞机的碎片、喷注实验，也不等于量子色动力学、超弦理论。相反，马成金先生受王洪成“水变油”宣传的影响和吸引，后来更专注柴油掺水的乳油技术推广，并以自己中专水平的化学知识解释是联键剂的作用。21世纪的新儒学量子色动力学有中国人自己完成的部分，如与杨振宁、李政道、钱学森、华罗庚、陈省身、苏步青、丘成桐等科学家的科学成果或科学导向都有关。下面我们慢慢道来。

#### 1) 从刘月生定律到大型强子对撞机

文化部部长蔡武同志说：过去有些人否定传统文化，认为不科学、愚昧、落后，鼓吹洋的比中国的好，新的比旧的好，现代的比古代的好。这是一种民族虚无主义、数典忘祖。也一直有些人夜郎自大，认为中国传统文化是世界上最好的文化，具有无法比拟的优势和特点，搞“复古”。这是一种狭隘的民族主义、“国粹主义”。现在又有人搞实用主义，不分良莠、精华糟粕，只要有利可图，就打着保护、弘扬传统文化的旗号搞开发利用。这是对传统文化缺乏敬畏之心，浮躁、功利。第一种人鼓吹的“洋”，仍然是那些上了教科书、众人知晓的东西。第二种人更不用说了，如有人说：老子在两千多年前就发现了各种粒子它妈。靠什么？人体意识成像技术。这是研究人体和自然最尖端的最先进的“仪器”，一分钱都不用花。道的子孙永远不抛弃用道的规律探索宇宙，两千多年前就实现了现代化，还要求什么现代化？第三种人知道的实用东西，也和第一、第二种人差不多，是那些上了教科书或社会上众人知晓的国内外的东西。所以在“自创”和“无神”的召唤下，20世纪的儒学面临老、

中、青大量各种新论，挑战20世纪类似相对论、量子论、基因论等科学成就。

21世纪互联网普及后，这种“繁荣”与“钱学森之问”成为矛盾：中国老、中、青发新论的人，很多称自己是大师，可得诺贝尔奖，钱学森之问却说中国没有培养大量大师。刘月生定律解读了这项难题：“向西方传统科学真理观念的挑战，又要求得到本国西方传统科学权威人物的认同，才被社会认可。这本身就是一个悖论”。这三种人早在清朝洋务运动开始后，就有之。刘月生先生针对国内这三种人的新论，如何形成合力振兴中华，研究了半个多世纪。

刘月生安徽人，年少过继给腿残又无子的伯父。中学毕业他到北京求学水利电力科技，品学兼优。奇怪的是他家庭成份高，1957年的反右却是学校一名积极分子。毕业后他被分配到西北水利电力设计院，但他私下发现有人对他反右当积极分子有意见。刘月生先生为了寻找振兴中华提取合力的真理，1960年刘月生先生决然从理科转身文科，再报考新疆大学马列主义与哲学系，被录取进入深造，后成为新疆医科大学的教授。刘月生先生把马列主义、毛泽东思想与信息论结合研究，1989年他出版了《自然论纲》一书，提出了“结构信息”和“交换信息”两个概念。今天用查尔斯·塞费的《解码宇宙》一书来解释，交换信息就是“分开”的信息，类似量子信息论里的“退相干”。反过来，结构信息就是“叠加”的信息，类似多元一体或双重的“纠缠”。对刘月生的“结构信息”和“交换信息”概念，有个更经典的说法是，结构信息就是“实验”，交换信息就是“看书”。用此定义来解决他的刘月生定律悖论，无数中国老、中、青发的新论，之所以挑战求不到饱学西方传统科学权威人物的认同，不全是这些人脑子出了毛病，而是这些“新论”绝大多数是属于交换信息。即使他们做的实验，要不别人不能重复，要不是类似“许驭定理”拒人门外。结构信息在哪儿？

实验有实践的意思。毛主席在他的著名《实践论》中说：“你要知道梨子的滋味，你就得变革梨子，亲口吃一吃。你要知道原子的组成同性质，你就得实行物理学和化学的实验，变革原子的情况”。但今天变革原子的物理学和化学实践已经深入到变革质子。实验却从普通的化学实验到变革原子、质子的实验，都有一个特点：关注“喷注”和“碎片”，甚至所有的实践也是类似在关注“喷注”和“碎片”的广义行为。对于个人和少数集体来说，实验有近似各尽所能、按需分配的原则。那么有没有一种实验，它喷涌的原始数据流，需要全世界成千上万的电脑及网格，才能来分担这一负载；需要全世界成千上万掌握最高、最新、最尖端科技交换

信息的科学家,才能来分析、操作、计算、理解和制造呢?有。即有一种近似把全世界纳入各尽所能、按需分配的原则的实践和实验,那就是攻量量子色动力学的类似欧洲核子中心耗资100多亿欧元建成的大型强子对撞机(LHC)。因有我们中国科学家,在世界很多科技大国、强国中,我国也是参加国之一。

大型强子对撞机也有“许驭定理”,那就是LHC“幕后英雄”搞量子色动力学,他们打的是所谓找“上帝粒子”和暗物质是烟幕弹,保密的是寻找未来新能源,是找能继续取得全球人类通向未来道路的控制权,类似共产主义把全世界纳入各尽所能、按需分配原则的可控、可操作的工具或产品“夸克球”之一。爱因斯坦的相对论其实是一个“距离定理”,是说对同样一件事情,即使每个人的观察看起来相互矛盾,也不能说哪一个观测者的信息比别人更准确,或者不如别人的准确。即每个人的信息都同样准确。因为相对论本质也是信息论,它解释出现不同的原因是,真理如同光速肯定只有一个,但每个观测者之间有类似“距离”的差异。缩短这种认识“距离”,答案自然会一样。而人们往往把大家看得一般高,忽视了这种“距离”。

正是有这种“距离”,我国很多老、中、青发交换信息新论的人,骂LHC“幕后英雄”是“劳民伤财”。目前又在有意建造更大型的直线对撞设备,更是“劳民伤财”。其实,这是一种短视。因为不在这种“距离”上的人,他想搞LHC“劳民伤财”都不行?拿给他LHC“劳民伤财”都不行!我们13亿人中,就拿数千万的工程技术人员和高级学者,又有多少人懂得起量子色动力学高尖实践论?玩得转量子色动力学高尖实践论?所以实践论分类学是斤两计量器,一个人、一个单位,甚至一个团体、一个地域,有多少斤两?实践论分类学也能考量。而早在前苏联,斯大林同志认识到了这种“距离”。所以他才懂得起搞100万名数学家公务员这种秘密武器。西方的很多科技大国、强国“忘我之心不死”,近300年来一直在公开或秘密打造数学家公务员队伍。而近300年来蔡武同志说的那三种人,很多却一直侥幸在玩“一手硬一手软”的游戏---文科儒学硬,理科儒学软。无异于错上加错。

所以蔡武同志说:要以敬畏之心对待传统文化。我们认为,敬畏传统文化,就是要学习古人西汉大儒董仲舒等敢于“罢黜百家,独尊儒术”之心。董仲舒这里“独尊”的要义,是“第一”,反过来“罢黜”的要义,是“推后”,即儒术第一,法家、道家,第二、第三等等。例如在董仲舒的儒学中,不仅接受和发扬了荀子的礼法并重、刑德兼用,而且还有墨家的“兼爱”、“尚同”,乃至墨家的某些宗教色彩思想、阴阳家的阴阳五行学说等部分。但有

不少反对儒学的人,却抓住“独尊”、“罢黜”的表面字眼,把“独尊”说成是“独裁”,把“罢黜”说成是“打倒”。其实这是不对的。即使在今天,新华书店里连“厚黑学”的书籍也在大量出售。可知连“厚黑学”也并没有打倒,只是排在实用之后,而且历史上的统治者也是儒法并用,这也道出董仲舒等敢于“罢黜百家,独尊儒术”之心,是地道的儒学“排序”之意。21世纪的新儒学,提出“对比百家,独尊量子色动力学”,也是继承地道的儒学“排序”之意,只是把量子色动力学排在前面而已。现在来回顾刘月生先生近60年来的传奇,他完成了从中学到西学、从文科到理科、从革命到开放的21世纪新儒学框架的统一。

## 2) 从钱学森的人体科学到量子色动力学

如果说儒学的“独尊”之理,是从稳定中提取“能量”,那么钱学森同志的一生是20世纪到21世纪中,从中学到西学、从文科到理科、从革命到开放为国家、为人民探索提取“能量”作出巨大贡献和牺牲的英雄之一。2010年钱学森同志倒在癌症的病痛的噩耗传来,笔者搞到万分地沉痛。钱学森同志是倒在人类的人体科学到量子色动力学探索的路上的。

笔者1959年从课堂上老师以“一尺之棰,日取其半,万世不竭”讲解物质无限可分说,感到了有一种提取“能量”的方法魅力:从普通化学实验的“喷注”和“碎片”的特点出发,化学方程式两边的平衡,关注的是分子式里的元素不变。而元素的不变,本质是元素里的质子数不变。抓住这个主要矛盾,那么化学方程式里质子不变,但质子里的夸克味、味夸克、海夸克、夸克海,它们因反屏蔽形成的广义色荷云,会不会也类似大自然的气象云层有打雷、闪电。下雨的时候呢?唐孝威先生发现“硬”辐射,夸克、反夸克和胶子有“三喷注”的信息传回国内,那么质子里的“软”辐射色荷云像什么样?夸克、反夸克和胶子的“软”辐射“喷注”,与无机和有机的普通化学反应有没有互动作用?成为笔者计算的业余爱好。

因为真空的量子起伏、量子涨落,可以用卡西米尔效应的平板之间的吸引力来计量,人称“真空能”。平面几何和立体几何告诉我们,3个点可形成一个平面,8点可形成一个立方体。两个正三角形可形成一个六面体。立方体的平板卡西米尔效应比六面体的大。把这类“点”换成质子数,立方体变成了氧元素,六面体变成了碳元素。16个点可形成一个超立方体,对应元素是硫,在空气中可燃烧。12个点可形成两个六面体,对应元素是镁,在空气中可燃烧喷射。六面体加5个点可形成一个18面体,对应元素是钠,在纯水中可燃烧。19个点可形成一个立方体和一个18面体,对应元素是钾,在

纯水中可燃烧喷射。以元素内质子数不变的几何形状变化这种堆垒分析，倍感笔者最尊敬的人之一华罗庚先生的堆垒数论的亲切。华罗庚先生的第一部数学经典名著《堆垒素数论》，是众所周知的。堆垒数论又称加性数论，是关于所谓加性问题的一个数论分支。

扩张这种堆垒的原子核内质子几何堆垒的量子色动力学分析，称为量子色动几何。那么“软”辐射的广义色荷云，不造成总体流动太大变化来生产粒子---生产和重新分布广义色荷，同时不对总的能量和动量流产生大的干扰，假设能提取朝相反方向运动的能量的化学反应，称为量子色动激光器或反冲辐射真空能。这种弱力能源的分析，类似量子色动化学，可具体联系到水的氧中的质子色动几何，与钾、钠元素中的质子色动几何之间的虚粒子云的碎片、喷注干扰互动，通过精心安排的类似氢元素、碳元素中的质子色动几何卡西米尔效应，实现不造成总体流动太大的相变，可提取巨大能量的比例吗？联系人体内的水循环，与钾、钠离子及其细胞通道的观控相对界的生理作用，生命科学可产生钱学森先生说的人体科学的革命。

1979年著名的上海《自然杂志》2卷5期同时发表了李政道先生的《夸克模型---今日的粒子物理》和中科院上海原子核研究所顾涵森同志的《气功“外气”物质基础的研究---微粒流的初步实验结果》两篇重要论文，显示了国内与国外科学中国人之间的巨大认知差异。

2009年量子信息与健康上海论坛期间，笔者与魏瑚同志作过交谈。魏瑚同志是化学家，也是老革命家。上世纪60年代初，她作上海中医研究所所长时，就支持过所里科学家对朝鲜科学家金凤汉教授的“风汉管”和“金凤汉小体”经络发现进行验证。顾涵森同志作“外气”实验时，魏瑚同志是中科院上海原子核研究所的所长和书记，她又支持顾涵森做实验。但顾涵森同志的认识还停留电动力学或量子电动力学的高度。李政道先生的论文已经介绍了量子色动力学和他对夸克禁闭模型的一种新的反屏蔽解释，但顾涵森和以后其他的人体科学家，都没有把人体内的水循环与钾、钠离子及其通道观控相对界的量子色动化学，与李政道先生的量子色动力学联系起来。盐亭县科协叶眺新同志希望得到钱学森先生的干预，笔者也支持他给钱学森先生写信。

钱学森先生是很谦逊的人，对何祚庥先生十分尊重。1983年5月26日钱学森同志亲自给盐亭县科协和叶眺新同志回信：“我因不是搞理论物理的，对你的议论没有评论的能力，而中国科学院理论物理研究所副所长何祚庥同志是此道行家，又热心于自然辩证法的研究，所以将文章转他了。他会答复

你的”。何祚庥先生后来发起组织了“科学无神论”组织和“科学无神论网站”，也许2007年8月22日、12月7日、12月15日，算是等到了何先生支持的书面“回信”，因为在科学无神论网站和三思科学网站等发表的文章中说：在网上是公布了基本资料的，良忠先生12月3日写作了《难道又是娱乐大众的玩笑---评废除“伪科学”提法网络签名》，“这就构成《签名者简介》1.0不完全版”。其文章中说：叶眺新，“城隍庙的老主顾，伪科学思想家，或曰自然哲学家”。而据四川省科协副主席董仁威先生说，2003年何祚庥先生到四川成都，一次开会董先生与何先生在主席台并坐，董先生问何先生：“你知道三旋理论吗？”何祚庥先生回答说：“那是伪科学”，于是董仁威先生没有再问了。

我们对何祚庥先生是尊重的。也不会因何先生对三旋理论打压，就忘记了何先生一生中某些感人的地方：第一，钱学森先生归国，何先生受组织之令，南下深圳迎接，是有热情的。即钱先生也最早认识何先生。第二，何先生一生对爱因斯坦的相对论持基本肯定态度，至今没变。第三，何先生是最早向国家建议研制原子弹、氢弹的科学家之一。第四，虽然崔琦达教授是我们的朋友，我们仍支持何先生反崔教授的无夸克论，因为何先生是对的。第五，2004年维尔切克等因夸克的渐近自由获诺贝尔物理奖后，何先生反悔谈到曾被他们排斥过的刘耀阳教授，对层子也有类似的“颜色”分层的看法是对的。第五、何先生是最早提出质子等可分的“层子模型”的科学家之一，即使他反对唐孝威院士的质子可衰变论。等等。

何祚庥院士在科学殿堂不可动摇的理论物理学地位，在他身边的人没有不感到的。吴新忠博士是南京大学、浙江大学、武汉大学培养出来的高材生，又在上海交通大学任教，他据了解的情况劝笔者说，不要去惹何院士。意思是，惹何院士等于是撞刘月生定律。

刘月生定律实际等于实验最大定律。三旋理论有实验证明吗？你有做实验的条件吗？三旋理论的最终目的也是寻找从自然提取能量。文化大革命的十年，正是国外科技强国确立量子色动力学的十年，中国在这十年内大学和高中停止公开招考学生，损失的不是这种知识，而是对这种知识精神的认知。钱学森先生和何祚庥先生都是亲自为国家研制原子弹、氢弹和宇宙飞船的。我们把这类工程涉及到的科学知识称为“无神论”，是说这类工程都能用量子电动力学以下的科学知识解答，它们类似味夸克、夸克味，是循规蹈矩的；要提取的能量，已经是最大的能量，反过来说已经无能量再可提取了。而提出“层子模型”也是为把我国打造成最有科学长杆的国家，因为1966年的北京世界科学家

大会，“层子模型”被认为是比“夸克”更先进的理论。所以1969年“九大”召开，钱学森被选为中央候补委员，他在大会中发言，满怀热情地提出中国的科学“要准备留洋了”。当武汉高校的“九大”代表会后回校传达这个喜讯时，作为青年学生的笔者高兴得难于言表。也同钱先生一样对何祚庥先生充满厚望。

但钱先生和何先生研制原子弹、氢弹和宇宙飞船应该知道核污染，以及宇宙射线对人体的伤害。在原子弹、氢弹和宇宙飞船的科学知识外，有没有隐秩序？有没有再能提取的能源？钱学森先生十分关注国外科学强国的研究进展。随着量子色动力学的确立，量子力学中玻姆的隐秩序理论被翻了出来。而且此时“四人帮”的打倒，四川唐雨耳朵认字在全国引起争论，钱学森先生把玻姆的隐秩序理论和人体科学联系起来，希望从人体科学中提取不同于原子弹、氢弹和宇宙飞船知识的能量。正是在这种背景下，钱学森同志介入了人体科学。

钱学森把后半生的热情献给了人体科学，本想得到何祚庥这位最好朋友和同志的理论物理权威的支持，然而得到的却是反戈一击。何祚庥先生批判人体特异功能，应该说有些是对的。何祚庥先生应该说是懂量子色动力学，并且也在研究超弦理论。但量子色动力学被认为只是强相互作用理论，需要大型强子对撞机、正负电子对撞机做实验。而很多气功学者和气功师，以何先生层子自创为榜样，什么“太极子”、“玄子”等虚设粒子满天飞，而且有一些高层人生的支持，他们要求取得合法的地位。四川大学吴邦惠教授是核物理学家，她支持人体特异功能也仅限于量子电动力学以下的知识，就不说科学殿堂其他的专家了。何先生自然拒绝别人学自己。这里没有量子色动几何和量子色动化学的变通，是难于进入人体科学的。

科学是沿着科学第一者躺下的道路，继续前进，才有科学第二、第三，才有科学长杆的阶梯。而不是沿着科学第一者相反的方向打倒第一者前进，也不是只读第一者的原著，就能前进。例如盖尔曼是夸克创立的第一者，躺下了，维尔切克沿着夸克方向继续前进。杨振宁是量子电动力学创立的广义荷的第一者，躺下了，李政道沿着广义荷方向解读夸克禁闭色屏蔽继续前进。爱因斯坦是相对论创立的第一者，逝世了，朗道沿着电磁场和引力场理论的方向写出《场论》继续前进。中国在怒吼，但在科学只有第一没有第二的误导下，科学殿堂内外无数挑战爱因斯坦的人，只想打倒爱因斯坦，于是反复在他的原著上下功夫，并很少注意到朗道类似的第二、第三者，已经把原著不清楚的很多方面完善了。朗道20多年中，对研究生招收的考题类型都是公开的，但能做对的人并不多，只有十来个，

说明要理解前沿科学的难度，并非易事。诺贝尔奖是对活人授奖。朗道是遭车祸后，临死之前，诺贝尔奖评委们感到他对现代科学的一些巨大贡献，应该获得诺贝尔奖，不造成死后的遗憾，才在当年授奖的。说明朗道的世界影响之大，但打倒爱因斯坦的人，很少有去关注朗道的相对论。

如果说量子电动力学以下的科学知识是“无神论”，那么量子色动力学就类似“有神论”，因为它不但包含夸克、夸克味的合众逻辑，还包含海夸克、夸克海的不合众逻辑。这是对“矛盾论”分类学的提升。因为这类宇宙极问的有限和无限的并存，称为“拓扑斯”逻辑。说白了，就是可以用拓扑学的分类法给予解答。例如环面与球面的拓扑类型不同伦，球面代表要么有，要么无。环面是空心，代表有和无可以并存。而环圈的自旋，有62种不同的状态，球面却只有4种。环圈不同伦于球面，苏步青先生的《微分几何》、陈省身先生的《微分流形》、丘成桐先生的庞加莱猜想等研究都讲有，但在我国传授面不广。

钱学森的人体科学恰又遇到文革量子色动力学的断层。十年文革，筑起的这座大坝，怒吼的中国，不是冲开这座大坝，而是沿着大坝的上游汹涌。癌症虽然有多种原因，但与人的精神因素也有关。反击人体特异功能中的伪科学等类似大潮，有些“无神论”者把矛头直接指向钱学森同志，甚至胡说是“精神领袖”。这无疑给伤者心中埋下阴霾。钱学森同志躺在病床上，中央领导同志多次去看望他，说明国家是相信和理解钱学森同志的。

3、报兵败层子、人体科学之“仇”，不信东风唤不回

钱学森先生兵败人体科学吗？何祚庥先生兵败层子科学吗？不是这个问题，人体科学和层子科学都面临实验难题，甚至20世纪的旧儒学和新儒学也类似。实验的“分开”是交换信息，实验的“叠加”是结构信息。人体科学不是直接提取类似原子弹、氢弹和宇宙飞船那样大的能量。以空气动力学类比，如果原子弹、氢弹和宇宙飞船类似飞机、火箭、气球、孔明灯升空的原理，那么人体科学就类似风筝升空的原理，这是微不足道的。但这里有一个奇异地方是：同一风筝、同一人、同一地方、同一时段，每次把风筝放上天的情况都不一样，有时甚至还不能放上去。这是一种概率现象。这种概率现象与量子色动力学散射实验中的喷注、碎片反应不同一样，但总体概率仍是有规律可循的，这是比约肯等人已经证明了的。人体科学或特异功能，排斥魔术、作假，和能用原子弹、氢弹和宇宙飞船所属层次的科学知识解释的外，也许还有比较“神”的现象。例如1984年全国第二届气功学术讨论会上，笔者与谭燮尧、金福兴等代表亲自观看了浙江

东阳气功师李少标先生，通过运气，能使手指冒烟----水蒸气。联系马成金先生的钾钠元素引发剂与水超普通化学能反应的汽化现象，作的量子色动力学猜想，也许人体内水循环与钾、钠离子细胞通道的观控相对界李少标人体作用，是同一个层次的道理。现在我们把气流或空气比作“海夸克”，把风筝飞起来所标志的那股或那片气流比作“味夸克”或“部分子”，那么这里的“海夸克”、夸克海，与“味夸克”、夸克味，是不同的。原子弹、氢弹和宇宙飞船能上天，更多的是利用人工的“海夸克”、夸克海与“味夸克”、夸克味的功能，而风筝飞起来则更多的是利用自然的“海夸克”、夸克海与“味夸克”、夸克味的功能。即人体科学也许探讨的更多的是自然的“海夸克”、夸克海与“味夸克”、夸克味的功能，而不是提取人体中与原子弹、氢弹和宇宙飞船相比的那种微不足道的能量。即也许钱学森先生对人体科学的追求，是通过人体的这种量子色动力学现象，达到对中医以及整个医学、生物、生理等超出量子电动力学层次的结构信息与交换信息的了解。

1) 研究“海夸克”、夸克海与“味夸克”、夸克味的喷注、碎片实验，需要大型强子对撞机或正负电子对撞机。层子模型排斥冷战和意识形态的因素，“兵败”也许在于从“味夸克”、夸克味到“海夸克”、夸克海之间没有一个类似“朗兰兹纲领”的语言沟通。这种类似“朗兰兹纲领”的语言沟通，不是我国没有正负电子对撞机或正负电子对撞机还没有造起来，而是缺乏对层子的“无神论”（或确定论）和量子色动力学的“有神论”（或比约肯度）的整合。所以我国的层子科学、人体科学、20世纪的新儒学，都在呼唤与时俱进的量子色动力学手册大全或大全的量子色动力学手册----21世纪新儒学。

普通化学实验的“喷注”、“碎片”有一个特点，按化学反应方程式，投入的“碎片”，与产生的“碎片”、“喷注”，是确定性的。赞成和质疑王洪成水变油说法的人，基本上都是这样看的。只有马成金先生以实验证明常温条件下水不变油，但是他的钾、钠引发剂与水实验是不确定性的，表现出量子色动力学实验的比约肯度特色。1994年2月28日铁道部沈阳铁路局离休干部王锡玉先生的《关于王洪成水变油问题致中央领导的一封信》中说：“那些要求发明人只有交出配方和制剂并经过所谓严格的科学检验，然后才能予以科学上的承认和专利保护的做法，这对于一般的发明是适用的，但对于像王洪成这样的超越现代科学理论认识范畴的重大发明却是不尽适用的。因为，当代世界公认的科学理论还拿不出验证这项超越时代的发明的理论指导和检测手段”。王锡玉先生说，根据全新的基

础理论的分析，王洪成的这项发明已经解决了常温条件下的原子核的转变问题，它是将水分子中的氧原子的核外2个电子和核内2个正电子打掉后变成了碳的同位素C16，是一种核反应。建议由民间的中国玄子物理研究所出面，在无需王洪成交出“水变油”配方和制剂的前提下，先行组织国内科学界、企业界、和政界对“水变油”的真实性和实用性公开进行检测和确认。这是鬼话。

它虽代表了民间和官方很多不了解情况赞成的人的猜想。其实党和国家对王洪成水变油的说法非常重视，严谷良先生是一位核物理学家，曾代表高层专门负责王洪成实验。2009年3月7日下午和晚上，作为原国家物资部燃料司副司长的严谷良高工，从北京到盐亭县玉龙农机站站长马成金工程师家，严谷良先生讲述了此事的周折。王锡玉先生所谓关键无非是发明人没有交出配方。而代表国家的一些有关部门又急于争抢到这个配方，十年来采取了许多事与愿违的做法，根本不是事实。因为即使王洪成不交出配方，现代科学仪器，如质谱分析，只要有王洪成加了引发剂的水或他的配方药剂，也能知道王洪成配方所含的化学元素。严谷良司长领导下的科学家和实验专家小组，完全掌握了王洪成配方的成份和大致的剂量，但无数次实验表现出了不确定性的类似量子色动力学实验比约肯度的特色。严谷良先生虽然是毕业于清华大学核物理学专业的高材生，但十年文革的阻断，对量子色动力学实验也不熟悉。也许直到今天，清华大学核物理学专业的一般学生，也不会做量子色动力学实验。

严谷良先生亲自对笔者讲，王洪成配方的成份与马成金的引发剂大同小异。他不需要知道马成金的引发剂配方的成份，也不愿意讨论马成金引发剂的作用原理。由于马成金家没有金属钾材料，他也没带来金属钾材料，他只是来看看马成金先生。所以，如果民间的中国人的全新的基础理论，是玄子物理研究认定的那种核反应，那么即使具有高超协调能力的只有中专学历的张廷金医师，他带走了许驭“氧核冷裂变”水变油的材料跑到了美国，已被有关大学聘任为管理学博士、管理学教授；赚到技术入股的超额利润后，正在美国加州注册创办美国TCCAM医科大学；也不能纯水不加油，引发剂不

含碳元素，让常温下大量的水氧核冷裂变碳元素。如普通的碳元素都没有，又何来大量的碳的同位素？如说加油才能产生碳，是模版效应，这不是成了掩耳盗铃的“核反应”？但严谷良先生是承认王洪成的“水燃烧”引发剂，除开常规反应的化学能外，是可以概率性观察到额外的类似“量子色动能”的。

我们认为，这种“量子色动能”，是水中氧元素核中的质子量子色动几何结构，从正立方体到六面体的涨落起伏，释放出的虚粒子色荷云扰动能量，这与钾、钠离子核中质子内的“海夸克”、夸克海与“味夸克”、夸克味的色荷云扰动有关。

2) 儒学是文科，研究的是社会问题。观察“海夸克”、夸克海与“味夸克”、夸克味的色荷云扰动、喷注，是大型强子对撞机的事，我国没有大型强子对撞机，但也许 13 亿中国人民和新中国就类似一部大型强子对撞机，上世纪 60 年代，也许我们只能观察到“味夸克”、夸克味，或部分子。但在 21 世纪，我们已能观察到全部“海夸克”、夸克海与“味夸克”、夸克味的扰动和喷注了。上世纪 60 年代，也许我们还处在“量子电动社会学”的认识阶段，21 世纪的今天，也许我们能领略“量子色动社会学”的认识了。

这里的“喷注”、“碎片”和“海夸克”、夸克海与“味夸克”、夸克味，用“户口”、“单位”、“个体”和“籍贯”等类似来对应。上世纪 60 年代的大跃进、人民公社，农村大兵团作战，以“阶级斗争一抓就灵”作实践检验，确实也能释放出巨大的生产力，类似原子弹、氢弹和宇宙飞船那样大的能量。21 世纪的今天，国家没变、执政党没变、籍贯户口没变，允许成千上亿的农民自由出外打工，家乡的生产仍能推进，家庭的收入比上世纪 60 年代增加了近千倍，实践检验如量子色动力学大型强子对撞机释放出的巨大能量。上世纪 60 年代每个人所在的“户籍”、“单位”是确定的，像味夸克、价夸克一样。农民出外办事，可以流动，但要请假或要办证明，如果自发出外做小生意或打工，就是走资本主义道路，要严格打击。上世纪 80 年代中叶到 21 世纪初，为发展小城镇和城市建设，从乡、镇、县、市各级政府，先后都出台有政策，农村户口的人可以交不同数量的钱买乡、镇、县的城镇户口，叫做“农转非”。

2010 年 9 月 7 日下午 4 点左右，笔者在四川绵阳市红星街居委会看到一幕类似“量子色动社会”语言不能沟通的现象：红星街居委会书记不在，一位办事员的女同志一直为难一个叫李敏的打工的青年人。事情很简单，长虹厂要集资建房，在长虹厂打工十多年的工人，没有住房的可以申请竞争有限的一点名额，就发了一张表，要申请人的爱人对

方居委会盖章证明没有买过房，或单位没有优惠分过房。李敏是盐亭县麻秧乡的农民，上世纪 90 年代初高中毕业后到长虹厂打工，他的爱人魏红梅，是绵阳市游仙区魏城镇的农民，也在那时高中毕业后到长虹厂打工，并在长虹厂相识相爱接了婚。现在孩子已经八、九岁了，还在佬佬家上学。

李敏现不在长虹厂打工，是因中途厂里推销员要他一起到外地销售长虹彩电，但李敏的销售任务几个月都没完成，回去再当工人，需从新工人算起，而被迫离开长虹厂，到绵阳水务集团一个旧房水管改造承包老板下面打零工。李敏和魏红梅是在长虹厂外农村租房住。

那么李敏是如何跟红星街居委会发生关系的呢？上世纪 90 年代中叶，麻秧乡政府出文卖“农转非”户口，李敏的母亲为他买了一个麻秧乡城镇户口，后来又转成盐亭县里城镇户口。不久绵阳市政府出文，只交 6000 元入城费，在绵阳市里打工又有县上城镇户口的，可以转成绵阳市里的城市户口。李敏的母亲找到她读小学时的一位后来在红星街居委会居住的同学，叙述了自家的处境和绵阳市政府的政策，这位李敏母亲的同学是一位善良的人，也就同意把李敏的户口挂在自家的户口。这种情况在绵阳是很多的。

现在李敏和他母亲找到这位同学，这位同学的单位也很快盖章证明李敏没有买过房，该单位没有给李敏优惠分过房。证明拿到红星街居委会，办事员的女同志始终说，她了解李敏母亲的这位同学和单位，但她不了解李敏的情况，她怕负责。她只能在李敏母亲的这位同学的单位出具的证明上盖章，不能在长虹厂发的张表上要求居委会盖章的地方盖章。要盖章，等红星街居委会书记回来处理。因为她要李敏的单位再出证明和盖章，即要找绵阳水务集团出证明和盖章，李敏申诉，他是在绵阳水务集团下的老板的老板手下打零工，这种老板本身就是农村打工者的自愿组合，工作业务本身没有保障，所以不是正式单位，不像“味夸克、价夸克”，有章可循，而像“部分子”。但中国的社会学家，只有类似普通物理、普通化学一样是普通社会学家，全国没有一个“量子色动社会学家”。

是的，这位办事员的女同志，在马恩列斯毛的著作中，找不到李敏这种有单位又没有单位，有户口又没有户口的大规模“量子色动社会”现象论述，甚至在三代领导核心的著作，也找不到李敏这种有单位又没有单位，有户口又没有户口的大规模“量子色动社会”现象论述，21 世纪难道不呼唤 21 世纪的新儒学？据李敏说，他的孩子户口跟随他，也挂在她母亲的这位同学的户口上，但他的孩子不能在户口所在地的小学上学，因为学校还要求同时出具孩子父亲的房产证。没有房产证，要 8000 元的

建校费,才能读书。无奈,他只能把孩子放到离绵阳近的姥姥农村上学。在马恩列斯毛和三代领导核心的著作中,都能找到亲民爱民的论述,从毛泽东时代到邓小平时代,四项基本原则都没有变,实践证明都能提取巨大的能量。毛泽东时代的“味夸克、价夸克”,是党和政府的政策。邓小平时代的“海夸克、色夸克”,还是党和政府的政策,但类似“朗兰兹纲领”语言沟通的21世纪新儒学,还没有建立起来,也许连居委会的办事员也有招聘打工的,他们的心灵,有难言的许多“许驭定理”。

3) 湖南科技出版社2008年出版的英国著名科学彭罗斯的《通往实在之路》一书,类似一本“量子色动力学手册大全”。彭罗斯把自然科学的与时俱进或分类学,从古到今整理出32个知识阶梯---这是人类发展的科学长杆标尺。也许彭罗斯整理得还不完全,甚至有错的,但人们还可以继续完善和编写。所以,彭罗斯整理出的这32个知识阶梯,类似孔子写“春秋”,全世界的任何国家、任何大学、任何部门或任何个人,不分老中青搞的科学新论,都可以计量他们站的位置,看清是与时俱进还是逆潮流而动。但这还不是实验的检验。

在宏观和微观之间,宏观比微观的实验,相对容易观察一些,所以纳米技术成为宏观和微观之间过渡,最吃香的技术。其次,像基因理论,在它出现之前,最吃香的技术是观察细胞。但有了基因技术,很多宏观的生物、生理现象,现在单用细胞解释的就少多了,而用基因技术解释的,更能有效地说明问题。类此,如果21世纪新儒学能建立起来,能走进孔子学院----当然这里的孔子学院,也含广义的,如各种大学和研究部门,那么量子色动力学,也有如纳米技术和基因技术一样的平等意义。

例如彭罗斯的《通往实在之路》一书,最后归结的是超弦、圈量子、扭量等类似的理论。超弦是把球量子、环量子并列,这反映的是物质的一种存在。圈量子是坚持时空和物质起源的一元化。扭量是把“操作”引进到时空和物质起源的一元化中,解决了时空和物质起源多元一体的难题,登上了科学阶梯末级。彭罗斯的整理也许是对的,但超弦、圈量子、扭量等类似的理论,属于深层次的微观,很难实验检验。

从非常大的宇宙尺度来描述,到从极端微小的粒子物理尺度来描述,全能超弦、圈量子、扭量等在描述数十亿个不同星系和每个事物时,都要能互相圆融。研究人员至今连弦理论还未能验证。目前有人提到可以在实验室检验的预测,但也许仍是事实而非。例如英国理论物理学家迈克·杜夫提出,把黑洞和量子纠缠这两种宇宙中最奇怪的现象结合在一起,为在实验室里验证弦理论提供了可能。杜夫说,虽然在技术上,它的应用前景无法预料,

或者能用在与物理无关的领域,但这不仅是为了检验弦理论是科学家一直寻找的“终极理论”,它所揭示的弦理论作用机制,或许会告诉我们,世上各种离奇的巧合之间,都存在某种深奥隐蔽的联系。但众所周知,量子纠缠涉及量子自旋,目前量子自旋连是球量子还是环量子基本都没有统一,更不要说对环量子自旋朗兰兹纲领语言的旋束态三旋算法及量子计算的应用。

又如,美国物理学家格林斯丁教授的弦理论测试设定的范围,基于弦理论范本中包括的罗伦兹不变性、解析性和么正性等三个数学猜想。格林斯丁说:“如果测试没有找到弦理论预测的W玻色子散射情况,那就证明弦理论重要的数学猜想之一是错的。换一句话说就是,证明弦理论是不存在的。”但有人说,假如范围满足,他将仍然无法确知弦理论是正确的。只是假如不在范围之内,正如他所理解的,弦理论可能是错的,或至少弦理论必须以一种高非平凡方式来重新改造。这不等于格林斯丁在白说。况且,测试预测的W玻色子散射,也还是需要大型强子对撞机一类的设备。反对者反驳弦理论的,正是没有创造出能用实验方法验证的预测,而无法得到证实,或者根本就是错误的。况且,现在仍然没有任何粒子加速器,能够达到检测弦理论所需的高能。由于技术上的限制,直到今日弦理论的测试仍难以进行。

当然,由于人们没有完全理解弦理论,因此不能排除基于弦的各种可能模式。而大多数弦理论模式,都是基于确定的数学猜想,人们所需要说明的东西,就是此类弦理论有一些明确的预测,可以检测到。实际量子色动力学的实验,它一些明确的预测,可以检测到的,这就确立了它在从原子弹、氢弹和宇宙飞船等可行技术,到超弦、圈量子、扭量等不可行技术之间,有如纳米技术和基因技术一样平等意义的地位。例如,量子色动力学实验的碎片、喷注研究,可以肯定地说,只利用原子弹、氢弹和宇宙飞船等涉及的量子电动力学层次以下的知识,坐在屋里不要仪器提供的数据,没有公认的通用数学计算方法,能预报地震、雷电发生的准确地点、级别和时间,永远是胡说。地面的板块,天上的云层,可以看成量子色动力学中广义的碎片、喷注元素。地质板块之间发生地震,地面的地块与天上的云层之间发生雷电,现用原子弹、氢弹和宇宙飞船等涉及的量子电动力学层次以下的知识解释,这类生物、生理现象用细胞学说解释一样。用量子色动力学的碎片、喷注研究所得的知识,再利用类似原理的仪器提供的数据和公认的通用数学计算方法,人类能预报任何地震、雷电发生的准确地点、级别和时间,就类似宏观的生物、生理现象,用基因技术解释一样的会有效。

4) 2010年8月19日, 38岁的法籍越南裔人吴宝珠, 获得有“数学界诺贝尔奖”之称的菲尔茨奖传来, 使我们又振奋又悲痛。吴宝珠是因成功证明难度极高的朗兰兹纲领引理的“基本引理”而获奖的, 这一成果使全世界的数学家终于可以松一口气, 所以早还被美国《时代》杂志评为2009年十大科学发现。1979年, 加拿大裔美国数学家罗伯特·朗兰兹提出了一个大胆的革命性构想, 将数学中的两大分支---数论和群论---联系起来, 通过一系列的推测和分析, 这一理论发现了与涉及整数的公式有关的不可思议的对称性, 并最终提出了所谓的“朗兰兹纲领”。而量子色动力学联系朗兰兹纲领, 是把宏观和微观两大分支联系起来, 通过一系列的推测和分析环量子, 应用自旋语言的旋束态三旋算法及量子计算。

今年是彭罗斯 80 华诞, 据沈致远先生及 2010 年 3 月 13 日《新科学家》透露, 弦论的创立者威滕, 最近已采用彭罗斯的扭量理论创造, 试图将弦论的 10 维空间加 1 维时间的 11 维时空, 减为较易对付的 4 维。三旋理论的线旋, 就能形象解读彭罗斯的扭量图像操作。

2010 年 8 月底, 新疆气象研究所原所长、著名科学家张学文先生为韩锋教授送行。韩锋教授是新疆师范学院物理教授, 退休后被河池学院聘为物理系主任, 据说是著名物理学家何祚庠院士的学生。在宴席间, 两人讨论起三旋理论, 张学文先生认为三旋理论解决了宏观和微观两大分支联系的“语言”。韩锋教授极力反对, 认为三旋是虚拟的宏观圈态自旋描述, 不能引进到微观领域。吴新忠博士谈到要尊重何祚庠院士时, 也提到类似韩锋教授一样的观点。再从董仁威先生传何祚庠先生说三旋理论是伪科学, 到科学无神论网站和三思科学网站等发表《废除“伪科学”提法网络签名者简介》, 嘲笑“朗兰兹纲领”, 定性三旋理论是伪科学, 看来在中国科学殿堂部分被控制的理论物理界已形成统一的口径。

其实, 说三旋理论是“伪科学”, 是别人的自由, 是别人的认识。我们不会感到为难。但三旋理论是不是“伪科学”, 任何神志清醒的人, 不难识别。因为三旋从来没有学过层子去瞎编自创太极子、玄子, 也没有学金凤汉去瞎编小管、小体之类, 而是设想圈体可软的话, 扭转能作线旋、面旋、体旋, 就有三种自旋的编码。这是一种可感、可模拟的图像和描述的自旋语言, 类似 21 世纪的新以太论, 例如, 维尔切克说, 量子维度上的运动所带来的变化不是位移, 即这里没有距离的概念, 而它是自旋的变化。这种“超速度平移”, 将给定内在自旋的粒子变成不同的粒子。那么三旋是如何进入这种 21 世纪新以太论的呢? 这是对自旋作语境分析

并用对称概念, 对自旋、自转、转动作语义学的定义:

(1) 自旋: 在转轴或转点两边存在同时对称的动点, 且轨迹是重叠的圆圈并能同时组织起旋转面的旋转。如地球的自转和地球的磁场北极出南极进的磁力线转动。

(2) 自转: 在转轴或转点的两边可以有或没有同时对称的动点, 但其轨迹都不是重叠的圆圈也不能同时组织起旋转面的旋转。如转轴偏离沿垂线的地陀螺或迴转仪, 一端或中点不动, 另一端或两端作圆圈运动的进动, 以及吊着的物体一端不动, 另一端连同整体作圆锥面转动。

(3) 转动: 可以有或没有转轴或转点, 没有同时存在对称的动点, 也不能同时组织起旋转面, 但动点轨迹是封闭的曲线的旋转。如地球绕太阳作公转运动。

粒子自旋不能理解为它环绕某一本征轴的旋转运动, 只能说自旋粒子的表现与陀螺相似。因为宏观世界的物体, 例如陀螺或汽车, 不具有自旋的性质。虽然这些物体也可以环绕本征轴旋转, 但是这种旋转不是它们的必不可少的性质; 特别是, 我们能够加强它们的旋转运动, 也能停止它们的旋转运动, 而基本粒子的自旋, 既不能加强, 也不可以减弱。那么如果提出基本粒子的结构不是通常认为的是球量子而是环量子的图像假论, 就此如果仍然站在球量子的观点, 把它设想成陀螺状。它只有一类旋转的两种运动。我们设为 A、a。大写 A 代表左旋, 小写 a 代表右旋。但站在环量子的观点, 类似圈态的客体我们定义为类圈体, 我们把它设想成轮胎状, 那么类圈体应存在三类自旋, 现给予定义:

(1) 面旋: 指类圈体绕垂直于圈面中心的轴线作旋转。如车轮绕轴的旋转。

(2) 体旋: 指类圈体绕圈面内的轴线作旋转。如拨浪鼓绕手柄的旋转。

(3) 线旋: 指类圈体绕圈体内中心圈线作旋转。如地球磁场北极出南极进的磁力线转动。线旋一般不常见, 如固体的表面肉眼不能看见分子、原子、电子等微轻粒子的运动。其次, 线旋还要分平凡线旋和不平凡线旋。不平凡线旋是指绕线旋轴圈至少存在一个环绕数的涡线旋转, 如墨比乌斯体或墨比乌斯带形状。同时不平凡线旋还要分左斜、右斜。因此不平凡线旋和平凡线旋又统称不分明自旋。反之, 面旋和体旋称为分明自旋。如果作为一种圈态编码练习, 设面旋、体旋、平凡线旋、不平凡线旋它们为 A、a, B、b 和 G、g、E、e、H、h。其中大写代表左旋, 小写代表右旋。现在来看一个圈态自旋密码具有多少不同结合状态? 单动态---一个圈子只作一种自旋的动作, 是 10 种。双动态---一个圈子同时作两种自旋动作, 但要排除两种动作



左旋和右旋是同一类型的情况，是 28 种。三动态——一个圈子同时作三种自旋动作，但要排除其中两种动作是同一类型的情况，是 24 种。一个圈子同时作四种自旋动作，其中必有两种动作左旋和右旋是属于同一类型，这是被作为“禁止”的情况。所以我们也把三种动态叫做多动态。环量子的自旋是共计 62 种，比球量子的自旋的 2 种多 60 种。

如果何祚麻先生及其同事和学生把这认为是“伪科学”，那么我们中国也是一个“伪科学”大国。因为中国大、中、专的理科教科书，大多数都是按宏观可感、可模拟的图像和描述的知识来教大家的。如果偏要把这种可感、可模拟的科学“无神论”，打成“伪科学”，那么这类科学无神论者实质是一批“有神论”者，因为他们在把自己打扮成为“神”，希望控制中国的科学。钱学森之问是“关于中国教育事业发展的—道艰深命题”，由此引发的沉重思考牵动着上至国家领导人下至普通百姓每一个关心中国发展的人。大师为什么也不能培养不出大师？钱学森先生已经明确说了：“我因不是搞理论物理的，中国科学院理论物理研究所副所长何祚麻同志是此道行家，又热心于自然辩证法的研究”。钱学森同志把希望寄托在何祚麻同志身上，希望这位 50 年间驰骋中国理论物理学界的泰斗，带动培养出无数的大师。那么何祚麻先生的水平到底怎样呢？

何祚麻先生我们没有具体接触，他的学生韩锋教授我们打过交道。2002 年有人把《三旋理论初探》一书送给在河池学院的韩锋教授看。韩教授看后提出了尖锐批评。当然批评，我们是非常欢迎的。但啼笑皆非的是，韩教授把墨比乌斯带和墨比乌斯体不能作联系。他说世上只有墨比乌斯带，没有墨比乌斯体。三旋理论中类圈体作非平凡线旋，是墨比乌斯体，所以是荒唐的。是的，众所周知的是墨比乌斯带，中国的书中很少介绍墨比乌斯体。但既然墨比乌斯带存在，如果把 3 条、4 条等同样的纸带，做成三角形、正方形等口型的管子，那么墨比乌斯体是指把三角形、正方形等口型管子两端扭转后的对接。这种墨比乌斯体类似把墨比乌斯带看成是压扁后的水管扭转一个面的对接，再充气吹胀，就可以近似再现墨比乌斯体。这是从宏观到宏观的扩张，这一点何祚麻先生的学生韩锋教授都难以理解，那么他们怎么能把宏观知识的数学扩张到微观领域里去呢？所以我们中国即使出了如华罗庚、陈省身、苏步青、丘成桐等很多的国际著名的数学大师，也是白搭。他们的微分几何、微分流形、堆垒数论、卡—丘空间推证等书籍摆在图书馆里，也是白摆，中国怎能出大师呢？

那么何祚麻先生的自然辩证法研究的水平又怎样呢？1965 年《红旗》杂志发表坂田昌一的《新

基本粒子观对话》，何祚麻先生夫妇参与了该文后面《注释》的写作。其中特别突出的是斗争哲学。例如大批玻尔的互补原理，是在国际学术界散布唯心主义、形式主义的论断等。也许有人说，他们是受主席斗争哲学的引导。但反过来说，他们何尝不也是把斗争哲学引导给主席。张学文先生是北大走过的高材生，但他为什么又没有沿着韩教授、何教授等指导的道路前行呢？实际张学文先生出版的《组成论》专著，是以“个”研究解读“熵”运用于系统科学、复杂性研究、信息论和热力学等领域，取得很高成就的科学家。例如把量子力学的空间破裂模式联系张学文先生的球量子组成论的“快刀斩乱麻”复杂程度分布研究，“快刀斩乱麻”的随机分割也如同喷雾器把药水变成很多个小滴的喷雾一样，其次也如同把杯子打碎、把煤挖出来要对物体施加能量一样，其后果还是使物体增加很多新的断面。这里药水变成雾滴，也是施加的能量形成了雾滴的表面积，而表面积的增加也就对应表面自由能的增加；计算每一次喷雾的雾滴的表面积的总和，应当与做功的总能量多少成正比例。这与黑洞的表面对应黑洞的熵相似。但球量子组成论即使反对物质无限可分，其思维仍是球面思维。因为球量子组成论的局限性，是阿伏伽德罗数的“个”的决定论，造出的“无神”事实。如果最基本的东西可分，是球量子及它的场，那么从图像上说，自旋是有体积的。但如果最基本的东西可分，是环量子及它的场，那么从图像上说，环量子的自旋可分立为三种自旋——体旋、面旋、线旋，线旋带动它的场，这是没有体积的。

这种环量子点“以太”的自旋堆垒、发散，不能用阿伏伽德罗数的“个”的“无神”论描述，而类似“有神论”。而三旋理论又退去这种“神”，是因为新中国的培养教育，从 1959 年到 1974 年坚持的把弦圈耦合成链条，再看成一条线；到 1974 年此理论第一次公开了三旋规范动力符号表及其与夸克的对应；再到 2002 年《三旋理论初探》一书出版，实际解决了弦理论、宇宙弦理论的三大难题：A、弦理论解决了物质族分 3 代与卡—丘空间 3 孔族的对应，但仍有多孔选择的难题。B、弦理论解决了多基本粒子与多卡—丘空间形状变换的对应，但仍有多形状选择的难题。C、弦理论解决具体的基本粒子的卡—丘空间图形虽有多种数学手段，但仍遇到数学物理原理的选择难题。所以 21 世纪新儒学量子色动力学中弦圈的发明权，也应属于中国人！21 世纪新儒学走进孔子学院，不仅能带文。也能带理。

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## 惯性力与加速系的物理学

(一评广义相对论)

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**内容提要**：本文指出：对于相对论，适用于加速系物理学的数学工具不是黎曼几何，而是平直的四维时空的曲线坐标运算。在这一前提下，证明了加上了惯性力的牛顿第二定律对一系列特殊的加速系成立，从而在狭义相对论的框架内给出了加速系的物理学方程的不变性，正如惯性系的物理学方程具有“洛伦兹不变性”一样，加速系的物理学方程具有一种“准洛伦兹不变性”。最后，本文指出在这一工作完成之前，狭义相对论作为一个理论体系是不完整的。

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**关键词**：曲线坐标；加速系的物理学；准洛伦兹变换；惯性力场张量；惯性场论；爱因斯坦

### 1. 引言

相对论刚刚建成，就提出了一个问题：“对于加速系（非惯性参照系），相对论的物理学方程表成什么形式？”时至今日，一个世纪已经过去。但在我们看来，这一问题尚未解决。在这里，我们将从两个略微不同的角度，重新探讨这一问题。

第一，大家知道，牛顿第二定律不是仅仅对某一个参照系成立，而是对一系列称为“惯性系”的参照系都成立；另一方面，只要加上惯性力，牛顿第二定律对加速系也成立。那么，这种加上了惯性力的牛顿第二定律仅对某一个加速系成立，还是对一系列加速系都成立呢？

第二，既然牛顿第二定律可以改写成在洛伦兹变换下保持不变的张量方程，加上了惯性力的牛顿第二定律能不能也改写成在某种参照系变换下保持不变的张量方程呢？

第一个问题属于牛顿力学的范畴，而第二个问题则属于相对论的范畴，但在牛顿力学和狭义相对论的框架之内，这两个问题似乎都没有人考虑过，直到广义相对论问世，它们才以完全变样的形式提上日程。

在本文中，我们将在狭义相对论的框架里回答这两个问题。

### 2. 曲线坐标与加速系

如果让 $x^1$ 、 $x^2$ 和 $x^3$ 表示普通的三维空间的曲线坐标，则“矢径” $\mathbf{r}$ 表成 $x^1$ 、 $x^2$ 和 $x^3$ 的函数：

$$\mathbf{r} = \mathbf{r}(x^1, x^2, x^3)。$$

把偏导符号 $\frac{\partial}{\partial x^\lambda}$ 略写成 $\nabla_\lambda$ ，则曲线坐标的基矢表成

$$\mathbf{e}_\lambda = \nabla_\lambda \mathbf{r},$$

从而矢径的微分表成

$$d\mathbf{r} = \mathbf{e}_1 dx^1 + \mathbf{e}_2 dx^2 + \mathbf{e}_3 dx^3 = \mathbf{e}_\mu dx^\mu.$$

对于给定的 $\mu$ 和 $\nu$ , 用 $\Gamma_{\mu\nu}^\lambda$ 表示矢量 $\nabla_\nu \mathbf{e}_\mu$ 的坐标, 则有

$$\nabla_\mu \mathbf{e}_\nu = \Gamma_{\mu\nu}^\lambda \mathbf{e}_\lambda. \quad (1)$$

引进曲线坐标的“共变度规张量”

$$g_{\mu\nu} \equiv \mathbf{e}_\mu \cdot \mathbf{e}_\nu,$$

再两边求偏导 $\nabla_\lambda$ , 考虑到 $\Gamma_{\lambda\mu\nu} = g_{\lambda\rho} \Gamma_{\mu\nu}^\rho$ , 则上式给出

$$\nabla_\lambda g_{\mu\nu} = \Gamma_{\mu\lambda\nu} + \Gamma_{\nu\lambda\mu}. \quad (2)$$

根据基矢的定义, 有

$$\nabla_\mu \mathbf{e}_\nu = \nabla_\nu \mathbf{e}_\mu.$$

从而

$$\Gamma_{\lambda\mu\nu} = \Gamma_{\lambda\nu\mu}.$$

上式与(2)式给出

$$\Gamma_{\lambda\mu\nu} = \frac{1}{2} (\nabla_\mu g_{\nu\lambda} + \nabla_\nu g_{\lambda\mu} - \nabla_\lambda g_{\mu\nu}).$$

曲线坐标的“逆变度规张量” $g^{\lambda\mu}$ 由方程组 $g^{\lambda\mu} g_{\mu\nu} = \delta^\lambda_\nu$ 定义。应用逆变度规张量, 上式可表成

$$\Gamma_{\mu\nu}^\lambda = \frac{1}{2} g^{\lambda\rho} (\nabla_\mu g_{\nu\rho} + \nabla_\nu g_{\rho\mu} - \nabla_\rho g_{\mu\nu}). \quad (3)$$

该式把符号 $\Gamma_{\mu\nu}^\lambda$ 表成度规张量的偏导。

以弧长 $s$ 为参变量, 则三维空间的任一曲线可表成参变方程

$$x^1 = x^1(s), \quad x^2 = x^2(s), \quad x^3 = x^3(s),$$

根据定义

$$ds^2 = d\mathbf{r} \cdot d\mathbf{r} = \mathbf{e}_\mu dx^\mu \cdot \mathbf{e}_\nu dx^\nu = g_{\mu\nu} dx^\mu dx^\nu.$$

另一方面, 曲线的切线方向矢量是

$$\boldsymbol{\kappa} = \frac{d\mathbf{r}}{ds} = \mathbf{e}_\mu \frac{dx^\mu}{ds}.$$

对于直线, 切线的方向矢量保持不变:  $\frac{d\boldsymbol{\kappa}}{ds} = 0$ , 考虑到

$$\frac{d\mathbf{e}_\nu}{ds} = \frac{dx^\mu}{ds} \nabla_\mu \mathbf{e}_\nu = \Gamma_{\mu\nu}^\lambda \frac{dx^\mu}{ds} \mathbf{e}_\lambda.$$

我们有

$$0 = \frac{d\boldsymbol{\kappa}}{ds} = \frac{d}{ds} \left( \mathbf{e}_\mu \frac{dx^\mu}{ds} \right) = \mathbf{e}_\lambda \left( \frac{d^2 x^\lambda}{ds^2} + \Gamma_{\mu\nu}^\lambda \frac{dx^\mu}{ds} \frac{dx^\nu}{ds} \right).$$

于是在给定的曲线坐标中, 一条直线满足微分方程

$$\frac{d^2 x^\lambda}{ds^2} + \Gamma_{\mu\nu}^\lambda \frac{dx^\mu}{ds} \frac{dx^\nu}{ds} = 0. \quad (4)$$

如果把上面诸方程中的张量或符号中加上一个时间坐标 $x^0$ , 再用固有时 $\tau$ 的微分代替弧长的微分 $s$ , 则得到(平直的)四维时空的曲线坐标的一组对应的公式。这组公式在形式上与三维空间的曲线坐标的公式完全一样, 但表现着全新的内容。

例如, (4)式原是直线在三维空间曲线坐标下的微分方程, 在四维时空, 它被改写为

$$\frac{d^2x^\lambda}{d\tau^2} + \Gamma^\lambda_{\mu\nu} \frac{dx^\mu}{d\tau} \frac{dx^\nu}{d\tau} = 0, \quad (5)$$

表示加速系中的一个质点的“等速直线运动”。

同样，我们还可以给出四维时空的曲线坐标运算的其他公式，这些公式与黎曼几何的公式颇有一些相似，例如，(5)式在黎曼几何中是“短程线方程”。但两者物理意义却迥然不同，不能彼此过渡。

### 3. 惯性力是不是矢量？

对于牛顿力学，“参照系”仅仅指刚性标架，而“加速系”则是指作“加速运动”（加速平动或旋转）的刚性标架。

在相对论中，“参照系”的概念比牛顿力学的更丰富多彩：任一（平直的）四维时空的曲线坐标系就表示一个“参照系”。四维时空的曲线坐标系可以分成两类，一类是洛伦兹坐标系（惯性系，再加上对三维空间取笛卡尔坐标系）；另一类是非洛伦兹坐标系。下面，按照习惯，如果不特别声明，我们把“惯性系”等同于“洛伦兹坐标系”，而“加速系”则等同于“非洛伦兹坐标系”。

把(5)式理解为加速系中的一个质点的“等速直线运动”方程，将该式两边乘以质点的静止质量  $m_0$  并移项，得到

$$m_0 \frac{d^2x^\lambda}{d\tau^2} = -m_0 \Gamma^\lambda_{\mu\nu} \frac{dx^\mu}{d\tau} \frac{dx^\nu}{d\tau}。$$

令

$$K^\lambda \equiv -m_0 \Gamma^\lambda_{\mu\nu} \frac{dx^\mu}{d\tau} \frac{dx^\nu}{d\tau}, \quad (6)$$

则有

$$m_0 \frac{d^2x^\lambda}{d\tau^2} = K^\lambda。$$

这个方程在形式上与相对论形式的牛顿第二定律完全一样，其中  $K^1$ 、 $K^2$  和  $K^3$  是经过改写的“惯性力”， $K^0$  是经过改写的“惯性功率”。

对于惯性系，当一个静止质量为  $m_0$  带电  $e$  的点电荷置于电磁场  $F^{\lambda\mu}$  中时，相对论形式的牛顿第二定律表成

$$m_0 \frac{d^2x^\lambda}{d\tau^2} = e F^{\lambda\mu} \frac{dx^\mu}{d\tau}。 \quad (7)$$

另一方面，在狭义相对论的框架中，对于一个给定的加速系，(7)式转化为方程

$$m_0 \frac{d^2x^\lambda}{d\tau^2} = e F^{\lambda\mu} \frac{dx^\mu}{d\tau} - m_0 \Gamma^\lambda_{\mu\nu} \frac{dx^\mu}{d\tau} \frac{dx^\nu}{d\tau}。 \quad (8)$$

在(7)式中，所有的物理量都是张量，从而(7)式是一个张量方程。那么，(8)式是不是也是一个张量方程呢？如果是，则其中的惯性力必须是矢量，那么惯性力是不是矢量呢？

或许有人说，惯性力有大小有方向，当然是矢量！这个回答没错，但答非所问。

在(7)式中，当参照系从一个惯性系变换到另一个惯性系时，四维时空的基矢  $e_\lambda$  和洛伦兹力的坐标  $L^\lambda = e F^{\lambda\mu} \frac{dx^\mu}{d\tau}$  都会相应地改变，但洛伦兹力  $L^\lambda e_\lambda$  本身却保持不变，在这种意义下，洛伦兹力的坐标  $L^\lambda$  在洛伦兹变换下是“协变”的；也是在这种意义下，洛伦兹力是一个矢量（四维时空的四维矢量）。

同样，当一个加速系变换到另一个加速系时，四维时空的基矢  $e_\lambda$  和(6)式给出的惯性力的坐标  $K^\lambda$  都会相应地改变。如果对于每一个（相对论意义下的）惯性力，存在一组参照系变换，对于其中的每一个变换，表达式  $K^\lambda e_\lambda$  保持不变，从而惯性力的坐标  $K^\lambda$  对于该变换是“协变”的，则惯性力就是矢量。

相对论的基本数学工具是张量分析，从而立足于“参照系变换”。对于相对论，一个四维时空的曲线坐标的变换表示一个“参照系变换”，全体参照系变换组成一个“群”；通常说的“参照系变换群”是该群的一个“子群”。从一个惯性系变换到另一个惯性系的参照系变换称为“洛伦兹变换”，全体洛伦兹变换组成“洛伦兹变换群”，它也是一个“参照系变换群”。

设  $G$  是一个“参照系变换群”，而某一符号对于变换群  $G$  中的每一个变换都具有协变性，则称该符号表示的对象为变换群  $G$  的“不变量”。按照这一规定，洛伦兹力是“洛伦兹变换群”的不变量，正是在这种意义下它是一个矢量。同样，如果对于每一个惯性力，总能找到一个以它为不变量的参照系变换群，则惯性力就是矢量。

#### 4. 惯性力场张量

那么，惯性力到底是不是矢量呢？为了回答这一问题，首先给出一个定理：

A. 设  $S$  与  $R$  是两个参照系变换， $S$  把惯性系  $\xi$  变换到惯性系  $\eta$ ， $R$  把惯性系  $\xi$  和  $\eta$  分别变换到加速系  $\alpha$  和  $\beta$ ，则从加速系  $\alpha$  到加速系  $\beta$  的参照系变换是  $RSR^{-1}$  ( $R^{-1}$  是  $R$  的逆变换)。

证明如下：根据定义，有  $\eta = S\xi$ ； $\alpha = R\xi$ ， $\beta = R\eta$ ； $\xi = R^{-1}\alpha$ 。于是

$$\beta = R\eta = RS\xi = RSR^{-1}\alpha。$$

大家知道：在相对论中，惯性系的基本物理学方程在“洛伦兹变换”下保持不变。下面，我们将通过一个牛顿力学中的例子看到：一个加速系也有某种物理量在某种参照系变换下保持不变。

把地面看作惯性系，则一个相对地面自由下落的“升降机”，记作  $\alpha$ ，是一个作“等加速直线运动”的加速系。设其中的一位质量为  $m$  的乘客感受到惯性力  $K$ ，则  $a = K/m$  描述参照系  $\alpha$  的特征，我们称它“惯性加速度”。再考虑一座相对地面作等速直线运动的大楼（据说，这是可以实现的），大楼里也有一个自由下落的“升降机”  $\beta$ ，则根据牛顿力学可得出结论：第一， $\beta$  的惯性加速度也是  $a$ ，从而加速系  $\alpha$  与  $\beta$  具有同一惯性加速度；第二，从地面到升降机  $\alpha$  的参照系变换也是从大楼到升降机  $\beta$  的参照系变换。应用命题 A，上面的结论可推广为如下命题：

B. 设  $R$  是一个参照系变换，它把某一惯性系变换到作“等加速直线运动”的参照系  $\alpha$ ；而  $S$  是一个从惯性系到惯性系的参照系变换，则加速系  $\alpha$  的“惯性加速度”对于参照系变换  $RSR^{-1}$  保持不变。

在相对论中，惯性力的表达式是 (6) 式，其有一个因子  $\Gamma^{\lambda}_{\mu\nu}$  表现参照系的特征，描写某种力场，我们称它为“惯性力场”。命题 B 中的“惯性加速度”是一种特殊的惯性力场，因此，命题 B 在相对论中可推广为：

C. 设参照系变换  $R$  把某一惯性系变换到加速系  $\alpha$ ；而  $S$  是一个洛伦兹变换，则加速系  $\alpha$  的惯性力场对于参照系变换  $RSR^{-1}$  保持不变。

下面，我们把形如  $RSR^{-1}$  的参照系变换称为“准洛伦兹变换”。固定  $R$ ，当  $S$  遍历整个洛伦兹变换群时， $RSR^{-1}$  形成一个参照系变换群，我们称它为“准洛伦兹变换群”，或更确切地称它为“由  $R$  生成的准洛伦兹变换群”。

设  $\xi$  和  $\eta$  是两个惯性系而  $\zeta$  是一个加速系，则从  $\xi$  到  $\zeta$  和从  $\eta$  到  $\zeta$  是不同的参照系变换，但它们生成同一个准洛伦兹变换群  $G_{\zeta}$ 。因此，一个加速系  $\zeta$  对应唯一的准洛伦兹变换群  $G_{\zeta}$ 。

命题 C 表明，一个加速系的惯性力场是该加速系所对应的准洛伦兹变换群的一个不变量，从而是一个张量，我们称它“惯性力场张量”。这是一种新型张量。

(6) 式表示的惯性力也是其对应的准洛伦兹变换群的不变量。正是在这种意义下，（相对论意义下的）惯

性力是矢量。

## 5. 加速系物理学的基本假设

上面我们经过两次推广，从一个个别的例子得出命题 C。但是，我们凭什么再三地作这种“从特殊到一般”的推理呢？

在这里，我们是在建立而不是应用物理学的定律。在这种过程中，“从特殊到一般”的推理是逻辑推理的基本形式。这种从已知进入未知的过程，要求有一定已知事实作为启发性的依据。那么，在上面的两次推广中，作为启发性依据的已知事实是什么呢？

我们知道，一个惯性系的各种物理量都是对同一组参照系变换保持不变的。对于一个加速系，我们也很难想象它的某些物理量对一组参照系变换保持不变而另一些物理量却对另一组参照系变换保持不变，因而我们可以很自然地联想：只要某一加速系有一个物理量对某一组参照系变换保持不变，则该加速系的其他物理量也都对这组参照系变换保持不变。这种联想不仅支持我们上面的“从特殊到一般”的推理，而且还支持我们进一步得出更深远的结论。

惯性系的物理量在洛伦兹变换下保持不变，在这种意义下，我们说它具有“洛伦兹不变性”，而它的坐标具有“洛伦兹协变性”；同样，如果一个物理量在准洛伦兹变换下保持不变，则我们说它具有“准洛伦兹不变性”，而它的坐标具有“准洛伦兹协变性”。

这样，我们进一步把命题 C 追溯到如下基本假设：

D. 一个加速系的任意物理学方程对于该加速系所对应的准洛伦兹变换群保持不变，而该方程的物理量的坐标具有对应的准洛伦兹协变性。

下面，根据习惯，除了特殊情形，我们不再区分一个张量和它的坐标表达式，从而忽略“不变性”与“协变性”之间的区别。

根据命题 D，惯性力场  $\Gamma^{\lambda}_{\mu\nu}$  是它对应的准洛伦兹变换群  $G_c$  的不变量，从而它才是一个张量。还有，加速系  $\zeta$  的“度规张量”  $g_{\mu\nu}$  之所以是张量，也是因为它是变换群  $G_c$  的不变量。(3) 式表示一个加速系的惯性力场张量与该加速系的度规张量之间的关系。

根据命题 D，在 (8) 式中，不仅惯性力场  $\Gamma^{\lambda}_{\mu\nu}$  是变换群  $G_c$  的不变量，而且其他物理量（其中包括电磁场  $F^{\mu\nu}$ ）也都是变换群  $G_c$  的不变量，从而 (8) 式作为变换群  $G_c$  的诸不变量之间的关系，仍然是一个张量方程。但它与 (7) 式相比有了两点改变：第一，增添了一项惯性力；第二，诸张量的协变性改变了，从“洛伦兹协变性”变成了“准洛伦兹协变性”。

下面，我们把立足于命题 D 的加速系物理学称为“惯性场论”，它是狭义相对论的一个新的组成部分。

按照爱因斯坦的意见，狭义相对论只给出惯性系的物理学方程，一旦涉及加速系时就必须应用广义相对论，从而必须应用“等效原理”与“广义协变性原理”。从数理科学的一般观点来看，像这样理解的狭义相对论是不完整的。

大家知道：一个参照系只要对惯性系稍有偏离，就成了加速系。这一事实表明：惯性系与加速系之间的关系，类似于数轴上的一个点与它的“邻域”之间的关系。在数学中，为了表现一个函数在某一点的行为，孤立地给出该函数在这个点的取值是不够的，只有同时给出该函数在这一点“邻域”的取值，对这个函数在该点的行为的描写才是完整的。同样，一个物理学理论仅仅孤立地给出惯性系的运动方程也是不够的，还需要同时给出加速系的运动方程。反过来说：狭义相对论作为一个完整的理论体系，应该不仅给出能惯性系

的物理学方程，还能同时给出这种方程在加速系的变形，而不用借助于该理论以外的“原理”。

因此，在建立惯性场论之前，狭义相对论还不是一个完整的理论体系。

## 6. 关于“广义协变性”

上面，为弄清相对论的物理学方程在加速系的表现形式，我们建立了惯性场论。面对同一课题，爱因斯坦走上了另一条道路：借助于严谨而又美丽的“黎曼几何”，引进了“弯曲时空”这一匪夷所思的观念，建立了广义相对论的雄伟大厦。广义相对论与惯性场论之间的关键的区别是，它用“广义协变性”取代“准洛伦兹协变性”来表现加速系的物理学方程的协变性。

按照爱因斯坦的意见，惯性力与万有引力不可分辨，因此广义相对论包括他的引力场论。在我们看来，惯性力与万有引力是不同的力，上面的惯性场论就不涉及万有引力。但只有在考察引力场论的时候，我们才能全面地评论广义相对论。在这里，我们只能提出两点感性上的异议。

第一，(5)式中的符号 $\Gamma^{\lambda}_{\mu\nu}$ 作为惯性场论的一个范畴，是“惯性力场张量”，它是加速系物理学中的一个最关键的物理量，这个物理量具有准洛伦兹协变性。而同一符号在黎曼几何中称为“联络”，它也是一个举足轻重的范畴，却并不是一个张量，不具有广义协变性。

谁也不能为这一事实而非难爱因斯坦，但广义相对论的这一特点似乎有悖于狄拉克关于物理学理论的“美”的原则。

第二，如果非洛伦兹变换 $R$ 无限接近恒等变换，则准洛伦兹变换 $RSR^{-1}$ 无限接近于洛伦兹变换 $S$ ，因此从洛伦兹协变性可连续地过渡到准洛伦兹协变性，而从洛伦兹协变性过渡到广义协变性，则是一次突变，既是一次数学运算上的突变，也是一次物理概念上的突变。

广义相对论的这一特点在逻辑上没有毛病，但也使人感到别扭。比方说，在某种近似下，两个相互作用等速直线运动的参照系可以看作是两个惯性系，它们之间的变换可以看作是“洛伦兹变换”。如果由于精确度提高，这两个参照系被看作加速系，则它们之间的变换被看成“准洛伦兹变换”。当精确度的提高很小时，新的准洛伦兹变换与原来的洛伦兹变换的差别也很小。很难理解这点小小的差别会引起什么突变，无论是数学运算方面还是物理概念方面的突变。

为什么爱因斯坦没有找到准洛伦兹协变性呢？这与其说是一个“智力”问题倒不如说是一个“爱好”问题。爱因斯坦偏爱“新颖观念”，由于这种偏爱他建立了光子论；由于这种偏爱他试图建立“统一场论”；还是由于这种偏爱，爱因斯坦选择了“广义协变性”。

从“洛伦兹协变性”到“准洛伦兹协变性”是一条凡人的思路，一条保守的、传统的、循规蹈矩的思路；而从“洛伦兹协变性”到“广义协变性”则是一条天才的思路，一条打破常规、出奇制胜、独辟蹊径的思路。我们得到准洛伦兹协变性是在一些已知事实的启发下，经过从特殊到一般的逻辑推理逐步导出的，而爱因斯坦得到广义协变性则是一次灵感的闪耀，人们无法追溯其来龙去脉。

如果“以成败论英雄”，则爱因斯坦这条思路找对了。由于当年广义相对论的成功，从1919年起爱因斯坦成了全世界家喻户晓的名人，至今不仅仍被公认为是当代最伟大的物理学家，还被公认为是当代物理学领域里的屈指可数的哲人与思想家。有史以来，还没有第二位物理学家享受这样的殊荣。

然而又有谁知道，物理学为此付出了怎样的代价！

## 7. 结束语

现在我们可以回答本文开始时提出的问题：第一，加上了惯性力的牛顿第二定律不是仅对一个加速系成



立，而是对一系列加速系成立，这一系列加速系之间的变换组成“准洛伦兹变换群”。第二，在相对论中，加上了惯性力的牛顿第二定律改写成在准洛伦兹变换下保持不变的张量方程，这种形式的张量方程具有准洛伦兹协变性，是惯性场论的基本方程之一。

### Inertial force and Non-inertial System Physics

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**Abstract:** It is pointed out that for relativity, the mathematical means of non-inertial system is the operations of the curve coordinate in the (smooth) four-dimensional time-space instead of Riemannian geometry. Starting from this premise, it is found that Newton second law with inertia force hold true for a set of special non-inertial reference systems, and thereby the invariability of physical equations in non-inertial reference systems is obtained: just as the physical equations in inertial reference possess “Lorentz invariability”, as well as those of non-inertial reference possess a certain “quasi-Lorentz invariability”. Finally, it is concluded that before this work being to success, special relativity as a theory system is incomplete.

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**Keywords:** curve coordinates; non-inertia physics; quasi-Lorentz transformation; inertial field tensor; inertia field theory; Einstein

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## 对万有引力的再考察

(再评广义相对论)

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**内容提要:** 本文指出, 广义相对论有两个论据不成立, 一个是惯性力与引力不可分辨, 另一个是惯性力不能完全抵消引力, 从而证明整个广义相对论是不合逻辑的。另一方面, 本文在惯性场论的基础上, 一方面通过引力与电磁力的对比, 另一方面通过经过改写的等效原理, 建立了一种新的引力场论, 它具有如下特征: 第一, 等效原理是它的逻辑结论; 第二, 通过“引力场张量”的概念, 它与牛顿引力理论紧密衔接; 第三, 它的数学结构简单, 与其他自然力的场论相比并没有特别迥异之处。

[谭天荣. 对万有引力的再考察. Academia Arena 2010;2(11):41-46]. (ISSN 1553-992X).  
(<http://www.sciencepub.net>).

**关键词:** 张量分析; 惯性力; 万有引力; 广义相对论; 等效原理; 自然引力论

### 1. 引言

在谈到广义相对论时, 爱因斯坦说: “这个理论主要吸引人的地方在于逻辑上的完备性。从它推出的许多结论中, 只要有一个被证明是错误的, 它就必须被抛弃; 要对它进行修改而不摧毁其整个结构, 那似乎是不可能的。”言外之意, 广义相对论在逻辑上无懈可击。可事实远非如此, 我们即将看到, 这个立足于逻辑推理的理论其实是不合逻辑的。

### 2. 对广义相对论的两点质疑

限于篇幅, 在这里, 我们仅仅对广义相对论的两个主要的论据提出质疑。我们质疑的第一个论据是:

A. 引力与惯性力不可分辨。

引力的规律有两个方面: 一方面是引力作用于物质的规律, 另一方面是物质激发引力的规律。当引力作用于物质时, 其效果与惯性力一样; 但物质激发引力却并不激发惯性力, 在这一点上, 引力与惯性力截然不同。爱因斯坦把他的“观察者”囚禁在一个“密封系统”里, 完全不让他知道他周围的物质激发引力的情况, 另一方面却假定这位观察者能极为敏锐地感知引力或惯性力对物质的作用。诚然, 经过这样精心选择的观察者确实不能分辨引力与惯性力。但是, 我们能因此得出什么结论呢?

物理学家们往往通过“观察者”的感受来表现某一观察对象的行为, 这种用观察者的主观感觉的语言来表现外部世界的客观规律的独特表现方式, 存在着各式各样导致错误的可能性。特别是, 如果刻意选择生理上残缺的人作为观察者或者刻意安排观察者处于不正常的观察条件之下, 人们就可以借助于这种表现方式随心所欲地制造各种荒谬可笑的命题, 这里信手拈来几个例子: 如果颁布禁令, 观察者只允许在夜色中见到猫,

那么观察者们肯定会得出一致结论：“一切猫都是灰色的。”如果把一位观察者终身囚禁在井底，则这位可怜的观察者们很难不得出结论：“天与井口的大小相等。”如果在红绿色盲中挑选观察者，则观察者们将会异口同声地说：“红色与绿色不可分辨”，等等！等等！在这些例子中，观察者确实确实有那样的主观感觉，但所得出的结论却并不是客观规律。同样，由于爱因斯坦的“密封系统”也是一种“不正常的观察条件”，不论处于这种观察条件之下的观察者有怎样的感受，都不能把命题 A 变成一条客观规律。

命题 A 是广义相对论的中心点，但这一命题并不比“一切猫都是灰色的”、“天与井口的大小相等”或者“红色与绿色不可分辨”等命题更高明，它与这三个命题来自同一性质同一水平的错误推理。只是由于爱因斯坦至高无上的权威，才使得这个命题登上了“物理学规律”的大雅之堂，成了广义相对论的一个组成部分。

只要我们解除“不允许在白昼观察猫”的禁令，观察者们就能立刻发现，世界上不仅有灰色的猫，而且还有黑猫、白猫、黄猫以及各式各样的花猫。同样，只要离开爱因斯坦的“密封系统”，观察者就能分辨惯性力与引力。仅凭这一点我们就足以断言：广义相对论是不合逻辑的。

我们质疑的另一个论据是：

B. 对于一个真实的引力场，不存在一个加速系，它的惯性力能在整个时空中完全抵消该引力场。

一个处于静电场中的带电粒子，其行为不仅与当地的电场强度有关，而且还与它自身的“荷质比”有关，但一个处于引力场中的质点，其对应的“荷质比”就是它的引力质量与惯性质量之比，而这个比值却是一个常量。从这一事实出发，爱因斯坦提出如下理想实验：如果一个升降机自由下落，则升降机作为一个加速系，其惯性力与重力相互抵消，从而升降机内的观察者处于失重状态，并由此得出了著名的“等效原理”。如果没有论据 B，等效原理就将表成：

C. 任意给定引力场，存在一个特殊的加速系（我们称它为该引力场的“特征参照系”），其惯性力场与该引力场相互抵消。

但爱因斯坦却坚持论据 B，从而坚持惯性力场与引力场只能在一个局部的时空区域相互抵消，并且通过如下例子来证明这一结论：地球的重力场在无穷远点为零，而任何加速系的惯性力在无穷远点却只能是有限的，或者趋向无穷大。因此，没有一个参照系的惯性力场能抵消地球的重力场。

这种推理使我想起一句趣话：“例子并不骗人，但骗人的人常举例子。”

当人们提出“任何加速系的惯性力在无穷远点是有限的甚至趋向无穷大”的论据时，他们所考虑的加速系总是作加速运动的“刚性标架”，但对于相对论，每一个（平直的）四维时空的曲线坐标系表示一个“参照系”，除了惯性系以外，每一个参照系都给出一个惯性力。有谁证明过这种一般意义下的惯性力在无穷远点总是有限的或者趋向无穷大吗？要知道，四维时空的曲线坐标系可以任意给定，我们想要什么样的惯性力就能有什么样的惯性力。

我们看到，命题 B 起源于把“参照系”等同于“刚性标架”，这是牛顿力学对“参照系”的狭隘理解，爱因斯坦坚持的这一论据原来是博物馆里的珍品。

### 3. 致命的飞跃

如果你问一位精通广义相对论的学者，为什么要用黎曼几何来描述万有引力，在绝大多数情况下，你得到的答复将是：“这是广义相对论的基本假设，不要问为什么！”或者是：“你问爱因斯坦去！”

在惯性场论（见《惯性力与加速系的物理学》）中，我们已经看到：惯性力由（平直的）四维时空曲线坐标给出。虽然黎曼几何的某些公式与惯性场论的公式在形式方面颇为相似，但两者的现实意义迥然不同，不能彼此过渡。根据等效原理，引力与惯性力等效，因此，即使仅从等效原理的角度来探讨引力理论，其数学工具也应该是惯性场论的公式而不是黎曼几何。既然如此，对广义相对论应用黎曼几何来描写引力，问一个“为什么”在所难免，不该用“你问爱因斯坦去”之类的遁词来搪塞。

事实上，对于刚才的问题，广义相对论的学者们也并不全都只会说“不要问为什么”，他们中的佼佼者会给出如下回答：

爱因斯坦已经证明：

第一，惯性力与引力不可分辨，因此，只有当惯性力场与引力场完全抵消时，才能在时空中引进“洛伦兹坐标系”；

第二，对于一个真实的引力场，不可能找到一个加速系，其惯性力场在整个时空中完全抵消引力场。从这两个前提得出结论：“在引力场所在的时空不能引进‘洛伦兹坐标系’”。

另一方面，根据黎曼几何，“在弯曲时空中不能引进‘洛伦兹坐标系’”。

由此可见，引力场所在的时空具有弯曲时空的特性。这一论据给我们启示，黎曼几何适用于描述引力场。

这或许是我们所能期待的最满意的回答。不幸的是，这一回答应用了命题 A 和命题 B，而我们已经看到这是两个极为古怪而幼稚的论据。令人困惑的是，爱因斯坦为什么会犯如此低级的错误呢？从思想方法的角度来看，爱因斯坦从来就不大重视逻辑推理，他更心爱的是惊世骇俗、匪夷所思的“新颖观念”。在建立狭义相对论的时期，这种思想方法显示过巨大的创造性。然而对于爱因斯坦来说，成也“新颖观念”、败也“新颖观念”。到了考虑加速系的物理学方程特别是考虑万有引力的问题时，爱因斯坦已经江郎才尽，他那以捕获“新颖观念”为中心的思想方法再也不能创造奇迹了。

通过缜密的逻辑分析来追溯爱因斯坦建立广义相对论的思路是一件吃力不讨好的差事，爱因斯坦的想法其实很简单：“弯曲时空”这一新颖观念实在太可爱了，用它来描述引力场是再惬意不过的。认识到这一点，当我们面对爱因斯坦的古怪而幼稚的失误时，就会省去很多烦恼。

然而，爱因斯坦应用黎曼几何来描述引力场已经是一个历史事实，虽然我们大可不必为追溯爱因斯坦的思路而苦恼，但这件事的后果却不仅是令人苦恼而已，我们不能不认真对待。

由于应用黎曼几何来描述引力场，爱因斯坦得出了“广义协变性”这一“划时代的成果”，然而这一成果对于相对论却是灾难性的。

“洛伦兹协变性”是相对性原理表达式，而相对性原理则是相对论的灵魂。不幸的是，在“广义协变性”中连一个“洛伦兹协变性”的原子也没有。我们被迫得出结论：所谓“广义相对论”只剩下相对论的名称，却不再有相对论的灵魂，不论黎曼几何的数学公式多么美丽，不论“弯曲时空”的观念多么神奇，它们都与相对论毫不相干。

因此，从“洛伦兹协变性”过渡到“广义协变性”实在是一次致命的飞跃，这一飞跃不仅“伤筋动骨”，而且还“触及灵魂”。经过这一飞跃，本来意义下的“相对性原理”不是被“推广”而是被埋葬了。对于相对论，这种“推广”只不过是一次豪华的葬礼而已。

#### 4. 引力场论与电磁场论的比较

在广义相对论发表之前，洛伦兹等人曾经从比较引力场与电磁场的角度探讨引力场论，可惜刚刚开了个头，就被爱因斯坦的工作所打断。在这里，我们继续这一方面的工作。

库仑定律（真空中的）一方面给出高斯方程

$$\nabla \cdot \mathbf{E} = \frac{\rho}{\epsilon_0}, \quad (1)$$

另一方面给出静电力方程

$$\mathbf{f} = \rho \mathbf{E}. \quad (2)$$

由于静电场是无旋的，可以引进静电势 $\phi$ ，使得

$$\mathbf{E} = -\nabla\phi. \quad (3)$$

借助于相同的数学步骤，从牛顿的引力定律也可以得出一组形式上完全相同的场方程。但引力场论与电磁场论的相似性只能到此为止。

在电动力学中，上面三个方程各自被推广成一组“时变方程”，每一组时变方程都可以表成一个四维时空的张量方程。

(1)式被推广为

$$\nabla_\mu F^{\lambda\mu} = \mu_0 J^\lambda, \quad (4)$$

其中 $\nabla_\mu$ 是偏导符号 $\frac{\partial}{\partial x^\mu}$ 的略写， $F^{\lambda\mu}$ 是电磁场的强度，它是一个二阶张量； $J^\lambda$ 是电荷密度与电流密度组成一个四维时空的一阶张量（矢量）。

(2)式被推广为

$$f^\lambda = F^{\lambda\mu} J_\mu, \quad (5)$$

其中 $f^\lambda$ 是电磁力（洛伦兹力）密度与电功率的密度组成的矢量。

(3)式被推广为

$$F_{\mu\nu} = \nabla_\mu A_\nu - \nabla_\nu A_\mu, \quad (6)$$

其中 $A_\lambda$ 是电磁势矢量。

到了这一发展阶段，电磁场论的公式不能再移植到引力场论中去。

因为电磁场的场源 $J_\mu$ 是一个一阶张量，而引力场的场源 $T^{\mu\nu}$ 即能量动量密度则是一个二阶张量，引力场的场源比电磁场的场源是高一阶的张量。根据张量分析，引力场张量也应该比电磁场张量高一阶。对比电荷电流激发电磁场的规律(4)式，我们得到：

D. 引力场的强度由一个三阶张量 $L^\lambda_{\mu\nu}$ 表示，存在普适常量 $\beta$ ，使得物质激发引力场的规律表成

$$\nabla_\lambda L^\lambda_{\mu\nu} = \beta T_{\mu\nu} \quad (7)$$

这是(1)式在引力场论中的推广。

另一方面，对比电磁学中的(5)式，我们得出如下引力作用于物质的规律：

E. 引力密度 $f^\lambda$ 与能量动量张量 $T^{\mu\nu}$ 满足如下关系

$$f^\lambda = L^\lambda_{\mu\nu} T^{\mu\nu} \quad (8)$$

这是(2)式在引力场论中的推广。

现在，还得找出一个表示引力场与引力势之间的关系的公式，它是(3)式的推广，对应于电磁场论的(6)式。为此，我们转向另一思路。

## 5. 等效原理与引力场论

放弃了把参照系等同于“刚性标架”的狭隘观点，就可以把等效原理表述为命题C。下面，我们给出能导出命题C的基本假设。

首先，把命题E应用于单个质点可得出结论：对于洛伦兹坐标系（惯性系；笛卡尔坐标），一个质点在引力场 $L^\lambda_{\mu\nu}$ 中的运动方程为

$$\frac{d^2 x^\lambda}{d\tau^2} = L^\lambda_{\mu\nu} \frac{dx^\mu}{d\tau} \frac{dx^\nu}{d\tau} \quad (9)$$

其次，根据惯性场论，可得出两个结论：

结论一：对于一个惯性力场为 $\Gamma^\lambda_{\mu\nu}$ 的加速系，(9)式作为张量方程仍然成立，但有两点改变，其一是增加了一项惯性力，从而方程变为：

$$\frac{d^2 x^\lambda}{d\tau^2} = (L^\lambda_{\mu\nu} - \Gamma^\lambda_{\mu\nu}) \frac{dx^\mu}{d\tau} \frac{dx^\nu}{d\tau}; \quad (10)$$

其二是方程的协变性改变了：(9)式具有“洛伦兹协变性”，而(10)式则具有“准洛伦兹协变性”。

结论二：对于任意加速系，惯性力场张量与加速系的“度规张量”满足关系：

$$\Gamma^\lambda_{\mu\nu} = \frac{1}{2} g^{\lambda\rho} (\nabla_\mu g_{\nu\rho} + \nabla_\nu g_{\rho\mu} - \nabla_\rho g_{\mu\nu}) \quad (11)$$

从这一结论可以看出，“度规”是惯性力场的“势”。

再次，对比惯性力场的“势”，我们可以把命题C追溯到如下两个前提：

前提一，引力势是一个二阶张量，引力场与引力势的关系是

F. 如果一个引力场 $L^\lambda_{\mu\nu}$ 的引力势是 $\Phi_{\mu\nu}$ ，则有

$$L^\lambda_{\mu\nu} = \nabla_\mu \Phi_{\nu\lambda} + \nabla_\nu \Phi_{\lambda\mu} - \nabla_\lambda \Phi_{\mu\nu} \quad (12)$$

前提二，对于引力场的“特征参照系”，其引力势 $\Phi_{\mu\nu}$ 与度规张量 $g_{\mu\nu}$ 有如下关系：

$$\Phi_{\mu\nu} = \frac{1}{2} g_{\mu\nu} \quad (13)$$

最后，命题C可推导如下：

根据(12)式，引力势为 $\Phi_{\mu\nu}$ 的引力场张量可表成

$$L^\lambda_{\mu\nu} = g^{\lambda\rho} L_{\rho\mu\nu} = g^{\lambda\rho} (\nabla_\mu \Phi_{\nu\rho} + \nabla_\nu \Phi_{\rho\mu} - \nabla_\rho \Phi_{\mu\nu}) \quad (14)$$

这一方程对任意参照系成立。对于特征参照系，根据(13)式，它给出

$$L^\lambda_{\mu\nu} = \frac{1}{2} g^{\lambda\rho} (\nabla_\mu g_{\nu\rho} + \nabla_\nu g_{\rho\mu} - \nabla_\rho g_{\mu\nu}) \quad (14)$$

(11)式与(14)式给出结论：对于引力场 $L^\lambda_{\mu\nu}$ 的特征参照系，有

$$\Gamma^\lambda_{\mu\nu} = L^\lambda_{\nu\mu}$$

根据这一等式与(10)式，命题C成立。

我们看到，除了惯性场论和关于引力势的基本假设以外，导出命题C还需要(8)式。因此，沿着等效原理的思路，也能追溯到命题E。

## 6. 自然引力论

上面，我们借助于“从特殊到一般”的逻辑推理，一方面从与电磁学的比较得到命题 D 和 E，另一方面从等效原理得到命题 E 和 F。有了命题 D、E 和 F，就可以展开一个新的引力场论，我们称它为“自然引力论”。

或许，还可以通过其他途径得到这三个命题，从而得出自然引力论。但对于我们来说，只有通过与电磁学的比较才能得到命题 D，只有通过等效原理才能得到命题 F，因此上面的两条途径缺一不可。

除了应用了命题 A 和命题 B 这两个错误的前提以外，广义相对论的另一不足之处就是单纯从等效原理一个方面探索引力场论，忽视了从张量分析的角度对比引力场与电磁学的途径，因此在建立广义相对论的过程中，爱因斯坦为寻觅物质激发引力场的规律而绞尽脑汁，他用了十年的时间才终于找到的“爱因斯坦方程”。这一过程不是从特殊的一般的逻辑推理，而是纯粹靠玄思冥想创造的奇迹。在我们看来，这是一种误入歧途的科学探索方式。

$$(1) \text{ 式和 } (3) \text{ 式给出静电学的泊松方程} \quad \Delta\phi = -\frac{\rho}{\epsilon_0} \quad (15)$$

在电磁学中，(15)式被推广为

$$\square A^\lambda = -\mu_0 J^\lambda, \quad (16)$$

其中

$$\square \equiv g^{\mu\nu} \nabla_\mu \nabla_\nu = \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} + \frac{\partial^2}{\partial z^2} - \frac{1}{c^2} \frac{\partial^2}{\partial t^2}.$$

从(7)式和(11)式可以导出引力势满足的如下“广义波动方程”：

$$\nabla^\lambda (\nabla_\mu \Phi_{\nu\lambda} + \nabla_\nu \Phi_{\lambda\mu} - \nabla_\lambda \Phi_{\mu\nu}) = \beta T_{\mu\nu}. \quad (17)$$

这一方程是(15)式在引力场论中的推广，对应于电磁学的(16)式。爱因斯坦方程相当于(17)式，但(17)式是一个惯性场论的公式，而爱因斯坦方程则是一个黎曼几何的公式，两者迥然不同。

上面诸式可以分为两类，(7)式、(8)式、(9)式、(11)式和(17)式对惯性系成立，从而对洛伦兹变换保持协变。而(10)式和(12)式等涉及等效原理和特征参照系等概念的公式，只不过是建立新的引力大厦而支起的手足架，没有必要保留在已经建成的大厦之中。

从逻辑的角度来看，自然引力论与广义相对论相比，具有如下优势：

第一，广义相对论与等效原理的关系复杂而暧昧，而从自然引力论可以导出等效原理。

第二，广义相对论作为一个引力场论，却没有一个“引力场张量”的概念，这无异于一个电磁场论没有“电磁场张量”的概念，怎么说都是难以令人满意的；而自然引力论则自始至终以引力场张量为中心，在这一点上，它与牛顿引力理论紧密衔接。

第三，尽管许多物理学家对广义相对论赞不绝口，但也有人略有微词，例如，波恩就说过：“广义相对论的形式复杂得可怕。”这很难说是它的优点。无论如何，广义相对论的古怪结构与物理学的其他分支格格不入是不争的事实。而自然引力论的数学结构简单，与自然界的其他场论相比并没有特别迥异之处。

## 7. 结束语

物理学是一门实验的科学，“自然引力论”与广义相对论孰优孰劣，终究取决于实验。但是，广义相对论明显地违背逻辑。我们相信，实验的结果与逻辑的结果终究会是一致的。

## An Examination on Gravitation

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**Abstract:** It is pointed out that there are two arguments in general relativity do not hold true, one is that the inertia force and the gravitation are indistinguishable; the other is that the inertia force and the gravitation cannot cancel out each other. Also, on the basis of inertia field theory, through the comparison between the electromagnet force and gravitation as well as through the equivalent principle that has been reformulated, a new gravitation field theory with the following characters is developed. Firstly, equivalent principle is its logical outcome; secondly, by means of the concept of “gravitation field tensor”, it is connected closely with Newton’s law of gravitation; thirdly, its theory structure is simple and nature, without especially different mathematical instruments in comparison with the other physical forces.

[ 谭天荣 . 对万有引力的再考察 . Academia Arena 2010;2(11):41-46]. (ISSN 1553-992X). (<http://www.sciencepub.net>).

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***Klebsiella* sp has taken lead among uropathogens in outpatients of University of Benin Teaching Hospital, Benin City. Nigeria-An observation**

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**Abstract:** Against the background of reports of changes in the prevalence of uropathogens, this study aimed to determine the prevalence of asymptomatic bacteriuria among out-patients of a tertiary hospital, the most prevalent uropathogen, and the distribution of uropathogens among both genders. Clean-catch midstream urines were collected from 1,011 out-patients consisting of 412 males and 599 females. Significant bacterial isolates were identified in the urine samples using standard techniques. Female patients had significantly higher prevalence of asymptomatic bacteriuria ( $p < 0.05$ ). *Klebsiella* sp was the most common uropathogen (33.3%) as well as in both genders of patients. Other pathogens recovered includes *Escherichia coli* (32.3), *Staphylococcus aureus* (17.6%), *Candida albicans* (7.5%), Coagulase negative *staphylococcus* (3.9%), *Proteus* sp (3.2%), *Enterococcus faecalis* (1.1%), *Pseudomonas* (0.7%) and *Providencia* sp (0.4%). An overall prevalence of (27.6%) of asymptomatic bacteriuria was found and *Klebsiella* sp was the predominant uropathogen in both genders of out-patients.

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**Keywords:** Asymptomatic bacteriuria, prevalence, uropathogens, *Klebsiella*, outpatients

## INTRODUCTION

Urinary tract infections (UTI) are among the most common conditions causing individuals to seek medical care (Aiyegoro *et al.*, 2007). They are also among the most common bacterial infections in humans, both in the community and hospital settings occur in all age groups, in both genders, and usually require urgent treatment (Orret *et al.*, 2006). Urine is the most received and processed specimen in a clinical microbiology laboratory (3) and *Escherichia coli* has been reported as the most prevalent aetiological agent (Aiyegoro *et al.*, 2007; Orret *et al.*, 2006; Boyko *et al.*, 2005; Hynierwicz *et al.*, 2001). In 2003, *Pseudomonas aeruginosa* was reported as the predominant isolate causing asymptomatic UTI among residents of Zaria, Nigeria (Ehinmidu, 2003). Against this background, this study reports on the rising incidence of *Klebsiella* sp as a major pathogen of urinary tract infection among out-patients attending various clinics in university of Benin teaching hospital in Benin City, Nigeria.

## Materials and methods

## Study population

The study was carried out at the University of Benin Teaching Hospital; Benin City, Nigeria from February to June 2010. A total of 1,011 patients were studied. The study subjects were out-patients attending various clinics. Exclusion criteria included signs and symptoms of UTI, antibiotic usage within one week and large fluid in-take prior (less than one hour) before clinic attendance. Verbal informed consent was obtained from all patients prior to specimen collection. Approval for the study was given by the Ethical Committee of the University of Benin Teaching Hospital.

## Specimen collection and processing

Clean-catch midstream urine was collected from each patient into a sterile screw-capped universal container, containing a few crystals of boric acid as preservative. The specimens were mixed, labeled and transported to the laboratory for processing. A loop-full (0.001mL) of well mixed un-centrifuged urine was streaked onto the surface of blood agar and cystine lactose electrolyte deficient



(CLED) medium (M6: Plasmatec Laboratories, United Kingdom). The plates were incubated aerobically at 37°C for 24 hours and counts were expressed in colony forming units (CFU) per milliliter (mL). A count of  $\geq 10^5$  CFU/mL was considered significant to indicate asymptomatic bacteriuria. Ten mL of each well-mixed urine sample was centrifuged at 2000g for 5 minutes. The supernatant was discarded and a drop of the deposit was examined microscopically at high magnification for pus cells, red blood cells, epithelial cells, casts, crystals yeast-like cells and *Trichomonas vaginalis*. Pus cells  $\geq 5$  per high power field were considered significant to indicate infection. The isolates were

identified by standard microbiological methods (Cowan and Steel, 1974). Statistical analysis was by the Chi (X<sup>2</sup>) square test. A p value of  $<0.05$  was deemed statistically significant.

## RESULT

A total of 279 microbial isolates were recovered and *Klebsiella sp* was the most predominant isolate (table 1). Table 2 shows the distribution of uropathogens among gender. With the exception of *Pseudomonas sp*, *Enterococcus faecalis* and *Providencia sp* females had a higher prevalence of uropathogens ( $p < 0.05$ ).

Table 1: Microbial isolates from urinary tract infections among out-patients in UBTH

Microbial Isolates	No of Isolates	%
<i>Escherichia coli</i>	90	32.3
<i>Staphylococcus aureus</i>	49	17.6
<i>Proteus sp</i>	9	3.2
<i>Klebsiella sp</i>	93	33.3
<i>Coagulase negative staphylococcus</i>	11	3.9
<i>Enterococcus faecalis</i>	3	1.1
<i>Pseudomonas sp</i>	2	0.7
<i>Providencia sp</i>	1	0.4
<i>Candida albicans</i>	21	7.5

**279**

Table 2: Gender related prevalence of uropathogens among outpatients in UBTH

Microbial Isolates	No of Isolates	males (%)	Female (%)
<i>Escherichia coli</i>	90	19 (6.8)	71(25.4)
<i>Staphylococcus aureus</i>	49	22 (44.9)	27 (55.1)
<i>Proteus sp</i>	9	4 (44.4)	5 (55.6)
<i>Klebsiella sp</i>	93	21 (22.6)	72 (77.4)
<i>Coagulase negative staphylococcus</i>	11	1 (9.1)	10 (90.9)

<i>Enterococcus faecalis</i>	3	2 (66.7)	1 (33.3)
<i>Pseudomonas sp</i>	2	0 (0)	2 (100)
<i>Providencia sp</i>	1	1 (100)	0 (0)
<i>Candida albicans</i>	21	2 (9.5)	19 (90.5)

**P < 0.05**

### Discussion

Several reports exist, indicating changes in the prevalence of uropathogens (Ehinmidu, 2003; Akinloye *et al.*, 2006). Against this background, this study focused on determining the prevalence of AB among out-patients of a tertiary hospital as well as to determine the most prevalent uropathogen and the distribution of uropathogens among genders of the study population. Our study showed a prevalence of AB of 27.6%.

The finding that females had higher prevalence of AB than males agrees with earlier studies (Anochie *et al.*, 2001). Aiyegoro *et al.*, 2007). Women are more prone to UTIs than men because in females, the urethra much shorter and closer to the anus than in males, (Akinloye *et al.*, 2006) and they lack the bacteriostatic properties of prostatic secretions. In young sexually active women, sex is the cause of 75—90 % of bladder infections, with the risk of infection related to the frequency of sex (Nicolle, 2008). The term "honeymoon cystitis" has been applied to this phenomenon of frequent UTIs during early marriage.

A total of 279 isolates were recovered from 213 specimens with asymptomatic bacteriuria, indicating mixed infections in some patients. *Klebsiella species* was generally, the most common isolate in the patients. Also, was the most prevalent isolate in both genders.

The most common organism implicated in UTIs (80—85 %) is *E coli* (Nicolle, 2008) the reason for this observed change cannot be clearly explained. *Klebsiella* are ubiquitous in nature. In humans, they may colonize the skin, pharynx, or gastrointestinal tract. They may also colonize sterile wounds and urine (Einstein, 2000). *Klebsiella* may be regarded as normal flora in many parts of the colon and intestinal tract and in the biliary tract. Oropharyngeal carriage has been associated with endotracheal intubation, impaired host defenses, and antimicrobial use (Nordman *et al.*, 2009).

Infection with *Klebsiella* organisms occur in the lungs, where they cause destructive changes. Necrosis, inflammation, and hemorrhage occur within lung tissue, sometimes producing thick, bloody, mucoid sputum described as currant jelly sputum (Chan *et al.*, 2009). The illness typically affects middle-aged and older men with debilitating diseases such as alcoholism, diabetes, or chronic bronchopulmonary disease (Chan *et al.*, 2009). This patient population is believed to have impaired respiratory host defenses (Hirsch *et al.*, 2005). The organisms gain access after the host aspirates colonizing oropharyngeal microbes into the lower respiratory tract (Hirsch *et al.*, 2009).

*Klebsiella* have also been incriminated in nosocomial infections (Mitford *et al.*, 2008). Common sites include the urinary tract, lower respiratory tract, biliary tract, and surgical wound sites. The spectrum of clinical syndromes includes pneumonia, bacteremia, thrombophlebitis, urinary tract infection (UTI), cholecystitis, diarrhea, upper respiratory tract infection, wound infection, osteomyelitis, and meningitis (Mitford *et al.*, 2008). The presence of invasive devices, contamination of respiratory support equipment, use of urinary catheters, and use of antibiotics are factors that increase the likelihood of nosocomial infection with *Klebsiella species* (Weinsberg *et al.*, 2009).

Extensive use of broad-spectrum antibiotics in hospitalized patients has led to both increased carriage of *Klebsiella* and, subsequently, the development of multidrug-resistant strains that produce extended-spectrum beta-lactamase (ESBL) (Paterson, 2000; Kaye *et al.*, 2000). These strains are highly virulent, show capsular type K55, and have an extraordinary ability to spread (Kaye 2000, Miftode, 2008, Adams-Haduch *et al.*, 2009). Most outbreaks are due to a single clone or single gene (Kaye, 2000); the bowel is the major site of colonization with

infection of the urinary tract, respiratory tract, and wounds (Kaye, 2000).

It should be noted that these observed changes in the prevalence of uropathogens are mostly from Africa as *Escherichia coli* remains the most common aetiological agent in North America (Drew *et al.*, 2005). This may indicate that these changes occur in some geographical locations. The changes may also be transient as they were first reported in 1969 (Okubadejo *et al.*, 1969; Philips *et al.*, 1969) and later in 2003 and 2006 (Ehinmidu, 2003; Akinloye *et al.*, 2006). However, these will require further investigations to verify.

The observed changes in this study have serious implications as most clinicians treat patients without recourse to laboratory guidance (Orret *et al.*, 2006). Such treatments are usually based on known aetiological agents and susceptibilities. This observed change in the prevalence of uropathogens may lead to change in antimicrobial susceptibility and ineffective treatment. Therefore, clinicians should rely on laboratory guidance before therapy as this will overcome the problem of mistreatment and reduce the emergence of resistant uropathogens. In conclusion, our study revealed a prevalence of 27.6% of AB among out-patients of University of Benin Teaching Hospital, Benin City. *Klebsiella sp* was the most prevalent uropathogen among the patients. Further studies are needed to ascertain if this change in the prevalence of uropathogens are transient and restricted to certain geographical locations.

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**The Complete Demonstrations To Our Universe Impossible To Be Created From Singularity****====Part 2: Our Universe Didn't Come From Singularity====**

《Our Universe Was Originated From Planck Era, Not From Singularity Or The Big Bang Of Singularity . Just The Birth And Combinations Of Very Large Amount Of Minimum BHs  $M_{bm} = m_p = 1.09 \times 10^{-5}g$  Created Our Universe And Its Continuous Expansion Until The Present.》

对宇宙起源的新观念和完整论证:宇宙不可能诞生于奇点 (下篇)

==== 我们宇宙诞生于在普朗克领域Planck Era新生成的大量原初最小黑洞 $M_{bm} \equiv m_p$   
 $= (\hbar c / 8\pi G)^{1/2} \equiv 1.09 \times 10^{-5}g$  的合并, 而不是“奇点”或“奇点的大爆炸”====

June/2010

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**【Abstract】** . In this article, based on some general laws of astronomy, physics and many classical theories, the calculated results can prove that our present expansive Universe was impossibly born from Singularity or from the Big Bang of Singularity but from the Big Crunch of pre-universe in Plank Era. According to the principle of time symmetry, suppose before the birth of our universe, there could be a final Big Crunch of pre-universe. Once the final Big Crunch of pre-universe reached to Planck Era, i.e. time  $t \leq [k_1 (2G\kappa)/C^5]^{2/3} (3c)$ ,  $t = -0.5563 \times 10^{-43}s$  and temperature  $T = 0.734 \times 10^{32}k$ , every Planck particle ( $m_p$ ) simultaneously reached 3 states: 1. Reached Planck Era; 2. The gravitational linkage between the closest particles broke off and the collapse stopped at the state of no gravity; 3. Every particle ( $m_p$ ) at that moment would exactly become a minimum gravitational black hole ( $M_{bm} = m_p = 1.09 \times 10^{-5}g$ ). Just those 3 states could effectively stop pre-universe continuously collapse to singularity, and let all  $M_{bm}$  explode in Planck Era. The strongest explosions of every  $M_{bm}$  in whole pre-universe synchronously formed a so-called the Big Bang. After that, the new and bigger  $M_{bmn} = 2M_{bm}$  of longer lifetime could certainly occurrence due to decrease in density and temperature caused by the Big Bang. Newborn  $2M_{bm}$  became the embryos of our present universe. It was the process of genesis of our present Universe. The collisions and combinations of all newborn  $M_{bmn} = 2M_{bm}$  would create an “Original Inflation”, and form the present expansion of our universe. The whole process changed from the disappearance of old pre-universe to the genesis of new universe in Plank’s Era was not reversible. Other important conclusions got in this article are those: Our universe has been a real universal black hole (UBH), which accords with all laws of general black holes (BH); Hubble law is just the expansive law of our universe to plunder energy-matters outside; the new and simple explanations and demonstrations to ” Original Inflation”, etc.

[Dongsheng Zhang. **The Complete Demonstrations To Our Universe Impossible To Be Created From Singularity**. Academia Arena 2010;2(11):52-71]. (ISSN 1553-992X). (<http://www.sciencepub.net>).

**【Key words】** . the genesis of our universe; singularity; the Big Bang; black holes (BH); cosmology; minimum gravitational black holes ( $M_{bm}$ ); Original Inflation; Planck Era; Planck particle ( $m_p$ ); Hawking quantum radiations (HQR);

**【1】** . The Laws and formulas of Our Universal Evolution.

The laws of our universal evolution can be simply and precisely described by two different methods, which are based on the achievements of modern physics and astro-cosmology.<sup>[3][4][2]</sup>

First, Figure 1 specifies the numerical values of time (t) corresponding to Temperature (T) at different time in our universe’s evolution.<sup>[3][4][2]</sup>

Second, Formulas (1a) below precisely describes our universe’s evolution relevant from the Big Bang to Radiation Era in Figure (1), (from  $t = 10^{-43}s$  to  $t = 1/3 \times 10^6$  years).<sup>[3][4][2]</sup>

$$Tt^{1/2} = k_1, \quad [4][3], \quad R = k_2 t^{1/2}, \quad RT = k_3, \quad R = k_4 \lambda \quad (1a)$$

t—Characteristic Expansion Time, T—Temperature of Radiations, R— Characteristic Size or Dimension of the Universe,  $\lambda$ --Wavelength of Radiation,  $k_1, k_2, k_3, k_4$ —Constants,

Formula (1b) below precisely describes our universe's evolution relevant within the Matter-Dominated Era in Figure 1, (from  $t = 1/3 \times 10^6$  years to the present).<sup>[3][4][2]</sup>

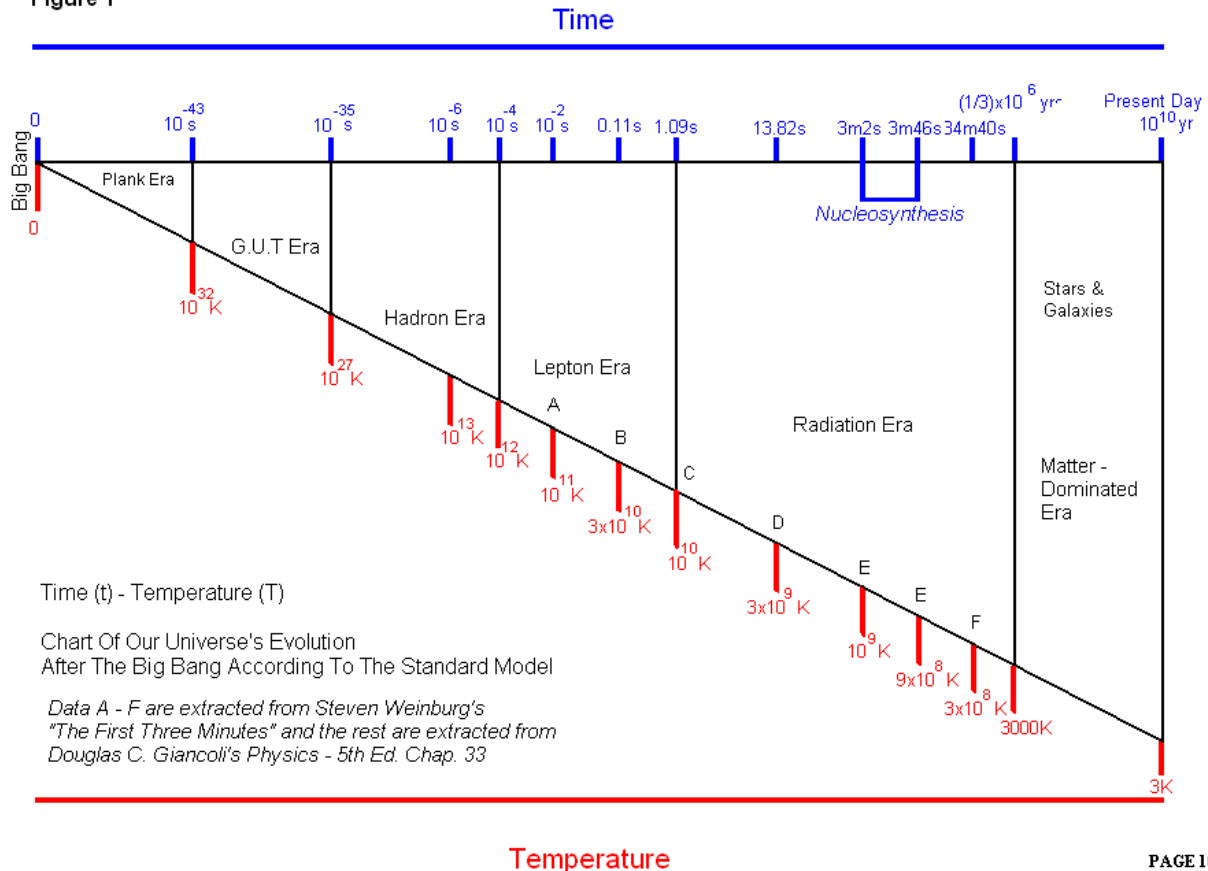
$$Tt^{2/3} = k_6, \quad [4][3] \quad R = k_7 t^{2/3}, \quad RT = k_8, \quad R = k_9 \lambda \quad (1b)$$

$k_6, k_7, k_8, k_9$  – Constants

$R = k_2 t^{1/2}$  in Formulas (1a) and  $R = k_7 t^{2/3}$  in (1b) conform to cosmological principle, Newton's Mechanics and modern observations.

Right now, it has not been known all problems in Planck Era on the top of Figure 1 below by modern sciences, such as the micro structure, physical states and characters, the genesis of our universe in that Era. This article will describe and prove the mechanism of our universe born out from Planck Era.

Figure 1



For example, in Matter-Dominated Era, the numerical values below calculated out from Formula (1b) accord with the values on Figure 1 above.

$$R_1/R_2 = (t_1/t_2)^{2/3}, \quad [3][4][6] \quad R_1 T_1 = R_2 T_2, \quad R_1/R_2 = \lambda_1/\lambda_2,$$

When  $t_1 = (13 \times 10^9 \text{ yrs})$  to  $t_2 = (4.0 \times 10^5 \text{ yrs})$ ,  $t_1/t_2 \approx 32,500$ ,  $(t_1/t_2)^{2/3} \approx 1,000$

$$R_1/R_2 = (12 \times 10^{27} \text{ cm}) / (12 \times 10^{24} \text{ cm}) \approx 1,000$$

$$T_1/T_2 = 3\text{K} / 3,000\text{K} \approx 1/1,000, \quad \lambda_1/\lambda_2 = 0.1\text{cm} / 10^{-2}\text{cm} \approx 1,000,$$

From the beginnings of the Matter-Dominated Era to the present, the numerical values show that, as time (t) in the universal evolution enlarged 32,500 times, its size (R) enlarged 1,000 times, its radiant temperature (T) decreased 1,000 times, and wavelength ( $\lambda$ ) of radiation increased in 1,000 times. The results above are consistent with the modern observations and MBR (Microwave Background Radiation).

**【2】** . About some essential natures and laws of black holes (BH), They must be obeyed by our universal black holes (UBH).<sup>[1]</sup> (see Part 1—<black holes> of this article in detail about the essential attributes of BHs)

1\*. The minimum BH--  $M_{bm}$ : According to Hawking radiation law of BHs and Schwarzschild special solution to GTRE and other classical formulas, the relationship of many physical parameters on the event horizon (EH) of BHs can be got as below:  $M_b$  -- mass of a BH,  $T_b$  --temperature on EH of BH,  $m_{ss}$  --mass of Hawking quantum radiation (HQR) on BH,  $R_b$  -- EH of a BH,  $h$ —Planck constant =  $6.63 \times 10^{-27} \text{g} \cdot \text{cm}^2/\text{s}$ ,  $C$  —light speed =  $3 \times 10^{10} \text{cm/s}$ ,  $G$  --gravitational constant =  $6.67 \times 10^{-8} \text{cm}^3/\text{s}^2 \cdot \text{g}$ , Boltzmann constant  $\kappa = 1.38 \times 10^{-16} \text{g} \cdot \text{cm}^2/\text{s}^2 \cdot \text{k}$ ,  $m_p$  -- Planck particle,  $L_p$  ---Planck length,  $T_p$  ---Planck temperature,

Hawking temperature formula on the event horizon (EH) of BH,

$$T_b = (C^3/4GM_b) \times (h/2\pi\kappa) \approx 10^{27}/M_b, \quad (2a)$$

Formula of energy transformation (i.e. gravitational energy can transfer into radiation energy through valve temperature) on EH of BH,

$$m_{ss} = \kappa T_b / C^2 \quad (2b)$$

According to Schwarzschild special solution to GTRE,

$$GM_b/R_b = C^2/2 \quad (2c)$$

From (2a) and (2b),

$$m_{ss} M_b = hC/8\pi G = 1.187 \times 10^{-10} \text{g}^2 \quad (2d)$$

Formula (2d) is a general law effective on any EH of BHs. Furthermore, according to axiom of any part  $\cong$  the whole,  $m_{ss}$  is impossible  $> M_b$ , at the limited condition, the maximum  $m_{ss}$  = the minimum  $M_b$ , so,  $M_{bm}$  --minimum BH,

$$m_{ss} = M_{bm} = (hC/8\pi G)^{1/2} = 1.09 \times 10^{-5} \text{g} \quad (2e)$$

Owing to  $(hC/8\pi G)^{1/2} \equiv m_p$ , <sup>[1][6]</sup> so,

$$m_{ss} = M_{bm} = (hC/8\pi G)^{1/2} \equiv m_p \equiv 1.09 \times 10^{-5} \text{g} \quad (2f)$$

$$R_{bm} \equiv L_p \quad (2g) \quad (Gh/2\pi C^3)^{1/2} \equiv 1.61 \times 10^{-33} \text{cm}$$

$$T_{bm} \equiv T_p \quad (2h) \quad (6.71 \times 10^{32} \text{k})$$

$$R_{bm} m_{ss} = h/(4\pi C) = 1.0557 \times 10^{-37} \text{cmg} \quad (2i)$$

The best important conclusion: When a BH could get into the gravitational collapse because of emitting Hawking quantum radiations (HQR) after engulfing all energy-matters outside, it would continuously shrink its size  $R_b$ , lose mass  $M_b$ , increase in  $T_b$ , and  $m_{ss}$  finally become a perfect minimum BH--  $M_{bm}$  equal to Planck particle--  $m_p$ , so,  $M_{bm} = m_{ss} = (hC/8\pi G)^{1/2} \equiv m_p$ , and explode and disappear in Planck Era,

2\*. From formula (2i) below, an essential nature of BHs is that, once a BH was formed, no matter whether it absorbs in or radiates out energy-matters, or collides with other BHs, it will only be a BH forever until it finally contracts to a minimum BH—  $M_{bm} \equiv m_p$ . In other words, every BH to its owning, losing out and taking in energy-matters knows very clearly, and the event horizon (EH) as a precise recorder can revise its size at any moment as to suit the change of energy-matters in BH.

$$2G M_b = C^2 R_b \quad (2c)$$

$$2G dM_b = C^2 dR_b \quad (2j)$$

If there is another BH— $M_{ba}$  to collide or combine with  $M_b$ , so,

$$2G M_{ba} = C^2 R_{ba} \quad (2k)$$

Formulas (2j) + (2k) + (2c), then,

$$2G(M_b + dM_b + M_{ba}) = C^2(R_b + dR_b + R_{ba}) \quad (2l)$$

3\*. The reasons of  $M_{bm} \equiv m_p$  must explode, disintegrate and disappear in Planck Era.

Owing to once  $M_{bm} < (hC/8\pi G)^{1/2} \equiv m_p \equiv 1.09 \times 10^{-5} \text{g}$ , its  $m_{ss} < 1.09 \times 10^{-5} \text{g}$ , so,  $m_{ss} M_b < hC/8\pi G < 1.187 \times 10^{-10} \text{g}^2$ , it violates formula (2d), which is the general law of BHs.

Furthermore, according to Uncertainty Principle,

$$\Delta E \times \Delta t \approx h/2\pi \quad (2m)$$

To  $M_{bm}$ ,  $\Delta E = M_{bm} C^2 = \kappa T_b = 10^{16} \text{erg}$ ,

$\Delta t = \text{Compton time} = R_{bm}/C = 1.61 \times 10^{-33}/3 \times 10^{10} = 0.537 \times 10^{-43}$ .

$\Delta E \times \Delta t = 10^{16} \times 0.537 \times 10^{-43} = 0.537 \times 10^{-27}$ , but  $h/2\pi = 6.63 \times 10^{-27}/2\pi = 1.06 \times 10^{-27}$ ,

Obviously,  $\Delta E \times \Delta t < h/2\pi$ , it violates Uncertainty Principle. Thus,  $M_{bm}$  could impossibly exist, but only disintegrate and vanish in Planck Era, so, it has no way to contract to singularity.

**【3】**。 The Transitive Condition Occurred from Big Crunch of Pre-universe to Big Expansion of Present Universe. Based on the principle of time symmetry, suppose the final collapse of pre-universe obeyed the same expansive law of our newborn universe.

From formulas (1a), (2b),  $R = k_2 t^{1/2}$ , when pre-universe contracted its size (R) to the Big Crunch, correspondingly its Temperature (T) would increase, and its time (t) would too much shorten. At an extreme circumstance, when (R) contracted to such an infinitesimal dimension, the real distance between two neighboring particles would finally become greater than the product of (C) (light speed) multiplied by time 2(t). It shows that there would not be time enough to transmit the gravity between neighboring particles. At that moment, all adjacent particles had to instantaneously break off the linkage of gravitational forces and lead the pre-universe to stop contraction and disintegration. No gravity between particles could certainly stop the contraction of particles. Thus, the pre-universe would change its state from the Big Crunch to the Big Expansion caused by the explosions of all  $M_{bm} = m_p$  in “universal package”. The strongest explosions of all  $M_{bm} = m_p$  may be called “the Big Bang” in this article. After that, owing to decrease in density and temperature because of the explosions of old  $M_{bm}$ , the new  $M_{bmn} = 2M_{bm}$  could certainly be formed and become the embryos of our present universe. The combinations of newborn  $M_{bmn}$  created the “Original Inflation” at the genesis of our universe and the present universal expansion. That is the simple process of the birth of our present universe. Such a process is different with the Big Bang at an infinitesimal explosive point of Singularity known by most people. Of course, the detailed process of changing states should be extremely complicated in Planck Era.

The transitive condition occurred from the Big Crunch of pre-universe to the Big Expansion of the present universe is demonstrated by Formula (3) below.

$$d_m \geq C \times [2t], \text{ i. e. } d_m/2C \geq t, -t \leq -d_m/2C, t = r/C \quad (3)$$

t – Characteristic Expansion Time,  $d_m$  – Distance between two closest particles, C – Light Speed =  $3 \times 10^{10}$  cm/s,

$$\text{Let } \rho = \text{energy-matter density g/cm}^3, M = 4\pi\rho R^3/3, \quad (3a)$$

$$H = \text{Hubble's Constant, } H = V/R = 1/t,$$

$$\text{From } 4\pi\rho r^3/3 = m, \text{ and } m = \kappa T/C^2, \quad (2b)$$

$$\therefore t^3 \leq 3\kappa T/4\pi\rho C^5 \quad (3a)$$

$$\text{From } \rho = 3H^2/8\pi G = 3/(8\pi G t^2), \quad (3b)$$

$$\therefore t \leq T(2G\kappa)/(C^5), \quad (3b)$$

$$\text{From (1a), } Tt^{1/2} = k_1 \quad (3ca)$$

$$\therefore t^{3/2} \leq k_1 (2G\kappa)/C^5, \text{ or } t \leq [k_1 (2G\kappa)/C^5]^{2/3} \quad (3c)$$

Formulas (3a), (3b), (3c) are all derived from Formula (3), and have the same value of (t).

Now the numerical value of (t) can be calculated as below. First, select two corresponding values (t) and (T) from Figure 1 into formula (1a) to get value of  $k_1$ , such as take  $t = 10^{-43}$  s, and corresponding to  $T = 10^{32}$  K, from Figure 1, so,

$$k_1 = Tt^{1/2} = 10^{32} \times 10^{-43} \text{ s} = 3^{1/2} \times 10^{10} \approx 1.732 \times 10^{10}, \text{ and from formula (3c),}$$

$$t^{3/2} \leq [(2G\kappa)/(C^5)] \times k_1 = 1.732 \times 10^{10} [(2G\kappa)/(C^5), \quad (3cb)$$

$$G = 6.67 \times 10^{-8} \text{ cm}^3/\text{g s}^2, C = 3 \times 10^{10} \text{ cm/s}, \kappa = 1.38 \times 10^{-16} \text{ g cm/s}^2 \text{ K},,$$

$$t^{3/2} \leq [(2 \times 6.67 \times 10^{-8} \times 1.38 \times 10^{-16}) / (3 \times 10^{10})^5] \times 1.732 \times 10^{10} = 0.075758 \times 10^{-74} \times 1.732 \times 10^{10} \approx 0.1312 \times 10^{-64},$$

$$t^3 = 0.017217 \times 10^{-128} = 0.17217 \times 10^{-129}, \text{ now let } t = t_m \text{ below for convenient calculations,}$$

$$t_m = 0.5563 \times 10^{-43} \text{ s}, \quad (3d)$$

$$\therefore t_m \leq 0.5563 \times 10^{-43} \text{ s}, \text{ and } t_m \geq 0.5563 \times (-10^{-43}) \text{ s}, \quad (3d)$$

Let  $t = t_m$  be the disintegrated time of all particles  $m_m$  and pre-universe. Correspondingly,

$$T_m = k_1/t^{1/2} = 1.732 \times 10^{10} / (0.5563 \times 10^{-43})^{1/2} = 0.734 \times 10^{32} \text{ K}, \quad (3e)$$

mass of a particle  $m_m$  corresponding to above temperature  $0.734 \times 10^{32}$  K:

$$m_m = \kappa T/C^2 = 1.38 \times 10^{-16} \times 0.734 \times 10^{32} / (9 \times 10^{20}) = 1.125 \times 10^{-5} \text{ g}, \quad (3f)$$

$$\rho = 3/(8\pi G t^2) = 0.5786 \times 10^{93} \text{ g/cm}^3, \quad (3g)$$

From formula (3aa), the radius  $r_m$  of  $m_m$ ,

$$r_m = (3m/4\pi\rho)^{1/3} = 1.67 \times 10^{-33} \text{ cm}, \quad (3h)$$

$$d_m = C \times [2t] = 3.34 \times 10^{-33} \text{ cm}, \quad d_m \geq 2 r_m (= 3.34 \times 10^{-33} \text{ cm}) \quad (3i)$$

$$\therefore (d_m \geq 2r_m) \quad (3j)$$

(3j) shows that, the gravitational links between two adjacent particles were surely broken.

The density  $\rho_u$  of the “universal package” formed by infinite particles  $m_m$ ,

$$\rho_u = m_m/d_m^3 = 0.302 \times 10^{93} \text{ g/cm}^3 \quad (3k)$$

( $\rho_u < \rho$ ) shows that, the density of pre-universe had a little decrease due to particles  $m_m$  disintegrated in whole



“universal package”:

$$m_m C^2 = 1.125 \times 10^{-5} \times 9 \times 10^{20} = 1.013 \times 10^{16}, \text{ and } \kappa T = 1.38 \times 10^{-16} \times 0.734 \times 10^{32} = 1.013 \times 10^{16}$$

$$n_m = m_m C^2 / \kappa T = 1 \quad (31)$$

Formula (31) indicates that, in the “universal package”, the Crunched every particle  $m_m$  was a whole particle of no contracting forces inside. In addition, they were the broken gravitational links between adjacent particles  $m_m$  outside. Thus, the only way for all particles  $m_m$  of pre-universe could be only disintegrated into powders with pre-universe together at the highest temperature of  $0.734 \times 10^{32} \text{K}$  in “universal package”,

Conclusions: The calculated values of ( $t \leq 0.5563 \times 10^{-43} \text{s}$ ,  $T = 0.734 \times 10^{32} \text{K}$ ) are almost equal to the beginning values of Planck Era in figure 1. It is said, once the Big Crunch of pre-universe collapsed into particles of above calculated values of ( $m_m = 1.125 \times 10^{-5} \text{g}$ ,  $r_m = 1.67 \times 10^{-33} \text{cm}$ ,  $T_m = 0.734 \times 10^{32} \text{K}$ ), pre-universe reached Planck Era and all particles  $m_m = m_p = M_{bm} = 1.09 \times 10^{-5} \text{g}$ . No gravity is equal to no power for contractions of particles, so, all  $m_m$  could only be disintegrated into rays of the highest energy. and then  $T_m \approx 10^{32} \text{k}$  become the highest temperature in Universe. With no gravity, the only way for the pre-universe and for all particles  $m_m$  had to stop their contraction and then started the expansion. Thus, pre-universe could only disappear in Planck Era, but have no way continuously to collapse to singularity.

Between  $t = -10^{-43} \text{s}$  and  $t = +10^{-43} \text{s}$ , there might be appearance of time ( $t = 0$ ). However, time ( $t = 0$ ) does not signify the presence of Singularity of infinite density at all, since at the virtual point of ( $t = 0$ ), the temperature  $T \approx 10^{32} \text{k}$ ,  $T$  was not infinity. The density  $\rho \approx 10^{92} \text{g/cm}^3 \neq 0$ , and the actual radius of universe  $R \neq 0$ . So, the virtual point of ( $t = 0$ ) was just a bridge from contracted state ( $t = -10^{-43} \text{s}$ ,  $+R$ ) into expanded state ( $t = +10^{-43} \text{s}$ ,  $+R$ ). Above viewpoints let the universal evolution accord with the law of causality and the second law of thermodynamics as well as all classical theories and laws.

Owing to that, the “universal package” was formed by all particles  $m_m$ , their simultaneous disintegrations and explosions in Planck Era could certainly lead the disappearance of pre-universe as well as the space expansion and decrease in density inside. Probably, if people used to consider that, there must be a Big Bang as the genesis of our universe, then, the explosions of all above  $m_m$  and the disappearance of pre-universe might be called the “Big Bang” creating our present universe in this article. As the result, in the sealed “universal package”, the tiny powders of the highest energy caused by exploded  $m_m$  had infinite opportunity to re-collide and re-combine into new particles and new minimum black holes ( $M_{bmn}$ ). The presences of a large amount of new  $M_{bmn}$  could become the embryos of our new universe, their combinations created “Original Inflation” and our present expansive universe.

**【4】**. Minimum Gravitational (Schwarzschild) Black Hole ( $M_{bm}$ ), Planck particles  $m_p$  and particles  $m_m$  above were all the perfect same thing, they came from final collapse of pre-universe. Formulas (4a), (4b), (4c) and (4d) come from formulas (1f), (1g), (1h) and (1i).<sup>[1]</sup>

$$m_{ss} = M_{bm} = (hc/8\pi G)^{1/2} \equiv m_p \equiv 1.09 \times 10^{-5} \text{g} \quad (4a)$$

$$R_{bm} \equiv L_p^{[3]} \equiv (Gh/2\pi C^3)^{1/2} \equiv 1.61 \times 10^{-33} \text{cm} \quad (4b)$$

$$T_{bm} \equiv T_p^{[3]} \equiv 0.71 \times 10^{32} \text{k} \quad (4c)$$

$$R_{bm} m_{ss} = h/(4\pi C) \quad (4d)$$

Let's compare the numerical values between  $M_{bm}$ ,  $m_p$  and  $m_m$ .  $m_m$  was particle of the final collapse of pre-universe in the state of no gravitational linkages between any two adjacent particles.  $M_{bm}$  was the minimum gravitational BHs come from the final collapse of BHs, they would finally become Planck particles  $m_p$ , and explode in Planck Era.<sup>[1]</sup>

Table 1: comparisons of numerical values between  $M_{bm}$ ,  $m_p$  and  $m_m$

$m_m$ of no gravity	$M_{bm}$ -minimum BH	$m_p$ -Planck particles <sup>[3]</sup>
$m_m = 1.125 \times 10^{-5} \text{g}$	$M_{bm} = 1.09 \times 10^{-5} \text{g}$	$m_p = 1.09 \times 10^{-5} \text{g}$
$t_m = \pm 0.5563 \times 10^{-43} \text{s}$	$t_{bm} = 0.539 \times 10^{-43} \text{s}$	$t_p = 0.539 \times 10^{-43} \text{s}$
$T_m = 0.734 \times 10^{32} \text{k}$	$T_{bm} = 0.71 \times 10^{32} \text{k}$	$T_p = 0.71 \times 10^{32} \text{k}$
$r_m = d_m/2 = 1.67 \times 10^{-33} \text{cm}$	$R_{bm} = 1.61 \times 10^{-33} \text{cm}$	$L_p = 1.61 \times 10^{-33} \text{cm}$

It can be seen from table 1, the numerical values of  $m_m$  have a little tolerance with values of  $M_{bm}$  and  $m_p$ . The reasons are that,  $m_m$  comes from formula (3f), but in the derived process, the numerical values of time  $t$  and

temperature  $T$  got from Figure 1 are not very precise. Thus, in reality,  $m_m$  should be completely equal to  $M_{bm}$  and  $m_p$ . So,

$$m_m \equiv M_{bm} \equiv (hc/8\pi G)^{1/2} \equiv m_p \quad (4e)$$

It can be seen from (4e) that, particles  $m_m$  of the final collapse of pre-universe should be the same with minimum BHs-- $M_{bm} \equiv m_p$ . After  $m_m$  became Planck particles  $m_p$ , they could explode and disappear in Planck Era at once with the same results of  $M_{bm} \equiv m_p$ .<sup>[1]</sup>

**【5】** . After pre-universe disappeared in Planck Era, how could our universe be born out from Planck Era?

From (4e), once the final collapse of pre-universe came to Planck Era, all particles  $m_m$  in “universal package” would become minimum BHs--  $M_{bm} \equiv m_p$ , and explode and disappear in Planck Era at once. That explosions could be so-called “the Big Bang” to the genesis of our universe. Energy-matters from pre-universe were the origination forming our universe. It may be said, no death of pre-universe, no energy-matters as the substantial foundation of our new universe.

How could our new universe be born from the ruins of pre-universe in Planck Era? The key problem is that, the waste energy-matters from disintegrated pre-universe could re-gather and re-form to new and stable minimum gravitational (Schwarzschild) BHs--  $M_{bmn}$ .

Once pre-universe finally collapsed into Planck Era, which would have extreme high temperature of  $10^{32}k$  and density of  $10^{93}g/cm^3$  in the sealed “universal package”. When all particles  $m_m \equiv M_{bm} \equiv m_p$  exploded and formed the Big Bang, it could certainly created the space expansion and lowered the temperature and density of “universal package”.

Acceding to Hawking law (5a) of the lifetime  $\tau_b$  of BHs due to emitting Hawking quantum radiations (HQR),  $M_b$ —mass of a BH,  $R_b$ —the event horizon of a BH,  $t_{bc}$ —Compton time, which indicates the necessary time to form a stable BH. The necessary condition to form a new stable minimum BH— $M_{bmn}$  was as below.

$$\tau_b = 10^{-27} M_b^3 \text{ (s)} \quad (5a)$$

$$t_{bc} = R_b/C \quad (5b)$$

$$\tau_b > t_{bc}, \text{ i.e. } 10^{-27} M_b^3 > R_b/C, \text{ from (2c),}$$

$$M_b = M_{bmn} = 2.2 \times 10^{-5} g \text{ (} \approx 2 M_{bm} \text{)} \quad (5c)$$

$$T_b = (C^3/4GM_b) \times (h/2\pi k) \approx 10^{27}/M_b = 0.45 \times 10^{32} k,$$

From (5c) above, a  $M_{bmn} \geq 2.2 \times 10^{-5} g \approx 2 M_{bm}$  can be got. It is said, once the new and original  $M_{bmn} \geq (2.2 \times 10^{-5} g \approx 2 M_{bm})$  were formed and occurred, they could impossibly disappear again and only grow up with absorbing energy-matters of very high density outside or combine to other smaller BHs. How could  $M_{bmn}$  certainly occur? Owing to decrease in density and temperature in “universal package” occurred from the explosions of all particles  $m_m \equiv M_{bm} \equiv m_p$  could lead: 1\*.  $M_{bmn}$  could easily appear from combinations of two or more  $M_{bm} = 1.09 \times 10^{-5} g$  in Planck Era, because decrease in temperature let  $M_{bm}$  have the longer lifetime. 2\*. From (2a) above, lower temperature could more easily form the bigger BHs, so,  $M_{bmn} \approx 2 M_{bm}$  would inevitably and easily be formed and become the stable embryos of our new universe. 3\*. Particles smaller than  $M_{bmn}$  could grow up bigger and then collapse to  $M_{bmn}$  due to absorb energy-matters outside, just as a neutron star absorbs energy-matters enough outside to collapse a BH. 4\*. Particles of mass more than  $M_{bmn}$  but density lower than  $M_{bmn}$  could contract its size to become a real  $M_{bmn}$ . 5\*. In Planck Era of the highest temperature and density, energy and particles could only nonstop instantly transfer each others.

Once a  $M_{bmn}$  was formed, it could nonstop plunder energy-matters of the highest density outside or combine or collide with other  $M_{bmn}$ , and create the “Original Inflation”. It just was the birth of our new universe. Thus, through expansions of  $137 \times 10^8$  years, the combined  $M_{bmn}$  grew up to a gigantic universal black hole (UBH) of  $10^{56} g$ .

Conclusions: The genesis of our universe came from two key and necessary steps. First, the final explosions and disappearance of pre-universe with its all old  $M_{bm} = 1.09 \times 10^{-5} g$  in Planck Era provided the needed energy-matters for our universe and decreased in temperature and density in “universal package”. Second, the new minimum stable BHs--  $M_{bmn} = 2.2 \times 10^{-5} g$  could be formed to become the embryos of our newborn universe. It must be known, only new minimum stable BHs--  $M_{bmn}$  as the embryos of our newborn universe can nonstop plunder

energy-matters outside and lead our universe to grow up bigger and bigger. In a word, no BHs as embryos, no our present gigantic universal BH appears, because only BHs can nonstop plunder energy-matters outside and keep them inside forever. According to the essential nature of BHs stated on above **【2】**, once a BH was formed, it would be a BH forever until it finally contracted to become  $M_{bm} \equiv m_p$  and vanished in Planck Era.

**【6】**. Our present universe is a real gigantic universal black hole (UBH) of  $M_u = 10^{56}g$ . The complete demonstrations are derived as below. The expansion of our universe is the results of collisions and combinations caused by a very large amount of  $M_{bm}$  or  $M_{bmn}$ .

1\*. The real observational numerical values had demonstrated that, our universe is a ball to have various precise and reliable values. A, The real and precise age  $A_u$  of our universe is:  $A_u = 13.7 \times 10^9 \text{ yrs.}^{[8]}$ , then, the event horizon  $R_u = C \times A_u = 1.3 \times 10^{28} \text{ cm}$ , density  $\rho_u = 3/(8\pi G A_u^2) = 0.958 \times 10^{-29} \text{ g/cm}^3$ . so, the total mass of our universe is  $M_u = 8.8 \times 10^{55}g$ . B. Hubble constant is another reliable observational value,  $H_0 = (0.73 \pm 0.05) \times 100 \text{ kms}^{-1} \text{ Mpc}^{-1[9]}$ , as a result, the density of our universe  $\rho_r : \rho_r = 3H_0^2/(8\pi G) \approx 10^{-29} \text{ g/cm}^3$ . The age of our universe is:  $A_r^2 = 3/(8\pi G \rho_r)$ ,  $A_r = 0.423 \times 10^{18} \text{ s} = (13.4 \pm 0.67) \times 10^8 \text{ yrs}$ . The total mass  $M_r = 8.6 \times 10^{55}g$ .

Thus, Mass of our universe has a very precisely observational value. For convenient calculations, let  $M_u = 8.8 \times 10^{55}g$ ,  $A_u = 13.7 \times 10^9 \text{ yrs}$ ,  $R_u = 1.3 \times 10^{28} \text{ cm}$ ,  $\rho_u = 0.958 \times 10^{-29} \text{ g/cm}^3$  below.

2\*. If our present universe is a real gigantic universal black hole (UBH), it certainly came from the collisions and combinations of a very large amount of original  $M_{bmn}$  or  $M_{bm} \equiv m_p = 1.09 \times 10^{-5}g$ , its  $R_{bm} = 1.61 \times 10^{-33} \text{ cm}$ , its  $T_{bm} = 0.71 \times 10^{32} \text{ k}$ , its  $\text{HQR } m_{ss} = 1.09 \times 10^{-5}g$ . Let  $N_{bu}$  is numbers of our present universe  $M_u$  owning  $M_{bm}$ , then,

$$N_{bu} = M_u / M_{bm} = 8.8 \times 10^{55} / 1.09 \times 10^{-5} = 8.0734 \times 10^{60} \quad (6d)$$

If our universe is a real UBH formed from  $N_{bu} \times M_{bm}$ , then,  $N_{bu} = 8 \times 10^{60}$  should be suitable with the same precise proportion of their event horizon as below (if let  $M_{bmn}$  replace  $M_{bm}$ , the same result can be got):

$$N_{bu} = R_u / R_{bm} = 1.3 \times 10^{28} / 1.61 \times 10^{-33} = 8.075 \times 10^{60} \quad (6e)$$

Owing to (6d) = (6e), it demonstrates clearly that,  $M_u$  are actually formed from  $N_{bu} \times M_{bm}$ , and  $M_u$  is a real UBH.

3\*. The Hubble's law of universal expansion is just the expansive law of our UBH due to plunder energy-matters outside.

Apply Hubble's law to the boundary of our universal ball,

$$M_u = 4\pi \rho_o R_u^3 / 3 = 4\pi (3H_0^2 / 8\pi G) C^3 t_u^3 / 3 = 4\pi (3H_0^2 / 8\pi G) C^3 t_u / 3H_0^2 = C^3 t_u / 2 G = C^2 R_u / 2 G \quad (6f)$$

From Schwarzschild solution To GTRE, i.e. formula (2c),  $2G M_b = C^2 R_b$

$$M_b = R_b C^2 / 2 G = C^3 t_{bu} / 2 G = R_{bu} C^2 / 2 G \quad (6g)$$

Right now, owing to  $M_u = M_b$ ,  $t_u = t_{bu}$ , so,  $R_{bu} = R_u$ . So, our universe is a real UBH, and the Hubble's law is just the expansive law of our UBH due to plunder energy-matters outside. When might  $t_u \neq t_{bu}$ ? Once our UBH plunder all energy-matters outside in future, it can no more expand, Hubble law will be no longer effective, then, the universal age  $t_u >$  Compton time  $t_{bu}$  of our UBH.

4\*. So-called "Flatness" ( $\Omega = \rho_r / \rho_o \approx 1$ ) of our universe is really just the essential nature of any BHs included our UBH. Our universe as a real UBH is certainly a sealed giant ball. To any BH, the exact amount of  $\rho_b$  must correspond to an exact amount of  $M_u$ , so,  $\Omega = \rho_r / \rho_o = 1$  is a certain result. Therefore, the argument about ( $\Omega = \rho_r / \rho_o \approx 1$ ) in scientists over 50 yrs is really a false proposition.

Owing to the wrong proposition of ( $\Omega = \rho_r / \rho_o \neq 1$ ), it led a lot of scientists to propose some wrong concepts, such as "Seeking lost energy-matters", "zero energy" and "dark energy", etc. It can be seen from formulas (6d) and (6e), Our UBH has not lost any energy-matters at all, but only has matters not found out.

From now on, if no energy-matters outside to be plundered, our UBH will no more expand, and start to emit HQRs, contract its size very and very slowly. According to Hawking law of lifetime of BHs (5a), the lifetime  $\tau_b$  of our present universe will be about  $\tau_b = 10^{-27} M_b \text{ (s)} = 10^{-27} (8.8 \times 10^{55})^3 \approx 10^{132} \text{ yrs}$ , due to emitting HQRs to finally become  $M_{bm}$  to disappear in Planck Era. If there are energy-matters outside, our UBH will plunder all energy-matters, and then emit HQRs to contract its size. Thus, the lifetime of our UBH will be much longer than  $10^{132} \text{ yrs}$  until it contracts to  $M_{bm}$  and disappears in Planck Era.

**【7】**. In this paragraph, author propose a newest and simplest principle to calculate the mechanism, process and terminal of "Original Inflation". it caused from "combinations of the newborn minimum BHs-- $M_{bm}$ ". Once all  $M_{bm}$  in our universe  $M_u$  were linked together to a "universal package", "Original Inflation" would go to the end, "universal package" had to turn into slower conventional expansion until to the present.

Let  $t_o$  be the time needed by all  $N_{bu} (=8.8 \times 10^{60} \approx 10^{61}) \times M_{bm}$  linking them together in the “universal package” in the newborn period of our universe, the total mass  $M_u$  of our present UBH is  $M_u = 8.8 \times 10^{55} \text{g}$ , which formed and expanded from original minimum BHs--  $M_{bm} \equiv m_p = 1.09 \times 10^{-5} \text{g}$ , i.e.  $M_u = N_{bu} \times M_{bm}$ . Therefore, after “Original Inflation”, our universal expansion was just the completely expansive result of  $N_{ub} \times M_{bb2} = 2.2 \times 10^{40} \times 4 \times 10^{15}$  (7-4)(7-6) through their combinations of  $137 \times 10^8 \text{yrs}$ .

For convenient calculations, let  $M_{bmn} = M_{bm}$ . Now let's know how  $N_{bu} \times (M_{bm} \approx 10^{-5} \text{g})$  could combine them together.  $R_{bm} = 1.61 \times 10^{-33} \text{cm}$  was the event horizon of  $M_{bm}$ . Suppose a newborn  $M_{bm}$  wanted to combine its adjacent companions in (2 or 3) times  $t_{bmc}$ ,  $t_{bmc}$  is Compton time of  $M_{bm}$ ,  $t_{bmc} = R_{bm}/C = 1.61 \times 10^{-33}/3 \times 10^{10} = 5.37 \times 10^{-44} \text{s}$ . In case light (gravity) went through  $2 \times t_{bmc}$ ,  $M_{bm}$  should link with numbers  $N_{bm2}$  of  $M_{bm}$ , so,

$$N_{m2} R_{bm}^3 = (2R_{bm})^3, \therefore N_{m2} = 8 \quad (7a)$$

Formula (7a) shows, when  $t_{bmc}$  prolonged to 2  $t_{bmc}$ ,  $M_{bm}$  would link with other 8  $M_{bm}$ . How long could  $M_{bm}$  link with all  $N_{bu} = 8.075 \times 10^{60}$  of  $M_u (=N_{bu} M_{bm})$ ?

$$N_{bu} = 8.8 \times 10^{60} \approx 10^{61} = (8^{67.5}) \quad (7b)$$

Formula (7b) shows, after original  $M_{bm}$  went through  $(2^{67.5}) \times t_{bmc}$ , all  $N_{bu} (=8^{67.5} \approx 10^{61}) \times M_{bm}$  would be linked together to become an original “universal package” of  $M_u$ . However,

$$(2^{67.5}) \approx (10^{20.3}), \text{ let } n_{o2} = 10^{20.3} \quad (7c)$$

Now, with the same way to get  $N_{m3} = 27$ ,

$$N_{m3} R_{bm}^3 = (3R_{bm})^3, \therefore N_{m3} = 27 \quad (7d)$$

$$N_{bu} = 8.8 \times 10^{60} \approx 10^{61} = (27^{42.6}), \text{ and } (3^{42.6}) \approx (10^{20.3}), \text{ let } n_{o3} = 10^{20.3},$$

$$\therefore n_o = n_{o2} = n_{o3} \approx (10^{20.3}) \quad (7e)$$

From formulas (7a) and (7d), regardless how many times  $t_{bmc}$  could prolong, the needed time to link all  $M_{bm}$  together was the same time--  $n_o \times t_{bmc}$ . However, owing to that, the combinations of all  $M_{bm}$  certainly created the biggest space expansion, it was just “Original Inflation”. According to the essential nature of BHs and formula (2c), in (7a), combinations of 8 same BHs certainly created 8 times space expansion of the event horizon  $R_{bm}$ , so,  $8 = 2^3$ . Under the similar condition, in (7d),  $27 = 3^3$ . It is said, when time from  $t_{bmc}$  prolonged to 2  $t_{bmc}$ , the combined numbers of  $M_{bm}$  was not  $2^3$ , but  $(2^3)^3 = 2^9$ . when time from  $t_{bmc}$  prolonged to 3  $t_{bmc}$ , the combined numbers of  $M_{bm}$  was  $3^9$ .

Furthermore, with the same way to get a general law of  $n_o$ ,

$$\text{Let } N_{mn} = n_o^9, \text{ and } n_o = 10^x \quad (7f)$$

$$\text{But } N_{bu} \approx 10^{61}, \therefore 10^{61} = 10^{9x} \quad (7g)$$

$$x_1 = 61/9 = 6.8, \therefore n_{o1} = (10^{6.8}) \quad (7-1a)$$

Formula (7-1a) shows, under the condition of “Inflation”,  $t_{bmc}$  only needed to prolong  $n_{o1} = 10^{6.8}$  times to link all  $M_{bm}$  together. Now, according to same principle of (7-1a),  $x_2$  and  $n_{o2}$  can be got from (7e), it was the condition of “no Inflation”, it may be called as “conventional expansion”.

$$x_2 = 61/3 = 20.3 \therefore n_{o2} = 10^{20.3} \quad (7-1b)$$

$$\therefore n_{o2} = n_{o1}^3 \text{ or } n_{o2} = 10^{13} n_{o1} \quad (7-1c)$$

1\*. Formulas (7-1a) and (7-1b) indicate that, there could be 2 ways to link all  $M_{bm}$  together in  $M_u$ , the needed time of 2 ways are all decided by value of  $M_u$ .

A. “Original Inflation”:  $t_{o1}$  was time of the end of “Original Inflation”,

$$t_{o1} = t_{bmc} \times n_{o1} = 5.37 \times 10^{-44} \times 10^{6.8} = 0, 2 \times 10^{-36} \text{s} = 2 \times 10^{-37} \text{s}. \quad (7-2a)$$

B. ”conventional expansion”:  $t_{o2}$  was time of the end of ”conventional expansion”,

$$t_{o2} = t_{bmc} \times n_{o2} = 5.37 \times 10^{-44} \times 10^{20.3} = 2 \times 10^{-24} \text{s} \quad (7-2b)$$

$$\therefore t_{o2}/t_{o1} = n_{o2}/n_{o1} = 2 \times 10^{-24}/2 \times 10^{-37} = 10^{13} \quad (7-2c)$$

The event horizon  $R_{bb2}$  or  $R_{bb1}$  of little BHs--  $M_{bb2}$  or  $M_{bb1}$  created after time of  $t_{o2}$  or  $t_{o1}$ ,

$$R_{bb1} = C t_{o1} = 6 \times 10^{-27} \text{cm} \quad (7-3a)$$

$$R_{bb2} = C t_{o2} = 6 \times 10^{-14} \text{cm} \quad (7-3b)$$

$$R_{bb2}/R_{bb1} = 10^{13} = t_{o2}/t_{o1} = n_{o2}/n_{o1} = n_{o1}^2 \quad (7-3c)$$

2\*. From (7-2a) and (7-2b), the newborn  $M_{bm}$  might have 2 ways to link all  $M_{bm}$  in  $M_u$  together and created 2 kinds of great expansions to become to little BH-- $M_{bb2}$  or  $M_{bb1}$ , A. “Original Inflation”: from (7-2a), “Original Inflation” can be considered, the event horizons  $R_{bb1}$  of newborn little BHs--  $M_{bb1}$  made the total

“Inflation” of  $n_{o2}/n_{o1}$  included its conventional expansion, after “Inflation of  $t_{o1} = 2 \times 10^{-37}$  s,  $R_{bb1} \times n_{o2}/n_{o1}$  turned equal to  $R_{bb2} = 6 \times 10^{-14}$  cm, so,  $2 \times 10^{-37}$  s was the end of “Original Inflation”. B. ” conventional expansion”. Through. ” conventional expansion” created by the combinations of all  $M_{bm}$  to form little BHs--  $M_{bb2}$ , after  $t_{o2} = 2 \times 10^{-24}$  s,  $R_{bb2}$  of  $M_{bb2}$  reached to  $6 \times 10^{-14}$  cm.

Conclusions: Above A and B reached the same results to form  $M_{bb2} = M_{bb}$ , and  $R_{bb2} = R_{bb1}$ . The sole difference between both is, “Original Inflation” was prior to ”conventional expansion” to form  $M_{bb1}$ .  $M_{bb1}$  was formed at the end of  $2 \times 10^{-37}$  s, but  $M_{bb}$  at the end of  $2 \times 10^{-24}$  s.

3\*. The other parameters of  $M_{bb1}$  and  $M_{bb2}$ ; known number;  $R_{bb2} = C t_{o2} = 6 \times 10^{-14}$  cm,

$$M_{bb1} = M_{bb2} = 0.675 \times 10^{28} \text{ g} \quad R_{bb2} = 4 \times 10^{15} \text{ g} \quad (7-4)$$

$$\rho_{bb1} = \rho_{bb2} = 3M_{bb2}/(4\pi R_{bb2}^3) = 4.4 \times 10^{54} \text{ g/cm}^3. \quad (7-5)$$

At the time of  $t_{o1} = 0.2 \times 10^{-36}$  s or  $t_{o2} = 2 \times 10^{-24}$  s, density  $\rho_{bb}$  of  $M_u$  was equal to  $\rho_{bb2}$  of  $M_{bb2}$ , the event horizon  $R_{ub}$  of  $M_u$  was:

$$R_{ub} = (3M_u/4\pi\rho_{bb2})^{1/3} = 2.4 \text{ cm} \quad (7-6)$$

$$N_{ub} = M_u/M_{bb2} = 8.8 \times 10^{55}/4 \times 10^{15} = 2.2 \times 10^{40}$$

$$N_{bbm} = M_{bb2}/M_{bm} = 4 \times 10^{15}/1.09 \times 10^{-5} = 4 \times 10^{20} \quad (7-7)$$

4\*. Now, let's study the real conditions of “Original Inflation”. According to the informations and calculations in paragraph 12.7 of 《New Instruction to Astronomy》, [3] from formula (1a)  $R = k_1 t^{1/2}$ ,  $R$  is Characteristic Size the Universe,  $t$  is Characteristic time, at the time of  $t = 10^{-36}$  s, the universal size  $R_{.36} = 3.8$  cm after “Original Inflation”. At that time, the universal density  $\rho_{bbb} = 3.8 \times 10^{53}$  g/cm<sup>3</sup>, the size  $R_{.44}$  of our universe at  $t = 5.37 \times 10^{-44}$ .

$$R_{.36} = 1.83 \times 10^{25} \text{ cm} \times (10^{-36} \text{ s})^{1/2} / (7 \times 10^5 \times 3.156 \times 10^7 \text{ s})^{1/2} = 3.8 \text{ cm}^{[3]} \quad (7-8)$$

$$\rho_{bbb} = 3M_u/(4\pi R_{.36}^3) = 3.8 \times 10^{53} \text{ g/cm}^3^{[3]} \quad (7-9)$$

$$R_{.44} = (3M_u/4\pi\rho_u)^{1/3} = 10^{-13} \text{ cm} \quad (7-10)$$

$$R_{.36}/R_{.44} = 3.8/10^{-13} = 3.8 \times 10^{13} \quad (7-11)$$

Above numerical values about ”Original Inflation” have broad typical case. It pointed out, when  $t = 10^{-36}$  s, the size  $R_{.36}$  of universe increased in  $10^{13}$  times, the volume suddenly rose  $10^{40}$  times.

5\*. Conclusions: A. The universal size 3.8 cm in (7-8), and the universal size 2.4 cm got by author in (7-6) are all after “Inflation” of  $t = 10^{-36}$  s, the numerical values of 3.8 cm and 2.4 cm are very approximate. It indicates that, the mechanism, process and terminal of “Original Inflation” proposed by author are all right, i.e. the combinations of all BHs surely created “Original Inflation”, which terminal was just all BHs in  $M_u$  to be linked together and formed new little BHs— $M_{bb1}$ . B. Owing to “Original Inflation” caused before the universal time of  $t = 10^{-24}$  s, it might impossibly be observed by mankind forever. If “Original Inflation” before  $10^{-36}$  s would be denied in future, the ”conventional expansion” before  $10^{-24}$  s should be recognized. Through calculations in detail in this article, that our universe was come from minimum BHs-- $M_{bm}$  should be a convincing proposition. In reality, ”conventional expansion” was also a “slower Inflation”.

6\*. From Figure 1 of page 2,  $t_o = 0.2 \times 10^{-36}$  s was in GUT Era.

## 【8】. Simple Reviews to Our Universe in the past, at present and in future

Our present universe is a gigantic universal black hole (UBH).

The age of our universe is:  $A_u = 137 \times 10^8$  years,

Schwarz child's radius of universe:  $R_u = 1.3 \times 10^{28}$  cm,

Density  $\rho_u = 3/(8\pi G A_u^2) = 0.958 \times 10^{-29}$  g/cm<sup>3</sup>.

The total mass of our universe is  $M_u = 8.8 \times 10^{55}$  g.

If no energy-matters outside, the lifetime of our present universe may be:  $L_u \approx 10^{132}$  yrs. If there still are energy-matters outside our present universe to be plundered, then,  $L_u \gg 10^{132}$  yrs.

Our universe was born from new  $M_{bm} = (hC/8\pi G)^{1/2} \equiv m_p \equiv 1.09 \times 10^{-5}$  g. The expansion of our universe was originated from the combinations of a large amount  $N_{bu} = 8 \times 10^{60}$  of new  $M_{bm}$ .

The size of our original Universe of  $M_u$  in Planck Era looks like the size of a present proton  $R_{u0} = 1.54 \times 10^{-13}$  cm,

The numbers of proton mass of the Universe are;  $N_{op} = M_u/m_{\text{proton}} = 10^{56}/1.67 \times 10^{-24} \approx 10^{80}$ .

After the end of “Original Inflation” at the universal expansive time of  $0.2 \times 10^{-36}$  s, due to all  $M_{bb}$  in  $M_u$  had linked together, the expansion of our universe was a conventional expansion due to decrease in temperature and density of all ( $N_{bb} = 0.33 \times 10^5$ )  $M_{bb}$ .

Mankind has exactly lived in the gigantic universal black hole (UBH), a great number of small and big black holes have scattered in the boundless universal space.

【9】. The further explanations, analyses and conclusions:

1\*. Singularity is defined a point of infinite density. The conditions of point structure, no resistance (exclusive forces) and universal model of zero pressure in General Theory of Relativity Equation (GTRE) would certainly lead the occurrence of singularity in a contracted ball of definite energy-matters. It was demonstrated from GTRE by S•Hawking and R• Penrose 40 years ago that, our universe was born from singularity or the Big Bang of singularity, and singularity would certainly occur in BHs. In this article, applying Hawking laws about BHs which is based on quantum mechanics and thermodynamics, author has successfully demonstrated and derived out the new and important formula  $(3c)-t^{3/2} \leq k_1(2G\kappa)/(C^5)$ , and calculated out accurately the time (t) of final collapse of pre-universe into Planck Era. Once pre-universe finally collapsed to  $t \approx -0.5563 \times 10^{-43}$ s, all particles in pre-universe became minimum BHs of  $M_{bm} = (hC/8\pi G)^{1/2} \equiv m_p \equiv 1.09 \times 10^{-55}$ g, which could prevent pre-universe continuously to collapse to singularity and create new minimum BHs--  $M_{bmn}$ . The new  $M_{bmn}$  occurred from Planck Era, would become the embryos of our newborn universe, their combinations created our present expansive universe.

2\*. In reality, John & Gribbin pointed out in his book—<Companion To The Cosmos>: “Our universe might originate from such particles--  $M_{bm} \approx 10^{-55}$ g.”<sup><7></sup> “ (Planck Era ) was really the state at genesis of our universe.”<sup><7></sup> In this article, author may just better demonstrated John & Gribbin’s above suppositions with correct Hawking laws about BHs through the more precise calculations.

3\*. Our present universe is a real universal BH (UBH), it completely accords with the laws of general BHs. Hubble law better reflects the expansive law of our universe come from the combinations of original  $M_{bm}$  and to engulf energy-matters outside.

4\*. The “Original Inflation” of our newborn universe was created by the combinations of all adjacent minimum BHs-- $M_{bm}$  of our universe. The end of “Original Inflation” was at universal time  $t_{bb} = 0.2 \times 10^{-36}$ s. That mechanism of “Original Inflation” is firstly proposed and demonstrated in this article.

5\*. Whether our present universe expand or not in future will not be decided by the real density  $\rho_r$ , but only be decided by energy-matters outside the present event horizon of our universe. If there are still energy-matters outside, our universe will continuously expand, and in turn if no energy-matters outside, our universe will contract. Our universe as a UBH,  $\rho_r = \rho_c$  or  $\Omega = 1$  is its essential nature. Therefore,  $\rho_r \neq \rho_c$  or  $\Omega \neq 1$  was a false proposition by the most scientists in the past.

6\*. The four difficult and complicated problems (Singularity, flatness, Event Horizon and magnetic monopole) at the genesis of our universe had troubled scientists for several decades. After author has negated the occurrence of Singularity and proved the flatness is the essential nature of our UBH in this article, the other two problems may be easily solved. Moreover, the new concepts in this article have given the better explanations to “Original Inflation”.

7\*. If the new concepts in this article could exclude the occurrence and existence of Singularity at the genesis of our universe, scientists will not need to beg the marvels or to provide some special original conditions for solving the complicated GTRE in future.

8\*. All numerical values calculated from Hawking theory about BHs and classical theories and its formulas in this article are precisely consistent with the observational results and the real evolutionary process of our universe in Figure 1. Probably, the new concepts in this article may not be accepted and convinced by the most scientists and scholars, because of no abstruse theory, no complicated mathematical equations as well as the old conventions not broken down. However, as a reasonable explanations to the genesis of our universe, new concepts in this article are much better than “Big Bang” of Singularity, because people do not need to be puzzled by uncertain Singularity.

====The End====

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**对宇宙起源的新观念和完整论证:宇宙不可能诞生于奇点(下篇)**  
**==== 我们宇宙诞生于在普朗克领域Planck Era新生成的大量原初最小黑洞 $M_{bm} \equiv m_p$**   
 **$\equiv (hc/8\pi G)^{1/2} \equiv 1.09 \times 10^{-5}g$ 的合并, 而不是“奇点”或“奇点的大爆炸”====**

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笛卡儿：“我们不能依赖他人的权威而接受真理，必须自己寻求。”

**【内容摘要】**：本文根据近代宇宙天文学和物理学的一些基本规律和公式，通过计算所得的数据，证明了我们现在膨胀的宇宙不可能诞生于“奇点”或“奇点的大爆炸”。按照时间对称原理，假设我们宇宙是从前辈宇宙的“大塌缩”而来，其最后的塌缩规律与我们宇宙诞生时的膨胀规律相同，那么，本文中重新推导出前辈宇宙的“大塌缩”公式。(3c)式就是来的最重要的公式，一旦前辈宇宙大塌陷到(3c)， $t \leq [k_1(2Gk)/C^5]^{2/3}$ ，即  $t = -0.5563 \times 10^{-43}$ s秒和宇宙最高温度  $T = 0.734 \times 10^{32}$ k时，前辈宇宙中的每个能量-物质粒子m同时进入3种状态：1. 每个粒子m都与其相邻的粒子因无足够时间传递引力而失去了引力联系以至于无法继续塌缩。2. 每个粒子m都变成成为  $M_{bm} \approx 10^{-5}g$ 的史瓦西最小黑洞。3. 同时进入普朗克领域而成为普朗克粒子  $m_p$ ，于是， $m = M_{bm} = m_p = 1.09 \times 10^{-5}g$ 。正是“宇宙包”内每个粒子m的这3种状态的共同作用，导致所有的m在封闭的“宇宙包”内停止收缩而爆炸解体，并与整个前辈宇宙同步消失在普朗克领域，从而共同阻止了前辈宇宙在普朗克领域继续塌缩成为“奇点”。同时，前辈宇宙的爆炸解体造成“宇宙包”内的温度和密度的下降，从而使宇宙中新生出来稍大而稳定的无数最小黑洞  $2M_{bm}$ 。它们就成为我们现在新宇宙的“胚胎”，它们的合并就是我们宇宙的诞生，同时造成了我们新生宇宙诞生后在  $t_0 < 2 \times 10^{-37}$ 前的“原始暴涨”，并形成许多更大的“小黑洞”将宇宙连接成一个整体。这些“小黑洞”的继续合并膨胀就形成了我们现在膨胀的宇宙。

本文还完全证实了我们现在宇宙是一个真实的宇宙大黑洞(UBH)，这样，宇宙诞生和演化中的各种难题就简化成为一般黑洞的生长衰亡规律。本文还论述了从前辈宇宙的大塌缩到我们新生宇宙大膨胀的转变过程。还首次提出了产生宇宙的“原初暴涨”新的机理，并做出了新的解释、论证和计算。 [New York Science Journal. 2009;2(3):79-100]. (ISSN: 1554-0200).

本文中唯一的最简单的假设就是按照时间反演和对称规律，推断我们宇宙的诞生来源于前辈宇宙的最后大塌缩。这种假设也是最简单而符合奥康姆剃刀(Ockham's razor)原则的。不像“奇点”那样不可理解，无法计算出与现今宇宙参数之间的任何有规律关系。本文所有的结论和计算结果都符合因果律：凡是有开端的事实都有原因。也完全符合现有的经典理论的基本公式的计算数据和近代天文物理的观测数据和结论。(参考文编号)

**【关键词】**：宇宙不是产生于“奇点”或者“奇点的大爆炸”；宇宙诞生于( $M_{bm} \approx 10^{-5}g$ )史瓦西最小黑洞；宇宙的“原初暴涨”(Original Inflation)产生于大量最小黑洞的合并；宇宙与黑洞的同一性；我们宇宙本身就是一个宇宙大黑洞；哈勃定律就是宇宙黑洞的膨胀规律；

**【1】**. 我们宇宙的演化规律与公式：(图一)

宇宙的演化规律可用两种不同的简单方式较精确地描述。这是根据粒子物理学和近代天文观测的成就而得出的结果. 通称之为宇宙“大爆炸”标准模型。

首先,图一详细地标列出了宇宙在各个不同时期的演化过程中时间t与温度T的相互对应的关系,其各种数据简明,但不精确,而是近似的。

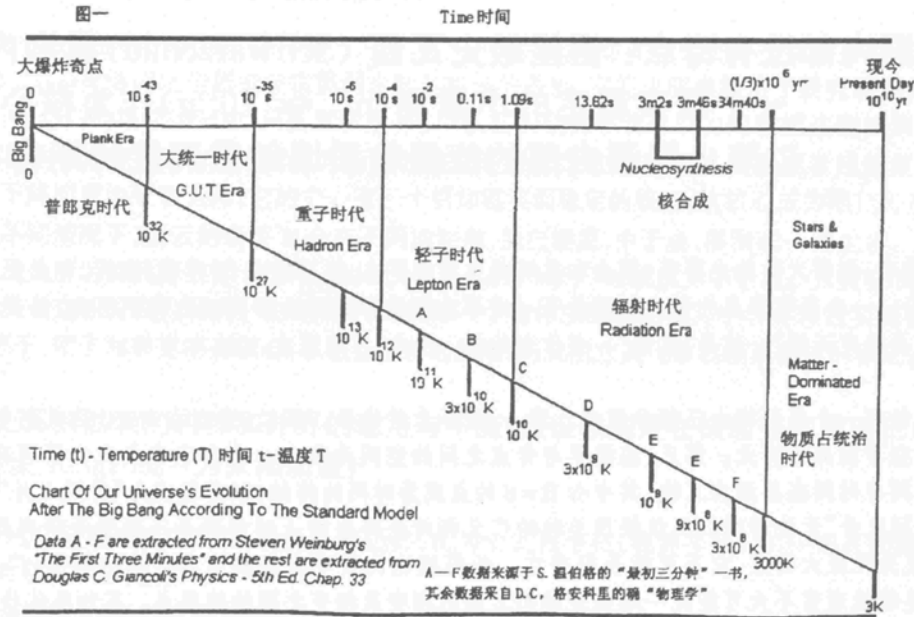
其次,下面的公式(1a)从量上定出了宇宙从辐射时代末期到大爆炸的过程中各个物理状态参数间的变化规律: (t = ±10<sup>-43</sup>秒到t = 1/3 × 10<sup>6</sup>年)

$$Tt^{1/2} = k_1, R = k_2 t^{1/2}, RT = k_3, R = k_4 \lambda, \quad (1a)$$

t—宇宙的特征膨胀时间, R—宇宙的特征尺度或大小, λ—辐射的波长, T—宇宙辐射温度, k<sub>1</sub>, k<sub>2</sub>, k<sub>3</sub>, k<sub>4</sub>—常数。

图一, 宇宙演变的标准模型中温度 T 与时间 t 的关系;

9. 附录 A: 图一, 宇宙演变的标准模型中温度 T 与时间 t 的关系;



附录 A 宇宙演变的标准模型中温度 T 与时间 t 的关系

下面的(1b) 式定出了宇宙在物质占统治地位时代各物理状态参数之间的变化规律和相互关系(t = 1/3 × 10<sup>6</sup>年到现今)

$$Tt^{2/3} = k_6, R = k_7 t^{2/3}, RT = k_8, R = k_9 \lambda, \quad (1b)$$

T, t, R, λ—同上, k<sub>6</sub>, k<sub>7</sub>, k<sub>8</sub>, k<sub>9</sub>,—常数。(1a)和(1b)也很难十分准确地定出其各常数。

上式  $Tt^{1/2} = k_1$  和  $Tt^{2/3} = k_6$  可参考 S. Weinberg 的“最初三分钟”之附录。如果将图一中的数值与按照(1a)(1b)式中计算出来的数据相比较,其结果是相当一致的,图一中的数值不可能准确到小数点后 1 位数,所以是近似的。宇宙演化的这两组数据的一致性表明用(1a)(1b)规律来表述宇宙的演化是正确的,与建立在近代粒子物理基础上的标准宇宙模型相符合。而且这些数据也与近代的天文观测数据 MBR (微波背景辐射) 相吻合。我们如果给出一组宇宙演化的初始值或特定值,就可以取代(1a)(1b)中的各个常数 k<sub>1</sub>……k<sub>9</sub>,从而可以算出对应于宇宙演化各个时间 t 相对应的其它各参数如 T, R, …。作为例子,我们用(1b)计算宇宙在物质占统治时代的各个物理参数的变化,按照公式(1b),

$$R_1/R_2 = (t_1/t_2)^{2/3}, R_1 T_1 = R_2 T_2, R_1/R_2 = \lambda_1/\lambda_2, T_1/T_2 = (t_2/t_1)^{2/3},$$

$$\text{如取 } t_1 = 13 \times 10^9 \text{ yrs, } t_2 = 4 \times 10^5 \text{ yrs, 则 } t_1/t_2 \approx 32,500, (t_1/t_2)^{2/3} \approx 1,000.$$

$$\text{取 } R_1 = 12 \times 10^{27} \text{ cm, 则 } R_2 = R_1/1,000 = 12 \times 10^{24} \text{ cm, 取 } T_1 = 3\text{K, 则 } T_2 = 3,000\text{K, 取 } \lambda_1 = 0.1 \text{ cm, 则 } \lambda_2 = 10^4 \text{ cm.}$$

以上各参数的初始值可见于图一,算出结果与近代观测数值相吻合。以上数值表明宇宙从物质占统治时代的最初时刻膨胀至今,时间膨胀了约 32,500 倍,尺寸扩大了约 1,000 倍,温度则降低约 1,000 倍,辐射波长增长约 1,000 倍,符合 MBR(微波背景辐射)的观测数据。

由于我们宇宙在创生期的密度异常大,那时的宇宙好似“原子”般的大小。关键问题在于这颗“原子”从何而来? 来源不外乎两个:(一),按照广义相对论,宇宙是从所谓的“奇点大爆炸”爆炸膨胀而来,从无到有,此路不通,因为它无法解释一个各种物理定律失效的“奇点”与一个如此有序的宇宙有任何物理量之间的



联系。(二), 二是认为这颗“原子”由前辈宇宙收缩的大塌陷经过“相变”转变而来。本文的论证与计算就在于确证宇宙如何从前辈宇宙的“塌陷相”转变为现今宇宙“膨胀相”, 这种相变发生的条件机理和途径。

**【2】**. 黑洞的基本属性和黑洞在其视界半径 $R_b$ 的守恒公式。我们宇宙是一个真实的“宇宙黑洞”。所有黑洞在其视界半径上的公式完全适用于我们“宇宙黑洞”。(此节请参看本文上篇)<sup>[1]</sup>

1\*. 最小黑洞--  $M_{bm}$ : 根据霍金黑洞量子辐射的温度公式和史瓦西的黑洞公式, 可以推导出来黑洞 $M_b$ 在其视界半径 $R_b$ 上准确的4个守恒公式, 它们规定出所有黑洞的生长衰亡规律。

$M_b$  — 黑洞质量,  $R_b$  — 黑洞的视界半径,  $T_b$  — 黑洞视界半径 $R_b$ 上温度,  $m_{ss}$  — 黑洞视界半径 $R_b$ 上霍金辐射量子,  $h$  — 普朗克常数 =  $6.63 \times 10^{-27} \text{g} \cdot \text{cm}^2/\text{s}$ ,  $C$  — 光速 =  $3 \times 10^{10} \text{cm/s}$ ,  $G$  — 引力常数 =  $6.67 \times 10^{-8} \text{cm}^3/\text{s}^2 \cdot \text{g}$ , 波尔兹曼常数 —  $\kappa = 1.38 \times 10^{-16} \text{g} \cdot \text{cm}^2/\text{s}^2 \cdot \text{k}$ ,  $m_p$  — 普朗克粒子,  $L_p$  — 普朗克长度,  $T_p$  — 普朗克温度,

霍金黑洞量子辐射的温度公式,

$$T_b = (C^3/4GM_b) \times (h/2\pi\kappa) \approx 10^{27}/M_b \quad (2a)$$

黑洞在其视界半径 $R_b$ 的熵温和能量转换公式,

$$m_{ss} = \kappa T_b / C^2 \quad (2b)$$

按照史瓦西的黑洞公式, 即对广义相对论方程的特殊解,

$$GM_b/R_b = C^2/2 \quad (2c)$$

从(2a)和(2b)得出,

$$m_{ss} M_b = hC/8\pi G = 1.187 \times 10^{-10} \text{g}^2 \quad (2d)$$

公式(2d)是在黑洞的视界半径 $R_b$ 上普遍有效的公式。运用宇宙中事物部分不大于全体的公理。黑洞视界半径 $R_b$ 上霍金辐射量子 $m_{ss}$ 不可能 > 黑洞质量 $M_b$ , 在极限情况下, 最大的 $m_{ss}$ 只能 = 最小的黑洞 $M_{bm}$ , 所以有,

$$m_{ss} = M_{bm} = M_b = hC/8\pi G)^{1/2} = 1.09 \times 10^{-5} \text{g} \quad (2e)$$

由于 $(hC/8\pi G)^{1/2} \equiv$ 普朗克粒子 $m_p$ , 所以,

$$m_{ss} = M_{bm} = (hC/8\pi G)^{1/2} \equiv m_p \equiv 1.09 \times 10^{-5} \text{g} \quad (2f)$$

$$\therefore R_{bm} \equiv L_p \equiv (Gh/2\pi C^3)^{1/2} \equiv 1.61 \times 10^{-33} \text{cm} \quad (2g)$$

$$\therefore T_{bm} \equiv T_p \equiv 0.71 \times 10^{32} \text{k} \quad (2h)$$

$$\therefore R_{bm} m_{ss} = h/(4\pi C) = 1.0557 \times 10^{-37} \text{cmg} \quad (2i)$$

最重要的结论: 当一个黑洞因为吞噬完外界能量-物质后, 而发射霍金辐射量子 $m_{ss}$ 不停地收缩时, 黑洞将减少 $R_b$ 和 $M_b$ , 增大 $T_b$ 和 $m_{ss}$ , 直到最后收缩成为最小黑洞 $M_{bm}$ , 而且,  $M_{bm} = m_{ss} = (hC/8\pi G)^{1/2} \equiv m_p$ , 并立即在普朗克领域爆炸消失。

2\*. 从下面推导出的公式(2i)可知, 黑洞的一个基本属性就是: 一旦黑洞形成, 不管它是在吞噬外界能量-物质而膨胀, 还是因发射霍金辐射而收缩, 直到最后收缩成为最小黑洞 $M_{bm}$ 之前, 它都永远是一个黑洞。从上面的公式(2c),

$$2GM_b = C^2 R_b \quad (2c)$$

$$2GdM_b = C^2 dR_b \quad (2j)$$

假设有另外一个黑洞— $M_{ba}$ 与 $M_b$ 合并或者碰撞, 该黑洞,

$$2GM_{ba} = C^2 R_{ba} \quad (2k)$$

公式(2j)+(2k)+(2c), 于是,

$$2G(M_b + dM_b + M_{ba}) = C^2(R_b + dR_b + R_{ba}) \quad (2l)$$

3\*. 等于普朗克粒子 $m_p$ 的最小黑洞 $M_{bm} \equiv m_p$ 必然在普朗克领域爆炸消失的原因,

由于在 $M_{bm} < (hC/8\pi G)^{1/2} \equiv m_p \equiv 1.09 \times 10^{-5} \text{g}$ 时,  $m_{ss} < 1.09 \times 10^{-5} \text{g}$ , 所以,  $m_{ss} M_b < hC/8\pi G < 1.187 \times 10^{-10} \text{g}^2$ , 这违反了一般的黑洞公式(2d), 不能以黑洞形式存在, 只能爆炸消失。

再按照量子力学的测不准原理,

$$\Delta E \times \Delta t \approx h/2\pi \quad (2m)$$

对于最小黑洞 $M_{bm}$ ,  $\Delta E = M_{bm} C^2 = \kappa T_b = 10^{16} \text{erg}$ ,

$$\Delta t = \text{Compton 时间} = R_{bm}/C = 1.61 \times 10^{-33}/3 \times 10^{10} = 0.537 \times 10^{-43}$$

$$\Delta E \times \Delta t = 10^{16} \times 0.537 \times 10^{-43} = 0.537 \times 10^{-27}, \text{ but } h/2\pi = 6.63 \times 10^{-27}/2\pi = 1.06 \times 10^{-27},$$

显然,  $\Delta E \times \Delta t < h/2\pi$ , 就是说, 如果 $M_{bm} \equiv m_p$ 继续存在, 或者变小后还存在, 它就必然也违反测不准原理。所以,  $M_{bm} \equiv m_p$ 只能在普朗克领域爆炸消失。

【3】. 从前辈宇宙的“大塌陷”到现今宇宙的诞生的大膨胀的转变条件；根据时间对称原理，假设前辈宇宙的最后塌缩遵循我们宇宙新生时同样的膨胀规律。

如果将前辈宇宙的最后“大塌缩”简单地假设成为我们宇宙诞生前的时间镜像反演或时间对称，即假设将用于描述我们宇宙诞生后的演化公式(1a)也可以反向地用于描述前辈宇宙最后的塌缩演化规律，而塌缩后演化的结果，根据计算如果符合现在宇宙各种规律和演变实况的数据的话，那么，这种假设就是合乎逻辑和规律的，就应当是合理可靠而予以承认的。

从公式(1a)  $R = k_2 t^{1/2}$ 和(2a), (2b)可知，当前辈宇宙走向大塌陷收缩其尺寸R时，相应地其粒子温度T增加，时间t缩小很快。在大塌陷收缩过程中(反向参看上面图一)，当t缩小 1,000 倍时，R只缩小 30 倍，所以t比R收缩得更快，这样收缩的结果，总会出现一种极限情况，当t收缩到某种极限时间时，两个相邻的粒子传递其引力所需的时间小于各个粒子湮灭解体时间，使它们中心间的真实距离 $d_m$ 会变得等于当时两相邻粒子的史瓦西半径之和  $2r$ 。这时，所有相邻之间的粒子都会因为引力无时间到达而产生引力断链，而所有在整个“宇宙包”里的粒子都成为等于普朗克粒子的最小黑洞 $M_{bm} = m_p$ 。它们之间因无引力而只能在 $T \approx 10^{32}K$ 高温下，使前辈宇宙停止收缩而爆炸解体，从而造成前辈宇宙的消亡。同时造成宇宙的膨胀和温度密度的下降。膨胀的结果，一方面使“宇宙包”内的温度和密度随着少许的下降，而使分散的能量重新集结转换为较大一点的稳定的新的最小黑洞-- $2M_{bm}$ 。正是在宇宙包内各处的这些新产生的最小黑洞成为产生我们新宇宙的胚胎。它们恢复引力后的合并和碰撞形成了宇宙初始的“原初暴胀”和宇宙的诞生。这就是前辈宇宙“大塌缩”到普朗克领域解体后，又生成新最小黑洞而形成我们新宇宙的转变过程。

前辈宇宙从最后的“大塌陷”转变到现今宇宙最初的“大膨胀”发生的条件，按照上述的原理由以下公式(3)来表述，

$d_m$ --两相邻粒子间的实际距离， $m$ --前辈宇宙塌缩到最后的粒子质量， $r$ --粒子 $m$ 的半径， $t$ --宇宙粒子的光从中心传递到其视界半径的特征时间， $C$ --光速， $\rho$ --粒子 $m$ 的能量-物质密度， $H$ --哈勃常数，

$$d_m \geq C \times [2t], \text{ 即 } d_m/2C \geq t, -t \leq -d_m/2C, t = r/C \quad (3)$$

$$\text{令 } \rho = \text{能量密度 } g/cm^3, M = 4\pi\rho R^3/3, \quad (3aa)$$

$$H = \text{哈勃常数, 宇宙在同一时间的常数, } H = V/R = 1/t,$$

$$\text{从 } 4\pi\rho r^3/3 = m, \quad m = \kappa T/C^2, \quad (3b)$$

$$\therefore t^3 \leq 3\kappa T/4\pi\rho C^5 \quad (3a)$$

$$\text{由 } \rho = 3H^2/8\pi G = 3/(8\pi G t^2), \quad (3ba)$$

$$\therefore t \leq T(2G\kappa)/(C^5) \quad (3b)$$

$$\text{从(1a), } Tt^{1/2} = k_1 \quad (3ca)$$

$$\therefore t^{3/2} \leq k_1 (2G\kappa)/C^5 \text{ 或者 } t \leq [k_1 (2G\kappa)/C^5]^{2/3} \quad (3c)$$

公式(3a),(3b),(3c)都是从公式(3)推导出来的，所以三式中的 $t$ 是等值的。

现求 $t$ 值如下：先从上面的图一中选取一对 $t, T$ 值代入(1a)求 $k_1$ ，当取 $t = 10^{-43} s$ ，图中下面对应的温度 $T = 10^{32}K$ ，如是，

$$k_1 = Tt^{1/2} = 10^{32} \times 10^{-43} s = 3^{1/2} \times 10^{10} \approx 1.732 \times 10^{10}, \text{从公式(3c),}$$

$$t^{3/2} \leq [(2G\kappa)/(C^5)] \times k_1 = 1.732 \times 10^{10} [(2G\kappa)/(C^5), \quad (3cb)$$

$$G = 6.67 \times 10^{-8} cm^3/gs^2, C = 3 \times 10^{10} cm/s, \kappa = 1.38 \times 10^{-16} gcm/s^2K,$$

$$t^{3/2} \leq [(2 \times 6.67 \times 10^{-8} \times 1.38 \times 10^{-16}) / (3 \times 10^{10})^5] \times 1.732 \times 10^{10} = 0.075758 \times 10^{-74} \times 1.732 \times 10^{10} \approx 0.1312 \times 10^{-64},$$

$$t^3 = 0.017217 \times 10^{-128} = 0.17217 \times 10^{-129}, \text{为计算方便, 下面令 } t = t_m$$

$$t_m = 0.5563 \times 10^{-43} s, \quad (3d)$$

$$\therefore t_m \leq 0.5563 \times 10^{-43} s, \text{ and } t_m \geq 0.5563 \times (-10^{-43}) s, \quad (3d)$$

可见， $t$ 与 $t_m$ 即是粒子与整个前辈宇宙同时解体的时间。相对应地：

$$T_m = k_1/t^{1/2} = 1.732 \times 10^{10} / (0.5563 \times 10^{-43})^{1/2} = 0.734 \times 10^{32} K, \quad (3e)$$

$m_m$ --与 $0.734 \times 10^{32}K$ 相对应粒子质量：

$$m_m = \kappa T/C^2 = 1.38 \times 10^{-16} \times 0.734 \times 10^{32} / (9 \times 10^{20}) = 1.125 \times 10^{-5} g, \quad (3f)$$

$$\rho = 3/(8\pi G t^2) = 0.5786 \times 10^{93} g/cm^3, \quad (3g)$$

从公式(3aa),  $m_m$ 的半径 $r_m$ ,

$$r_m = (3m/4\pi\rho)^{1/3} = 1.67 \times 10^{-33} cm, \quad (3h)$$

$$d_m = C \times [2t] = 3.34 \times 10^{-33} cm, \quad d_m \geq 2r_m (=3.34 \times 10^{-33} cm) \quad (3i)$$

$$\therefore (d_m \geq 2r_m) \quad (3j)$$

(3j) 表明前辈宇宙塌缩到 $m_m$ 时, 2 邻近粒子之间的引力却是断链了。粒子 $m_m$ 爆炸解体后, 由粒子  $m_m$ 组成“宇宙包”里的密度 $\rho_u$ ,

$$\rho_u = m_m / d_m^3 = 0.302 \times 10^{93} \text{g/cm}^3 \quad (3k)$$

由于 $\rho_u < \rho$ , 表明前辈宇宙解体后, 整个“宇宙包”里的密度由于粒子爆炸后填满了空隙而降低了。 $n_m$  表明“宇宙包”里的 $m_m$ 就是一个整体的一堆内外都无引力的能量, 所以只能爆炸解体。

$$m_m C^2 = 1.125 \times 10^{-5} \times 9 \times 10^{20} = 1.013 \times 10^{16}, \text{ 同时, } \kappa T = 1.38 \times 10^{-16} \times 0.734 \times 10^{32} = 1.013 \times 10^{16}$$

$$\therefore n_m = m_m C^2 / \kappa T = 1 \quad (3l)$$

结论: 计算值 $t \leq 0.5563 \times 10^{-43} \text{s}$ ,  $T = 0.734 \times 10^{32} \text{K}$ 几乎精确地符合附录A图一中 (Plank's Era) 普朗克时期末端值。对于时间反转的前辈宇宙来说, 就是塌缩到进入普朗克时期的开始端。上述计算值表示前辈宇宙一旦收缩到大塌陷的 $t = t_m = -0.5563 \times 10^{-43} \text{s}$ ,  $T = T_m = 0.734 \times 10^{32} \text{K}$ 时, 整个“宇宙包”内的粒子都塌缩成为一个个单独的内外都无引力联系的宇宙的最高能量粒子, 进入普朗克领域, 即 $\underline{m_m} = \underline{m_p} = \underline{M_{bm}} = 1.09 \times 10^{-5} \text{g}$  (见下节)。无引力就无收缩的动力。所有粒子和整个“前辈宇宙”只能在普朗克领域爆炸消失。根本不可能再继续塌缩成为“奇点”。

在上述设想中, 宇宙从前辈宇宙收缩坍塌到新宇宙的产生和膨胀的转变过程中, 也会出现 $t = 0$ 的点, 但这并非人们所认知的“奇点”, 而只是前辈宇宙从收缩坍塌点 ( $-10^{-43} \text{s}$ , R) 到新宇宙膨胀起始点 ( $+10^{-43} \text{s}$ , R) 之间的过渡桥梁, 因为, 在 $t = 0$ 点, 宇宙尺寸 $R \neq 0$ , 温度 $T \approx 10^{32} \text{K}$ , 而不是无限大, 宇宙密度 $\rho_u$ 不是无限大, 而是 $= 3 \times 10^{92} \text{g/cm}^3$ 。这种观点使宇宙演化合乎能量守恒、合乎因果律(热力学第二定律)、不违反现存的各种天体物理定律与经典理论, 反而是它们之间的无缝结合。

由于无数粒子 $m_m$ 聚集所形成的“宇宙包”, 并非自由空间, 前辈宇宙无数最小黑洞 $m_m$ 的爆炸解体湮灭是在密闭的“宇宙包内”完成。它们在普朗克领域同时的爆炸解体可以称之为诞生我们宇宙的“大爆炸”。其结果就是使“宇宙包”内的温度和密度降低, 使分散的能量能够重新结合成稍大而稳定的最小黑洞--  $2M_{bm}$ 。它们就是产生我们新宇宙的胚胎。它们的长大和合并就造成了我们新宇宙的诞生和膨胀。

【4】. 最小引力(史瓦西)黑洞--  $M_{bm}$ 与普朗克粒子 $m_p$ 和上节所提出的前辈宇宙的最终塌缩粒子 $m_m$ 完全是同一种东西, 这说明霍金黑洞理论与量子引力论和近代粒子理论等有殊途同归的互恰性。下面的公式 (4a), (4b), (4c) 和 (4d) 来源于前面的(2f), (2g), (2h) 和 (2i)。<sup><1></sup>

$$\underline{m_{ss}} = \underline{M_{bm}} = (\hbar c / 8\pi G)^{1/2} \equiv \underline{m_p} \equiv 1.09 \times 10^{-5} \text{g} \quad (4a)$$

$$R_{bm} \equiv L_p^{[3]} \equiv (G\hbar / 2\pi C^3)^{1/2} \equiv 1.61 \times 10^{-33} \text{cm} \quad (4b)$$

$$T_{bm} \equiv T_p^{[3]} \equiv 0.71 \times 10^{32} \text{k} \quad (4c)$$

$$R_{bm} m_{ss} = \hbar / (4\pi C) \quad (4d)$$

比较  $M_{bm}$ ,  $m_p$  和  $m_m$  的数值列在下面的表1 中。  $m_m$  是前辈宇宙塌缩到最后失去引力状态时的计算数值,  $M_{bm}$  是最小黑洞。  $m_p$  是普朗克粒子, <sup><1></sup>

表:  $M_{bm}$ ,  $m_p$  和  $m_m$  的各种参数的比较

$m_m$ 无引力状态	$M_{bm}$ - 最小黑洞	$m_p$ - 普朗克粒子 <sup>&lt;2&gt;</sup>
$m_m = 1.125 \times 10^{-5} \text{g}$	$M_{bm} = 1.09 \times 10^{-5} \text{g}$	$m_p = 1.09 \times 10^{-5} \text{g}$
$t_m = \pm 0.5563 \times 10^{-43} \text{s}$	$t_{bm} = 0.539 \times 10^{-43} \text{s}$	$t_p = 0.539 \times 10^{-43} \text{s}$
$T_m = 0.734 \times 10^{32} \text{k}$	$T_{bm} = 0.71 \times 10^{32} \text{k}$	$T_p = 0.71 \times 10^{32} \text{k}$
$r_m = d_m / 2 = 1.67 \times 10^{-33} \text{cm}$	$R_{bm} = 1.61 \times 10^{-33} \text{cm}$	$L_p = 1.61 \times 10^{-33} \text{cm}$

从上面的表 1, 可见,  $M_{bm}$  和  $m_p$  是完全等同的。<sup><1></sup> 但是  $m_m$  的数值与  $M_{bm}$  和  $m_p$  有一点小的误差, 原因在于  $m_m$  来自公式(3f), 但在推导(3f)的过程中, 由于时间  $t$  和温度  $T$  的数值均取自于不精确的图 1。所以, 实际上,  $m_m$ ,  $M_{bm}$  和  $m_p$  三者应该是相等的。也就是说,  $m_m$  就是最小黑洞  $M_{bm}$ 。  $m_m$  所有的参数都应该等于相应的  $M_{bm}$  的参数。所以有,

$$\underline{m_m} \equiv \underline{M_{bm}} \equiv (\hbar c / 8\pi G)^{1/2} \equiv \underline{m_p} \quad (4e)$$

由此可见, (4e)式表明, 前辈宇宙最后塌缩成为 $m_m$ 时, 即成为 $m_m = M_{bm} \equiv m_p$ , 而只能爆炸解体消失在普朗克领域。<sup><1></sup>

【5】. 在前辈消失在普朗克领域之后, 我们的新宇宙是如何从普朗克领域诞生出来的?

从公式 (4e)可见,一旦前辈宇宙最后塌缩成为 $m_m$ 而进入普朗克领域时,所以在“宇宙包”里的粒子  $m_m = M_{bm} = m_p$ , 而立即在普朗克领域爆炸消失. 如果说,有人喜欢将我们宇宙的诞生说成是来自于一“大爆炸”的话,那么,这所有 $m_m$ 在普朗克领域的爆炸就是诞生我们新宇宙的大爆炸. 因为构成我们宇宙所有的能量-物质都是来自前辈宇宙爆炸后的遗物. 所以说,没有前辈宇宙的死亡,就没有能量-物质成为我们宇宙的物质基础.

我们新宇宙是如何从旧宇宙的废墟中诞生的呢? 关键问题在于从旧宇宙解体的废旧能量-物质能够重新集结成为新的最小引力(史瓦西)黑洞--  $M_{bm}$ . 其实,在  $10^{32}k$  和密度  $10^{93}g/cm^3$ 的普朗克领域本来就是能量与粒子随时都在湮灭和产生的互相转换的. 我们知道它们湮灭和产生的时间就是康普顿时间,即Compton time. 因此,只有当新生粒子的寿命 $\tau_b$ 大于康普顿时间 $t_{bc}$ 时,该粒子才能存活下来,而成为稳定的小黑洞. 前面【2】节中已经论证过,黑洞一旦形成,除最后变为普朗克粒子 $m_p$ 而爆炸消失外,它将永远是一个黑洞. 按照霍金的黑洞寿命公式,黑洞寿命 $\tau_b$ ,

$$\tau_b = 10^{-27} M_b^3 \text{ (s)} \quad (5a)$$

$$t_{bc} = R_b/C \quad (5b) = 0.45 \times 10^{32}k,$$

因此,只有在 $\tau_b > t_{bc}$ 时,即 $10^{-27} M_b^3 > R_b/C$ 时,新产生的黑洞 $M_b$ 才能存活,并吞噬外界能量-物质而不断地长大,从(2c)使,得出,

$$M_b = M_{bmn} = 2.2 \times 10^{-5}g \approx 2 M_{bm} \quad (5c)$$

$$T_b = (C^3/4GM_b) \times (h/2\pi k) \approx 10^{27}/M_b = 0.45 \times 10^{32}k, \quad (5d)$$

从(5c)式可以看出,只有当形成黑洞 $M_{bmn} \geq 2.2 \times 10^{-5}g \approx 2M_{bm}$ 时,如果它的外面有能量-物质可供吞噬, $M_{bmn}$ 就会不停地长大成为大黑洞. 在前节已经说过,由于前辈宇宙的最小黑洞 $M_{bm} = m_m$ 的爆炸消失,使“宇宙包”内的温度密度降低,从(5d)式可知,当 $M_{bm}$ 增加到  $2 M_{bm} = M_{bmn}$ 时,  $10^{32}k$ 高温相应的减半即可. 所以 $M_{bmn}$ 是很容易而必然形成的. 1\*.  $M_{bmn}$ 可以由2个或更多个 $M_{bm} = 1.09 \times 10^{-5}g$ 碰撞结合而成,因为温度降低后的 $M_{bm}$ 会较难解体. 2\*. 从(2a)可知,温度降低后容易形成较大的新最小黑洞 $M_{bmn} \approx 2 M_{bm}$ .

3\*. 小于 $M_{bmn}$ 的高密度  $10^{93}g/cm^3$ 粒子容易吸收外面的能量-物质,长大后塌缩成 $M_{bmn}$ . 正如中子星能吸收外界物质后,而塌缩成为黑洞的道理是一样的. 4\*. 质量大于  $M_{bmn}$  而密度较低的粒子团容易收缩成为新最小黑洞 $M_{bmn}$ . 一旦 $M_{bmn}$ 形成之后,它们就会吸收外界密度为  $10^{93}g/cm^3$  的能量-物质和互相合并而不停地长大.  $M_{bmn}$ 就成为我们新生的宇宙的胚胎,他们的合并和互相连接在一起,造成了宇宙的“原初暴涨”. 这就是我们宇宙诞生的机理和过程.“原初暴涨”后,形成较大的小黑洞. 它们继续合并造成的膨胀就形成了我们现在有137亿年的膨胀的宇宙.

结论: 我们宇宙诞生的2个必要条件和过程是: 1. 前辈宇宙及其旧的最小黑洞 $M_{bm} = m_p = 1.09 \times 10^{-5}g$ 的消失为我们宇宙提供了能量-物质基础. 2. 前辈宇宙及其旧的最小黑洞 $M_{bm} = m_p$ 的爆炸使“宇宙包”里的温度降低,而能够产生较大的较长寿命的稳定的新最小黑洞 $M_{bmn}$ 成为产生新宇宙的胚胎. 没有 $M_{bmn} = 2.2 \times 10^{-5}g$ 作为胚胎,就不可能有我们现在的巨无霸宇宙,因为只有黑洞才能吞噬外界的能量-物质而长大,并能不让它们流失出去.

**【6】.** 完全论证我们现在宇宙是一个质量为 $10^{56}g$ 的真正的巨无霸宇宙黑洞(UBH). 我们宇宙的膨胀就是大量的最小黑洞  $M_{bm} \sim M_{bmn}$  在宇宙初期合并产生膨胀的结果. Hubble定律就是我们宇宙吞噬外界能量-物质而膨胀的规律. 宇宙的平直性( $\Omega = \rho_r / \rho_0 \approx 1$ )是宇宙黑洞的本性.

1\*. 现代精密的各种天文望远镜实际的观测数据表明,我们宇宙球体具有精密而可靠的数据. A, 我们宇宙真实可靠的年龄  $A_u = 137$  亿年.<sup>[8]</sup> 于是,由此计算出,其视界半径 $R_u = C \times A_u = 1.3 \times 10^{28} \text{ cm}$ , 密度  $\rho_u = 3/(8\pi G A_u^2) = 0.958 \times 10^{-29} g/cm^3$ . 所以,宇宙的总质量  $M_u = 8.8 \times 10^{55}g$ . B. Hubble 常数的实际的可靠的观测数值是  $H_0 = (0.73 \pm 0.05) \times 100 \text{ kms}^{-1} \text{ Mpc}^{-1}$ <sup>[9]</sup>, 由此算出宇宙的实际密度  $\rho_r = 3H_0^2/(8\pi G) \approx 10^{-29} g/cm^3$ . 并得出宇宙年龄  $A_r^2 = 3/(8\pi G \rho_r)$ ,  $\therefore A_r = 0.423 \times 10^{18} \text{ s} = (134 \pm 6.7)$  亿年. 结果,宇宙的总质量 $M_r = 8.6 \times 10^{55}g$ .

由此可见,两种不同的精确测量数据所得出的结果几乎完全一致. 因此,取我们宇宙的数据如下作为后面的计算. 取宇宙总质量  $M_u = 8.8 \times 10^{55}g$ . 宇宙年龄 $A_u = 137$  亿年. 视界半径 $R_u = 1.3 \times 10^{28} \text{ cm}$ , 宇宙密度  $\rho_u = 0.958 \times 10^{-29} g/cm^3$ .

2\*. 假如我们现在宇宙是一个真实的巨无霸宇宙黑洞(UBH),它就必然来自大量宇宙最小黑洞  $M_{bmn} \sim M_{bm}$ 的合并. 为计算方便,现仍取 $M_{bm} = m_p = 1.09 \times 10^{-5}g$ , 其  $R_{bm} = 1.61 \times 10^{-33} \text{ cm}$ , 其 $T_{bm} = 0.71 \times 10^{32}k$ , 其

霍金辐射量子  $m_{ss} = 1.09 \times 10^{-5} \text{g}$ . 令  $N_{bu}$  是  $M_u$  拥有  $M_{bm}$  的数目。当然如果取  $M_{bmn}$  作为计算, 结果与取  $M_{bm}$  是一样的。因为  $M_{bmn} \approx 2M_{bm}$ 。

$$N_{bu} = M_u / M_{bm} = 8.8 \times 10^{55} / 1.09 \times 10^{-5} = 8.0734 \times 10^{60} \quad (6d)$$

假如我们宇宙是一个由  $N_{bu}$  个  $M_{bm}$  合并而成的宇宙黑洞, 那么, 宇宙的  $R_u$  也应该准确地是  $R_{bm}$  的  $N_{bu} = 8 \times 10^{60}$  倍。计算结果如下:

$$N_{bu} = R_u / R_{bm} = 1.3 \times 10^{28} / 1.61 \times 10^{-33} = 8.075 \times 10^{60} \quad (6e)$$

由于 (6d) = (6e), 这很清楚地证明, 我们宇宙  $M_u$  确实是由  $N_{bu}$  个最小黑洞  $M_{bm}$ , 合并膨胀而成的宇宙黑洞。

3\*. 宇宙膨胀的 Hubble 定律就是宇宙黑洞吞噬外界能量-物质而膨胀的规律。

将 Hubble 定律运用到我们宇宙球体的视界,

$$M_u = 4\pi\rho_0 R_u^3 / 3 = 4\pi(3H_0^2 / 8\pi G) C^3 t_u^3 / 3 = 4\pi(3H_0^2 / 8\pi G) C^3 t_u / 3H_0^2 = C^3 t_u / 2 G = C^2 R_u / 2 G \quad (6a)$$

从史瓦西对广义相对论方程的特价, 公式 (2c),  $2G M_b = C^2 R_b$

$$M_b = R_b C^2 / 2 G = C^3 t_{bu} / 2 G = R_{bu} C^2 / 2 G \quad (6b)$$

现在由于  $t_u = t_{bu}$ ,  $R_{bu} = R_u$ ,  $M_u = M_b$ , (6a) = (6b). 而我们宇宙是一个真正的宇宙黑洞, 黑洞只有在吞噬外界能量-物质或者与其它黑洞合并才产生膨胀。因此 Hubble 定律所反应的宇宙质量随时间的增长而正比例增长的规律, 正是黑洞吞噬外界能量-物质的膨胀规律。什么时候  $t_u \neq t_{bu}$ ? 一旦黑洞吞噬完外界能量-物质, 黑洞就会停止膨胀, 此时  $t_{bu}$  就几乎不变, Hubble 定律也就失效了。宇宙年龄  $t_u \neq$  黑洞的 Compton 时间  $t_{bu}$ 。

4\*. 关于我们宇宙的“平直性”问题, 即  $(\Omega = \rho_r / \rho_0 \approx 1)$  问题。黑洞的平均密度  $\rho_0$  在确定的质量  $M_b$  下只有一个确定值。我们宇宙作为一个真正的宇宙黑洞就是一个密封的巨大球体, 所以  $(\Omega = \rho_r / \rho_0 = 1)$  是黑洞的本性, 是必然的结果。不能例外。因此, 50 年来, 科学家们对  $(\Omega = \rho_r / \rho_0 \approx 1)$  的争论是一个毫无意义的伪命题。

由于提出了错误的命题  $(\Omega = \rho_r / \rho_0 \neq 1)$ , 已经导致许多科学家提出某些错误的观念, 比如最明显地是“寻找宇宙丢失的能量-物质”, 其次“零点能”与“暗能量”等也与此有关。因此, 从公式 (6d) 和 (6e) 来看, 我们宇宙黑洞 UBH 一点能量-物质也未丢失, 一点也不少, 当然也不多。

从现在起, 如果宇宙黑洞外面没有能量-物质, 宇宙黑洞就会开始发生霍金辐射而不停地收缩, 直到最后收缩成为最小黑洞  $-M_{bm}$  而爆炸消失, 宇宙的年龄就是约为  $\tau_b = 10^{-27} M_b \text{ (s)} = 10^{-27} (8.8 \times 10^{55})^3 \approx 10^{132}$  年。如果外面还有能量-物质, 宇宙黑洞会继续吞噬外界能量-物质而扩大, 只有在吞噬完所有外界能量-物质后, 才会不停地发射黑洞霍金辐射而最后收缩成为  $M_{bm}$  爆炸消失。其年龄按 (5a) 式计算。

【7】。作者用宇宙诞生于“最小黑洞  $M_{bm}$  的合并”原理, 对宇宙“原初暴涨”的机理、过程和终结提出了最新最简单的解释和计算。认为宇宙“原初暴涨”终结的时间  $t_0$  就是宇宙  $M_u$  内所有原生最小黑洞  $-M_{bm}$  连成一整体的宇宙时间。

从上节可知, 我们现在黑洞宇宙的总质量是  $M_u = 8.8 \times 10^{55} \text{g}$ . 它来自宇宙诞生时  $N_{bu} = 8 \times 10^{60}$  个最小黑洞  $M_{bm} = m_p = 1.09 \times 10^{-5}$  的合并。因此, 我们宇宙黑洞的 137 亿年的膨胀就是那诸多最小黑洞合并所产生的膨胀。如果将从宇宙诞生到将原始“宇宙包”内所有组成  $M_u$  的最小黑洞  $N_{bu} \times M_{bm}$  连成一整体的时间定为  $t_0$ 。由于  $M_{bm}$  的视界半径  $R_{bm} = 1.61 \times 10^{-33} \text{cm}$ , 假设  $M_{bm}$  在诞生后需要 2 或者 3 倍的  $t_{bmc}$  时间 将其邻近的  $N_m$  个  $M_{bm}$  连接起来,  $t_{bmc}$  就是  $M_{bm}$  的 Compton 时间,  $t_{bmc} = R_{bm} / C = 1.61 \times 10^{-33} / 3 \times 10^{10} = 5.37 \times 10^{-44} \text{s}$ . 当光 (引力) 走  $2 \times t_{bmc}$  时,  $M_{bm}$  所能够连接的其它的  $M_{bm}$  的数目为  $N_{m2}$ ,

$$N_{m2} R_{bm}^3 = (2R_{bm})^3, \therefore N_{m2} = 8 \quad (7a)$$

(7a) 式表明, 当  $M_{bm}$  的引力传递时间从  $t_{bmc}$  延长到  $2 t_{bmc}$  时,  $M_{bm}$  能够连接 8 个  $M_{bm}$ . 那么,  $M_{bm}$  需要延长多少倍时间才能将所有  $M_u$  中的  $N_{bu} = 8.075 \times 10^{60}$  个  $M_{bm}$  连成一体呢?

$$N_{bu} = 8.8 \times 10^{60} \approx 10^{61} = (8^{67.5}) \quad (7b)$$

(7b) 式表明, 在  $M_{bm}$  的引力走过  $(2^{67.5})$  倍的  $t_{bmc}$  后, 所有的  $N_{bu} (= 8^{67.5} \approx 10^{61}) \times M_{bm}$  就连成一体成为宇宙 ( $M_u$ ) 的原初“宇宙包”了。

$$(2^{67.5}) \approx (10^{20.3}), \text{ 令 } n_{02} = 10^{20.3} \quad (7c)$$

现在以同样的方式求  $N_{m3}$ ,

$$N_{m3} R_{bm}^3 = (3R_{bm})^3, \therefore N_{m3} = 27 \quad (7d)$$

$$N_{bu} = 8.8 \times 10^{60} \approx 10^{61} = (27^{42.6}), \text{ 而 } (3^{42.6}) \approx (10^{20.3}), \text{ 令 } n_{o3} = 10^{20.3},$$

$$\therefore n_o = n_{o2} = n_{o3} \approx (10^{20.3}) \quad (7e)$$

由(7c)和(7e)可知, 不管 $t_{bmc}$ 以几倍的时间延长, 连接整个 $M_u$ 所需的时间是一样的, 即 $10^{20.3}$ 秒。但从(7a)和(7d)看, 由于黑洞的合并必然会产生“空间膨胀”, 从(2c)式可知, 这种空间膨胀就产生了宇宙的“原初暴涨”, 从(7a)看, 当 $M_{bm}$ 连接其它的8个 $M_{bm}$ 时, 其 $R_{bm}$ 也会增长8倍, 即 $8 = 2^3$ 倍。同样在(7d),  $R_{bm}$ 也会增长 $27 = 3^3$ 。这就是说,  $t_{bmc}$ 延长到 $2 t_{bmc}$ 时, 其所连接的 $M_{bm}$ 数就不是 $2^3$ , 而是 $(2^3)^3 = 2^9$ 。同样, 当时间 $t_{bmc}$ 延长到 $3 t_{bmc}$ , 其所连接的 $M_{bm}$ 的数目应是 $3^9$ 。

下面用同样的方式求一般规律的 $n_o$ ,

$$\text{令 } N_{mn} = n_o^9, \text{ 和 } n_o = 10^x \quad (7f)$$

$$\text{但 } N_{bu} \approx 10^{61}, \therefore 10^{61} = 10^{9x} \quad (7g)$$

$$x_1 = 61/9 = 6.8, \therefore n_{o1} = (10^{6.8}) \quad (7-1a)$$

(7-1a)是“暴涨”情况下 $t_{bmc}$ 延长的倍数 $n_{o1}$ 。现在从(7e)式按照的原理, 得出一个在没有“暴涨”情况下的 $x_2$ 和 $n_{o2}$ , 可称为“正涨”。

$$x_2 = 61/3 = 20.3 \therefore n_{o2} = 10^{20.3} \quad (7-1b)$$

$$\therefore n_{o2} = n_{o1}^3 \text{ 或者 } n_{o2} = 10^{13} n_{o1} \quad (7-1c)$$

1\*. 公式(7-1a)和(7-1b)证明了将所有 $M_u$ 连成一体而组成整个“宇宙包”的有2种方式: 不管以何种方式, 将所有 $M_{bm}$ 连成一体为 $M_u$ 所需的时间都是由 $M_u$ 的值所确定的。

$$\text{A. 暴涨: } t_{o1} = t_{bmc} \times n_{o1} = 5.37 \times 10^{-44} \times 10^{6.8} = 0.2 \times 10^{-36} \text{ s} = 2 \times 10^{-37} \text{ s}. \quad (7-2a)$$

$$\text{B. 正涨: } t_{o2} = t_{bmc} \times n_{o2} = 5.37 \times 10^{-44} \times 10^{20.3} = 2 \times 10^{-24} \text{ s} \quad (7-2b)$$

$$\therefore t_{o2}/t_{o1} = n_{o2}/n_{o1} = 2 \times 10^{-24}/2 \times 10^{-37} = 10^{13} \quad (7-2c)$$

由 $t_{o2}$ 和 $t_{o1}$ 所能生成的小黑洞 $M_{bb2}$ 和 $M_{bb1}$ 的视界半径 $R_{bb2}$ 和 $R_{bb1}$ 分别是:

$$R_{bb1} = C t_{o1} = 6 \times 10^{-27} \text{ cm} \quad (7-3a)$$

$$R_{bb2} = C t_{o2} = 6 \times 10^{-14} \text{ cm} \quad (7-3b)$$

$$R_{bb2}/R_{bb1} = 10^{13} = t_{o2}/t_{o1} = n_{o2}/n_{o1} = n_{o1}^2 \quad (7-3c)$$

2\*. 从(7-2a)和(7-2b)可知, 初生宇宙的最小黑洞 $M_{bm}$ 有2种合并的方式使初生宇宙 $M_u$ 产生大膨胀, 而将 $M_u$ 内所有 $M_{bm}$ 连成一体。

A. 暴涨: 指(7-2a)中 $t_{o1}$ 产生的“原初暴涨”, 这种情况可以理解为 $M_{bm}$ 在原始合并过程中, 小黑洞 $M_{bb1}$ 的视界半径 $R_{bb1}$ 有 $n_{o2}/n_{o1}$ 倍的“暴涨”。因此, 经过 $t_{o1} = 2 \times 10^{-37}$ s而终结“暴涨”后,  $R_{bb1}$ 变成 $R_{bb1} \times n_{o2}/n_{o1} = R_{bb2}$ 。B. 正涨: 指(7-2b)中 $t_{o2}$ 所产生的 $M_{bm}$ 正常合并而引起的大膨胀。这种膨胀在 $t_{o2} = 2 \times 10^{-24}$ s时结束。所形成的小黑洞 $M_{bb2}$ 的视界半径 $R_{bb2}$ 。

结论: 上面A和B两种情况所达到的结果是一样的, 即 $M_{bm}$ 的合并结果都成为 $R_{bb2}$ 的小黑洞, 即 $M_{bb2} = M_{bb1}$ 和 $R_{bb2} = R_{bb1}$ 。只不过在“暴涨”时,  $M_{bb1}$ 在 $t_{o1} = 2 \times 10^{-37}$ s时就形成了。而在“正涨”时,  $M_{bb2}$ 是在 $t_{o2} = 2 \times 10^{-24}$ s时才形成的。

$$3*. \text{ 小黑洞 } M_{bb1} \text{ 和 } M_{bb2} \text{ 的其它参数; 已知 } R_{bb2} = C t_{o2} = 6 \times 10^{-14} \text{ cm},$$

$$M_{bb1} = M_{bb2} = 0.675 \times 10^{28} \text{ g}, R_{bb2} = 4 \times 10^{15} \text{ g} \quad (7-4)$$

$$\rho_{bb1} = \rho_{bb2} = 3M_{bb2}/(4\pi R_{bb2}^3) = 4.4 \times 10^{54} \text{ g/cm}^3. \quad (7-5)$$

在那时,  $t_{o1} = 0.2 \times 10^{-36}$ s 或者  $t_{o2} = 2 \times 10^{-24}$ s时,  $M_u$ 的密度 $\rho_{bb}$ 与 $M_{bb2}$ 的 $\rho_{bb2}$ 是一样的。 $M_u$ 在那时的视界半径 $R_{ub}$ 是:

$$R_{ub} = (3M_u/4\pi\rho_{bb2})^{1/3} = 2.4 \text{ cm} \quad (7-6)$$

$$N_{ub} = M_u/M_{bb2} = 8.8 \times 10^{55}/4 \times 10^{15} = 2.2 \times 10^{40}$$

$$N_{bbm} = M_{bb2}/M_{bm} = 4 \times 10^{15}/1.09 \times 10^{-5} = 4 \times 10^{20} \quad (7-7)$$

4\*. 现在来探讨有“原初暴涨”的情况: 按照苏宜《新天文学概论》中12.7节中的资料和计算,<sup>[3]</sup>根据公式(1a) $R = k_1 t^{1/2}$ ,  $R$ 为 $t$ 时的宇宙尺寸,  $t$ 为从宇宙创生起的宇宙年龄, 在 $t = 10^{-36}$ s时, 宇宙经过“暴涨”的尺寸为 $R_{-36} = 3.8 \text{ cm}$ , 此时, 求出宇宙密度 $\rho_{bbb} = 3.8 \times 10^{53} \text{ g/cm}^3$ , 宇宙在 $M_{bm}$ 时的尺寸, 即 $t = 5.37 \times 10^{-44}$ 时的尺寸 $R_{-44}$ 。

$$R_{-36} = 1.83 \times 10^{25} \text{ cm} \times (10^{-36} \text{ s})^{1/2} / (7 \times 10^5 \times 3.156 \times 10^7 \text{ s})^{1/2} = 3.8 \text{ cm}^{[3]} \quad (7-8)$$

$$\rho_{bbb} = 3M_u/(4\pi R_{-36}^3) = 3.8 \times 10^{53} \text{ g/cm}^3 \quad (7-9)$$

$$R_{-44} = (3M_u/4\pi\rho_u)^{1/3} = 10^{-13} \text{ cm} \quad (7-10)$$

$$R_{.36}/R_{.44} = 3.8/10^{-13} = 3.8 \times 10^{13} \quad (7-11)$$

必须指出，苏宜教授书中的宇宙“暴涨”的数据是很有代表性的。它指出，当宇宙从初始暴涨到  $t = 10^{-36}$ s时，宇宙尺寸增大  $10^{13}$ 倍，体积暴涨  $10^{40}$ 倍。

5\*. 结论：A. (7-8)式中提出的宇宙在  $10^{-36}$ s时的“暴涨”尺寸是 3.8 cm，作者在(7-6)中同是在约  $10^{-36}$ s时，宇宙的“暴涨”尺寸是 2.4 cm，二者是极其接近的。这说明作者提出宇宙“原初暴涨”的机理是：所有宇宙  $M_u$  中的原初最小黑洞  $M_{bm}$  的合并造成了宇宙的“原初暴涨”，而所有  $M_{bm}$  合并将  $M_u$  连成一体后，就是“原初暴涨”的终结。作者前所未有的对“暴涨”发生的机理、过程和终结都做出了明确的规定和计算，其数据符合现有的理论和观测数据。 B. 因为“暴涨”发生在宇宙初生时的  $10^{-24}$ s之前，其发生的真实情况也许永远不可能被人类观测到。因此，如未来在“暴涨”被否定的情况下，作者还提出了“正涨”的机理、过程和终结的理论。就是说，只要宇宙出生于最小黑洞  $M_{bm}$ ，由  $M_{bm}$  合并产生的膨胀只能二者必居其一。

6\*. 从第2页的图1,看,  $t_{bb} = 0.2 \times 10^{-36}$ s在宇宙演变的大统一时代, 即 GUT Era.

### 【8】. 对我们宇宙过去现在和将来的数据的一些简单的陈述.

我们现在的宇宙是一个真正的巨无霸宇宙黑洞，他的生长衰亡完全符合一般黑洞的规律。他因吞噬外界能量-物质或与其它大小黑洞合并而增加  $M_u$  和  $R_u$ ，只有外界无能量-物质可吞噬时，就发射霍金辐射，直到最后收缩成为最小黑洞  $M_{bm} = m_p$  而消亡。这时，宇宙的年龄将是  $L_u \approx 10^{132}$  亿年。如果宇宙尚有能量-物质可吞噬，它们被吞噬完后，宇宙才收缩，结果同上。只不过宇宙年龄将是  $L_u \gg 10^{132}$  亿年。

我们宇宙黑洞现在的年龄为  $A_u = 137$  亿年。视界半径  $R_u = 1.3 \times 10^{28}$  cm, 宇宙黑洞的总质量是  $M_u = 8.8 \times 10^{55}$  g. 宇宙现在的平均密度  $\rho_u = 3/(8\pi G A_u^2) = 0.958 \times 10^{-29}$  g/cm<sup>3</sup>. 宇宙中遍布着大小黑洞，还有大黑洞套住小黑洞。平直性 ( $\Omega = \rho_r / \rho_g = 1$ ) 是宇宙黑洞的本性。

宇宙黑洞诞生于普朗克粒子  $m_p$  的最小黑洞  $M_{bm}$ ，即  $M_{bm} = m_p$ 。由  $N_{bu} = 10^{61}$  个  $M_{bm}$  合并而成，宇宙诞生时的尺寸只有现在的质子大小，即  $R_{u0} = 10^{-13}$  cm.  $M_{bm}$  在出生时的合并造成了宇宙的“原初暴涨”，宇宙在  $t_0 = 2 \times 10^{-37}$ s 时结束“原初暴涨”，将整个  $M_u$  连成一体，并形成许多  $M_{bb1} = 4 \times 10^{15}$  g 的小黑洞。宇宙黑洞现在的膨胀就是这些小黑洞  $M_{bb1}$  的合并造成的。

人类现在生活在宇宙黑洞中，不知道宇宙黑洞  $M_u$  视界之外的宇宙，但在宇宙黑洞内的空间，散布着许多黑洞，最小的黑洞是约  $3M_\theta$  的恒星级黑洞，最大的黑洞是  $(10^8 \sim 10^{12}) M_\theta$  的超级大黑洞，它们都处在星团和星系的中心。

### 【9】. 进一步的解释、分析和结论:

1\*. 奇点被定义为具有无穷大密度的点。广义相对论方程中粒子的点结构、粒子没有热压力作为对抗力、零压宇宙模型和定质量物质粒子的收缩必然造成奇点的出现。就是这些假设使 S·霍金 和 R·彭罗斯在 40 年前证明了我们宇宙诞生于奇点或奇点的“大爆炸”，证明了黑洞里有奇点。本文运用霍金的黑洞理论公式和其它经典理论公式，推导出来一个新的重要公式 (3c)， $-t^{3/2} \leq k_1(2G\kappa)/(C^5)$ ，精确地计算出，当前宇宙塌缩到时间  $t \approx -0.5563 \times 10^{-43}$ s 时，所有前辈宇宙中的：粒子塌缩成为最小黑洞  $M_{bm} = (hC/8\pi G)^{1/2} \equiv m_p \equiv 1.09 \times 10^{-55}$ g，即普朗克粒子  $m_p$ ，而爆炸消失在普朗克领域。由于爆炸使充满能量-物质的“宇宙包”产生膨胀和温度的降低，于是能量重新聚集成稍大的稳定的最小黑洞  $2M_{bm}$ ，它们成为产生新宇宙的胚胎，它们的合并造成了宇宙的“原初暴涨”和我们现在宇宙黑洞的膨胀。

2\*. 实际上 John & Gribbin 已在他的 <大宇宙百科全书> 书中指出，“我们宇宙可能来源于  $M_{bm} \approx 10^{-55}$ g 的粒子”<sup><7></sup> “（普朗克领域）实际上是我们宇宙诞生时的状态。”<sup><7></sup> 作者在本文中只不过用正确的理论公式和数据通过精密的计算准确地证实了 John & Gribbin 的这个猜想而已。

3\*. 我们宇宙是一个真实的宇宙黑洞 (UBH)，它完全遵循一般黑洞的参数  $M_b$ ,  $R_b$ ,  $T_b$ ,  $m_{ss}$  在其视界半径  $R_b$  上的守恒公式。因吞食外界能量-物质而膨胀，发射霍金辐射而收缩。

4\*. 本文首次提出了产生“原初暴涨”的机理，并论证了我们新生宇宙的“原初暴涨”是由于新生的最小黑洞  $M_{bm}$  的合并而造成的，其终结的时间为  $t_{bb} = 0.2 \times 10^{-36}$ s.

5\*. 无论我们现在的宇宙是膨胀还是收缩，或者说是开放还是封闭，不像弗里德曼对广义相对论方程的解所指出的那样，取决于宇宙的实际密度  $\rho_r$ ，这种  $\rho_r \neq \rho_c$  或  $\Omega \neq 1$  的假设是从错误的理论中得出的伪命

题。对于一个真正的宇宙黑洞，只有一个取决于 $M_b$ 的确定密度， $\rho_r = \rho_c$  或 $\Omega = 1$  是黑洞的本性。科学家几十年对 $\rho_r \neq \rho_c$  的争论时毫无意义的。

6\*. 宇宙学中有 4 大难题，即奇点，平直性疑难，视界疑难和磁单极疑难，他们困扰了科学家们数十年，作者在本文中解决了奇点和平直性疑难之后，其它 2 个疑难就容易了。况且本文对“原初暴涨”的正确解决可能对视界疑难提供了解决的钥匙。

7\*. 本文虽未创建新理论或创立新方程,但在解答现今存在的科学难题上却似乎胜过其它的任何一种单独的经典理论或新理论. 由于所运用的各种经典理论的基本公式基础坚实,在自然界行之有效,故文中对宇宙学提出的所有新观念新论证新解释和新结论有比较圆满的自治性,与现今的观测数据完全相符合。本文也不排斥任何新理论的现有成果和结论。

8\*. 如果本文排除了宇宙诞生于“奇点”或者“奇点的大爆炸”，那就没有必要在宇宙创生时给予任何特殊的边界条件，也不必乞灵于上帝或奇迹或新物理学如量子引力论，弦论或超对称理论等对我们宇宙起源或对“宇宙大爆炸”的诸多牵强附会的解释。根据现成的经典理论就能阐明和推算出我们宇宙诞生时的演变机理，条件和过程，这种演变过程完全符合现有的物质世界的规律和物理定律，如因果律，质能转变守恒定律，和我们现在宇宙黑洞的膨胀。

9\*. 本文计算中所得出的数据与现有理论，公式和观测结果是相当一致的。这表示本文中新观念是宇宙的实际演化规律的一幅较好的自治图像。或许本文中的新观念和论证方法由于缺乏深奥的新理论，复杂的数学方程和违反常规而难于为绝大多数科学家所接受和信服。但本文由于所用的理论和公式却是可靠而有效的，所以其独特而简单的证明方式和所计算的结果是符合宇宙演变中各种现有的规律的。这为运用几个简单而可靠的经典基本公式以解决复杂的科学难题提供了一个实例。爱因斯坦曾警告说：“万事万物应该尽量简单，而不是更简单。”本文中简单的新观念和新的论证方法也许可以作为一种抛砖引玉吧。

====全文完====

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## 解开八卦图

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摘要: 老子创立了道教, 入世无为。孔子创立了儒教出世, 有为。及具体地设出了阴阳金, 木, 水, 火, 土五行来演化万物运动上升到哲学高度。可惜他们总体上一个从宏观, 一个从微观上分析看待问题, 对伏羲画的八卦图没有真正理解, 继没有找到道的来源, 也没有解释出八卦图所表示出事物的意义, 因此几千年来八卦的作用始终没有在科学技术上发挥巨大的作用。

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关键词: 八卦图图解 来源 功能作用等

为什么中国人至今没有获得诺贝尔科学奖? 在美国学生应当学习的科学课, 有一套新标准, 如: 不提倡学达尔文进化论等。因他的理论不能在实践中得到复制证实。而我们中国独有的古老的太极八卦图, 有着很宏奥的哲理, 它设解论万物特别方便适用, 也叩击现代科学殿堂的大门。确少数人问津和研究, 总认为由于年代久远, 因此真正解开太极八卦图为现代科学服务已成刻不容缓的事了。

那太极八卦图究竟它是受了什么启发怎么创造出来的? 太极八卦图有那些作用? 创造出它来究竟是为了什么目的?

首先《周易》是谁写的, 是怎样一部书? 王锡玉先生认为: 先天古太极八卦图产生于至少六千多年前的新石器时代, 它为全人类的高智先驱、中国人的开宗先祖——伏羲氏所画。他借助于高功能所获信息和上一轮人类古文明残留下来的遗迹——河图、洛书的启示, 仰观俯察, 像天法地, 近取自身, 远涉诸物, 从而感应顿悟, 绘制出了先天古太极八卦图并相传至今, 成为现代人类开云拨雾、认识宇宙的指南。

乾泉先生认为, 易经是一部集体性著作。经过历代哲学家的阐释, 发展成为一部博大精深的哲学著作。同时, 它也是我国古代一部关于自然科学和社会科学的经典。《周易》古人用它来预测未来、决策国家大事、反映当前现象。上测天, 下测地, 中测人事。然而这只是古人在未掌握科学方法之前所依托的一种手段, 并不是真正的科学。虽然有些理解与科学相符, 那是因为这个理解正好有科学合理性, 但就不能因为说它是科学的。只能当它是一种文化。

我也认为从古至今没有人真正了解八卦和起源问题, 只有传说和不确切的猜想, 而无确凿之实证解开八卦之谜。因此, 我国的易学研究在原理探索上仍无重大进展, 理论研究停步不前, 思想混乱, 实际应用容易趋向神秘主义。上述状况严重歪曲了八卦的学术地位和科学价值, 阻碍了中华易学良性化发展的步伐。

首先解开“周易”一词的出处及原意。至于《周易》的“周”字, 历来说法颇多, 如有人认为: 周是“易道周普无所不备”的意思; 也有人认为: 周易是指的周朝。周朝为一般人所接受, 很多人都以为《周易》的“周”字就是年代的意思。

在《简易道德经》里, 周是周到圆满, 易是运动变化无不果的意思。我认为周是表示万物自旋周期的周, 知道了自旋的周, 如活人你去论证他有什么功能作用和变化才有意义。易你知道了它为什么能作自旋的周期, 你对它运动变化无不果的过去还是现在及将来, 就易如反掌。就像知道人的一生六个时期中, 婴儿时期需哺乳, 少年青年时期在学习, 中年壮年在工作, 老年功成名就安享晚年的规律,

下面对《周易》简单概述解释它起源问题

据传, 《周易》的诞生地就是现在的世界遗产城市安阳市。羑里城位于安阳市区南 10 公里处。

奇门遁甲书中是伏羲见蚩尤打仗制造了大雾无法取胜, 就发明了指南车。创立八卦是龟板烧了变形纹路等, 搞发明的人知道这两件都不科学, 一个新产品短期内是不可能发明出来的, 创立八卦是龟板烧了变形纹

路,也不可能建立八卦图理论. 奇门遁甲书中也说可能是外星人送给黄帝天书。

外星人送给黄帝天书。那外星人是谁? 任何理论不能凭空捏造,

因此,我最近得到资料研究发现,约7000年左右冰川融化洪水泛滥冰河期结束,维拉科查人或玛雅人他们为了今后重返地面,作最后中国地形地面测绘时(这事是有历史记载的可查资料大千世界刊号 ISBN7-436-39240-9 [[消失的科技文明]]可能当时看见炎黄大地上伏羲正同蚩尤打仗战场上惨烈,尸横遍野,血流成河,就将自己使用的指南车(就是永动机。它这能前进,或蚩尤阵地位置南方,因此车朝南行。古人把这种车称指南车)赠送给伏羲也就是后来称黄帝,才破了强悍凶猛蚩尤在打仗时制造的大雾,结束了旷日持久的战争。虽然他们两者时间可能有相差,这并不影响这件事的真实。

我认为最起码黄帝发展了八卦,他肯定战争结束后,对立下战功的指南车进行了研究。就将指南车中八组卦件所在位置不同,做出不等能量就发生了不匀速转动。同自然界万物也有如快和慢两种不同矛盾,从而发生一元复始的进化现象结合起来联想,而创立出八卦图和理论。或是将外星人送给黄帝天书加以时代应用上描叙,这是其一。

如我经搞永动机顿悟写出统一场论后,由于自然和科学杂志都拒收我稿件,2007年春节初二我请来南京大学研究生小凌看我永动机和论文,被他批评了一顿后,初八我在地摊上买旧书,才看到了香港人写的奇门遁甲书,认真读后使我增添了智慧和力量。原来八卦图内表叙如空门生门等实同我统一场论椭圆图一个意思。



同时古人已议论是外星人送给黄帝天书,八卦有一万年以上历史。所以无论来源于上古维拉科查人还是伏羲都受指南车启蒙写出八卦较科学些。

那为什么称八卦? 古人认为易卦系统最基本的要素为阴阳概念,而阴阳概念包括阴阳的性质和状态两层意义。如果不理会阴阳的状态,只论及其性质,则可以用阳爻(—)和阴爻(--)表示阴阳。将上述阴阳爻按照由下往上重叠三次,就形成了八卦,即“乾,坤,震,巽,坎,离,艮,兑”八个基本卦,称为八经卦。

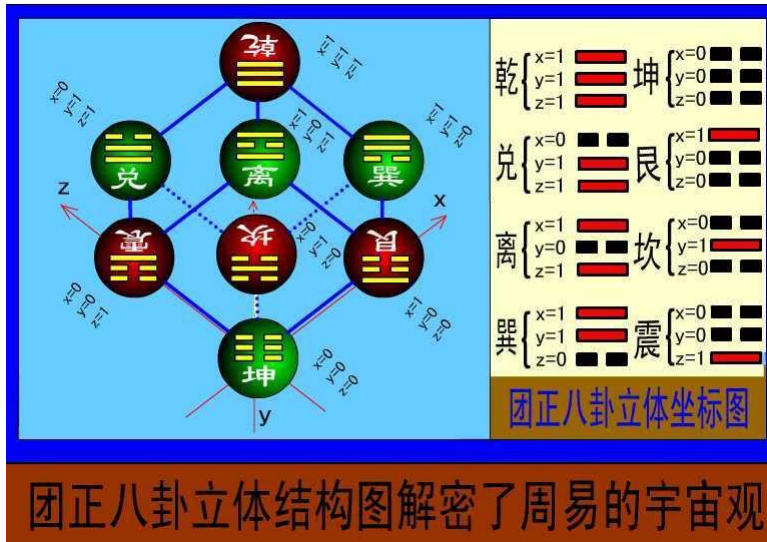
我认为是受指南车中八组卦件启发? 见上图八个似箭头零件立起来时,是卦在圆盘上。而且无穷大或无限小用八组卦件最理想组成系统,好比人的双手双脚双耳双眼才能去复制能量。所以古人根据这个系统结构称八卦名词。

同时在预测上用阳爻(—)和阴爻(--)表示。

也是来源永动机中那八组卦件中,每一组也有那一长两个短的配件组成。两个短的配件阴爻(--)在圆盘内不同位置是转换成不同角度,才好复制出能量发生自旋。所以用阳爻(—)表示为男性或是指杠杆,阴爻(--)表示复制出更多能量或是女性,这样来建立预测理论是符合科学的。见下图

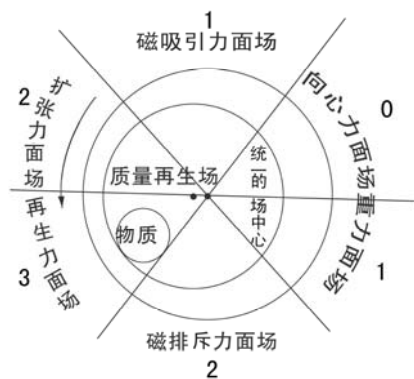


那中国的八卦图表示什么意思呢？图一



团正八卦立体结构图解密了周易的宇宙观

其实这些图并不能让人解密宇宙万物。见我的图二, 三. 就使人们容易理解了



椭圆运动走势图



八卦图那两个似箭头,实质是宇宙创生时一个表示作向心力,一个表示作离心力的两条道推挤摩擦才产生出万物。[阴阳如男女,或精神世界、物质世界等,是进化产生出宇宙后万物名称的不同场合上灵活应用描述。宇宙最初不存在阴阳]

它们各具备不同功能。一个是在作椭圆向心运动作用下,去中心将零碎的如气体聚合成团。也就是零的开始去创造出质量。一个是在系统加速的离心力作用下,将质量从中心抛出去复制出更多再生能量。这样就知它们以后的发展方向。

因这种椭圆运动的道,在物理上称向心运动。因此,得到了向心力向中心加速使进入中心物质得到了系统自旋的离心力被抛出去做功,自然界万物就是以这两种简单不同推挤摩擦力表叙,才使统一场上各种场力面上的物体,无论在时间,还是在空间就有进化发展的自旋能量了,进而才逐步产生出如引力,电磁力、强作用力、弱作用力等问题。这样再来利用如太极子物理学等对它们的各种表叙,及结合以上各种数据灵活运用它,就能去设、解、论万物发生在统一场上的不同随机问题,和解开如自旋不匀速问题。

那个图大圆圈的大小,(实质是张多维空间的大椭圆球运动立体图)它表示一个质量如人或弥漫气体,作一元复始运动进化时的质量大小,去复制出更多能量的场或道的运动形态轨迹。就是它大圆圈越大,向心椭圆运动力就越大。

图中小圆圈空穴,也就是科学家所说如星系中心的黑洞空穴那样,它似杠杆的力臂长短,或女性的子宫,或电脑复印机及工具、武器等,经过系统加速运动,就可将质量复制出更多能量。如汽油经过转化质量就不存在,能量就守恒了。所以,将小圆圈空穴及工具等,称质量再生场。是被用来复制出更多能量。

因自然界没有任何一种物质聚合后,能使交界处没有空穴和内部没有空穴,在这个空穴中,实际产生了两个中心或两种场,一个是在椭圆壳体中心形成,它的能量是以向心力为中心的统一的场或称自转极,【也就是老子道的中心轴。老子没有找到它的功能作用,仅用天地人是表叙不清它功能作用。】另一个它的能量是被系统加速产生的离心力为中心或称如地球的倾斜极,或是表示以竞争对手为中心,图中是以不对称的椭圆内壁空穴运动场所中心形成质量再生场。就是图中那两个黑点,同八卦图二表叙略有区别,它是随着不同速度,才有不同偏心度。这样去演示操作一个质量受作用力大小,就知它所在位置有统一质量标准。如场的质量越大,或离心力越大,或空穴偏得越大,或人们手中使用大质量的工具、兵器等,为它们复制出的能量就越多。

以及一个质量它在被自旋运动过程场上不同位置,条件或时间,被复制出的能量是截然不同,也像八卦图二表叙出六种质量力面场一样,周易利用它仅从卦的解释,以为有三变才得了一爻。[永动机中做功的心脏每一组也有那三个零件组合]

因此一卦有六爻和要做十八变。虽表叙不同,但基本意思和目的相符。[它好比人五脏六腑。没有它配合人就不能活。(其实六种质量力面场是相对数,是由各自运动质量决定。如西红柿六个而西瓜内部这有五个小空穴场就能复制能量和储存种子了)。

一个事物在一元复始运动过程场上出现的匀速运动,和从上向下加速运动,不规则运动,及向上降速运动的四种运动速度,见上图三。

这样就在各自速度环境中,被向心力和离心力大小发散出各自万物。如地球上出现匀速运动春季,加速运动夏季,不规则运动秋季,降速运动冬季,就又出现了不同季节生长出不同植物生物,那些植物生物在进化时又出现了生老病死等多维空间,。

而在周易预测上,把这四种速度等称四象以及八种门,六十四卦等来设解论事物。同时演算方法先逆时针从下向上,以后从上向下演算两者基本意思也相同。

中国老子把八卦中一个下面似箭头向心运动规律,看做成人人生在世创造出再大质量没有用,眼一闭脚一瞪一死百了,创立了道教入世无为。

孔子把八卦中另一个上作离心力运动似箭头,看做成人人生在世就是要复制出更多能量,如财产等光宗耀祖,创立了儒教出世有为。及具体地还设出了阴阳金,木,水,火,土五行来演化万物运动上升到哲学高度等。可惜他们总体上一个从宏观,一个从微观上分析看待问题。对伏羲画的八卦图没有真正理解,继没有找到道的来源,也没有解释出八卦图所表示出事物的意义。更不能在科学技术上真正发挥出巨大的作用。

这是由于图画得不准确和表叙的意思不同,就不能像我那两张图让人一目了然去演化万物运动。而且他们说不出为什么,他们不是搞永动机发明的人,这能作预测上牵强附会。因此一个事物发展中不可预测的随机性,往往降低八卦理论科学性

八卦图如像这两张图表叙解释清楚,自然科学先进 3000 年,夸克解释就不应该美国人获诺贝尔奖。

总之,八卦图创立出目的实质是让人们利用这两个似箭头的向心力和离心力大小,这两个善的道德方向,[[‘德’]指它提倡善的发展。因善恶到头终有报。如做出的能量最多或最少极限时都受到系统控制统一。发生大爆炸或大塌缩等。]]。也可称精神文明[精神指运动,活人才能复制物质,和物质文明去发展,[因此八卦就是以最简单的方法揭开了万物微观世界运动规律,来劝化启发指导人们事事要按道德办事,人遇人交往按道德办事,国家与国家关系按道德办事,解开自然一切难题,顺沿这个所谓的两种道办事

如星系,原子,动物,植物,等去顺序演算,就知它过去和现在及将来都是在运动中,被复制出的能量多少,产生出统一椭圆球结构下,才进行了一元复始的进化运动,这样就能进一步去推测它发展趋势和引出的相互之间物理运动变化等。

纵观人类发展史和对宇宙的认识史,在各个时期都有其时代特征的新理论观点问世。但随着社会科技的进步,这些理论观点又被划时代的新认识所代替。然而,在人类认识史上,唯一经久不衰且随着现代科技的发展越来越证明其深邃奥秘集真理于一体的,就只有中国的“易经”过去和现在及将来都以道德为适用。所以,“易经”绝非单纯是占卜问卦搞预测的一门学问。实际上,它是囊括天地人一切领域的总学问、总宇宙观。“易经”的本质,即向心力离心力大小或是用宇宙阴阳场数(素)交变转换的对立统一等设立出的万能理论。

今后我们也可用【【统一场论】】完善八卦理论,让人们打开智慧的大门,去建立起更雄伟的,如钢筋混凝土的框架结构新的哲学和物理学及天文学等科学大厦,引领人们将质量存放在一个系统内去复制出更多再生能量,一个科学大发展的道德化新时代,去造福人类。否则今后能源危机和核战争不可避免提前。甚至那些因气候变暖离开地球的人还会新冰河期到来要回马枪再上地面破坏核设施。

因此,解开八卦任重而急迫,决不能像达尔文的进化论那样不能让人去复制成功,也要让周易接近平民掌握运用。更不要像唯心论、唯物论那样,只将精神世界、物质世界圈定为谁是第一性,而不讲事物在运动发展中,它们之间关系是互动随机应变中,形成了统一场论这个数学道理来设题解题。同时,对牛顿、爱因斯坦质量转换能量观,及量子论,超弦论等各种理论也要灵活运用,明确谁的质量大或是方法得当,谁就是统一的场等。为中国人早日获得诺贝尔奖作贡献,为世界大同作贡献。

由于时间仓促和科研忙及脑病痛限制我写作,对八卦问题暂叙这一部份,仅供参考。

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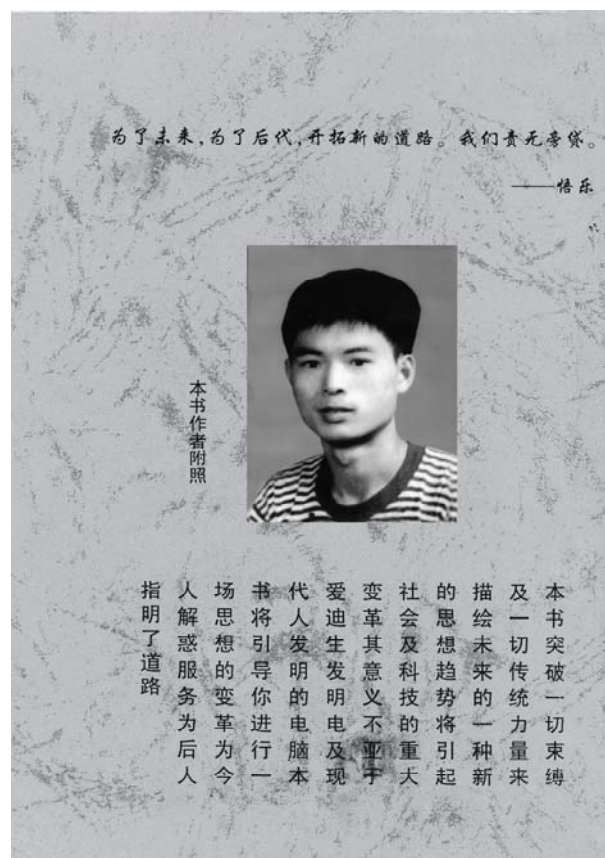
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## Development and validation of extracurricular instructional package in social studies

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**Abstract:** The purpose of this study is to develop extracurricular activities for social studies instruction and to compare learning outcomes in the extracurricular activities and the conventional groups. To achieve these objectives two research questions and three hypotheses were formulated. Four instruments were developed. The validated extracurricular instructional package (EIP) was presented to the experimental group while the control group was taught the same social studies topics using the conventional approach. The major findings were that (1) JS1 Students taught with extracurricular instructional packages relationship develop more cooperative attitude to work (2) exhibited cordial relationship with others (3) developed positive attitude to work. Recommendations were made: Teachers work load should be restructured to accommodate their involvement in extracurricular programs (2) More flexible time-release from teaching or in structuring the allow time for activities during school day.

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**Keywords:** extracurricular instructional package, social studies

### 1. Introduction

Social studies has been defined variously by many authorities: some regard it as a synonyms for citizenship education which aims to train individual to live co-operatively with one another, to appreciate cultures, cultures other than one's culture and to share with one another (Dike, 2002). Social studies, according to Adeyemi (2004) centers around man, that is on how man manipulates and is manipulated by the various environments in which he finds himself. All these connotes that social studies is concerned with the political, geographical, scientific and technical environments to confront the challenges of survival on the earth as his home. Nzeribe (2002) opines that social studies is an investigation of human activity which studies man at home, at work, in politics, at play, in the community, nation and in every programme of his life. It is an embracing subject as it stresses the relationship between all aspects of life and learning, incorporating the knowledge of the individual subjects in the discussion of all aspects of man and his environment. The fact about social studies is that it draws its character from social sciences, natural sciences and humanities to constitute its autonomy and identity.

In Nigeria, the introduction of social studies into the curricular is seen as a way by which national consciousness, unity in diversity, national tolerance and respect for others are to be taught. The initial objective of social studies in Nigeria relates to the relationship of subjects and the broadening of the country's education system. This is to say that social studies could be the answer to Nigeria's problems. Ibikunle, (2001) asserts that the new integrated social studies direct the attention of Nigerian children into

their own immediate environment before it attempts to show them more of the other world. This promotes a greater integration of learning experience as it employs systematic coorelation of subjects around themes drawn from the functions of living. It is also organized around problem-solving.

To ensure that learners are exposed to learning experiences which will shape their behaviors, foster values, ideals, solve social/personal problems in the society, the curriculum must be planned and developed to diagnose the needs of society and learners. Curriculum specialists and educators view curriculum as a way of gaining experimental and problem solving approaches. These experiences are acquired through three major curriculum categories namely programme of studies, programme of activities, and programme of guidance. These programmes represent a mirror image of a nation's state of development (Dike 1995). Curriculum therefore should be seen as an avenue through which a society provides solutions to her identified problems and since the problems of a society vary with time, its curricular should also be adaptive. Ituen (1995) in highlighting the need for schools to give adequate attention to these categories of curriculum in distinguishing these components, noted that programme of studies comprises subjects studied in schools, in order to cultivate the intellect and to disciple the mind. Programme of guidance is an organized effort on the part of the school to help students to understand themselves and identify their academic difficulties with a view to finding suitable solutions to them, while programme of activities are all school sponsored learning activities. these

components have complementary functions in achieving educational goals.

As demand for life-long education increases a variety of factors in Nigeria such as political instability, economic recession, struggle for national integration amidst divergent ethnicities, increasing crime rate etc, raise serious doubts towards the ability of the conventional curriculum to solve the challenges of the present time. because of the criticisms leveled against the conventional curriculum, Ukah (2003) advocates for the reversal of the conventional curriculum to a curriculum of “self integration” designed to enable citizens to see how “culture shapes their lives and how then can shape reality” The National Policy On education (2004) therefore places a great emphasis on the acquisition of practical and applied skills, which are necessary to attain self-reliance, as a result, curriculum specialists have introduced changes in curriculum design.

Some of these curriculum innovations are: Contextual learning where students employ their academic understandings and abilities in a variety of in and out-of-school context to solve real-world problems. Problem-based learning-solution of a real world problem shaping the whole learning experience of the students, and Metacognition – thinking about thinking “assisting learners to know what they know and what they don’t know” extracurricular Activities which means all the school based or school sponsored activities and events presented under the auspices of a school.

The objectives of these curriculum innovations are:- Development of skill in social living, development of ethnical value and education for self integration and liberation.

The study therefore is an attempt to contribute to curriculum development in Nigeria through validation of extracurricular instructional packages and events presented under the auspices of a school, which enhance its overall academic programs. Norwood Board of Education (USA) highlighted the importance of the extracurricular activities as follows.

1. Develop useful new capabilities in learners that can lead to the extension of career opportunities.
2. Develop pupil initiative and provide for the exercise of responsibility
3. Development leadership capabilities and good organizational skills.
4. Aid learners in social skills
5. Enable learners to explore a wide range of individual interest that might not be available in the regular program. Schools and employers of labor are beginning to care about the

extracurricular activities students were involved

Social studies were established in Nigeria because of its unique role in giving young Nigerians a firm base in national unity. It was expected that through social studies Nigerian would.

- Develop a sympathetic appreciation of the diversity and interdependence of all members of the local community, national and international communities
- Ensure the acquisition of relevant knowledge, skills and attitudes which are essential pre-requisite to personal development as well as to a positive personal contribution to betterment of mankind.
- Develop respect and tolerance of the opinions of others in disagreement and willingness to accept necessary changes in system of law and order.

Decades after its implementation Nigerian is skill besieged by many national problems such as youth restiveness, drug abuse, cultism, ethnicity, students graduate without acquiring leadership skills? part of problem may be because social studies curriculum had placed more emphasis on knowledge acquisition with the exclusion of opportunities to assist students to develop morally and socially. Extracurricular activities have the potentials to assist the learners to overcome intolerance in small and large communities, foster a more cooperative environment, encourage complex building and reduce school dropout. This study wants to contribute to nation building and integration by developing and validating Extracurricular instructional Package (EIP) for teaching social studies concept.

The purpose of this study is to develop extracurricular activities for social studies instruction, specifically to generate extracurricular activities for selected topics in JS 1 social studies, integrate the content with extracurricular activities. Also to compare the learning outcomes in the extracurricular activities group and the conventional teaching group.

### 1.1 Research Hypotheses

HO<sub>1</sub>. There is no significant difference in the development of co-operative attitude to work by students exposed to social studies extracurricular instructional package (EIP) and their counterparts exposed to the conventional social studies package.

Ho<sub>2</sub>. There is no significant difference in the ability to resolve conflicts by students exposed to social studies extracurricular instructional Package



(EIP) when compare with their counterparts exposed to the conventional social studies package.

$H_{03}$ . There is no significant difference in the commitment/dedication to work by students exposed to social studies extracurricular package compared with their counterparts taught with conventional social studies package.

## 2. Methodology

The population consisted of all the JS1 students in Rivers State, Nigeria using a combination of random and stratified sampling technique, one hundred and sixty students were drawn from four junior secondary school in Ogba-Egbema-Ndoni LGA. Their baseline knowledge and behaviour were considered, that is: high-ability, average and low ability students were randomly assigned to the experimental and control groups in each of the four sampled school.

### 2.1 Instrument

Three types of instruments were used, namely:

1. An Extracurricular Instructional Package (EIP) in the selected topics in JS1 social studies.
2. An instructional package on the same topics using conventional approach
3. An achievement test for each lesson taught with the two approaches. After teaching both the experimental and control groups the stated topics, performance tests given to guide answer the research questions and hypotheses. Questionnaire items and checklists were also used to monitor changes in behaviour of the students. The instruments developed (Extracurricular

Instructional Package – EIP) were formatively evaluated to ensure their validity, using the large group approach. Analysis of the data was carried out using t-test, mean and standard deviation.

### 2.2 Procedure

The experimental group (ET1) was taught the topic “meaning and importance of co-operation” with formatively developed Extracurricular Instructional Package (EIP). The control group (CT1) was taught the same topic (meaning and importance of co-operation) without a developed extracurricular instructional package, using conventional approach. The meaning of conflict and consequences of non co-operation was taught using Extracurricular Instructional Package (ET2) while the control group (CT2) was taught the same topic with conventional approach. The third topic “Attitude to work” was taught with formatively developed Extracurricular Instructional Package (EIP) to the experimental group (ET3), while the control group (CT 3) was taught the same topic using conventional approach.

## Result and Discussion

### Research question 1

To what extent do extracurricular activities help students acquire relevant knowledge, skill and attitudes from the following topics in social studies?

- a. Meaning and importance of co-operation
- b. Meaning of conflict and consequences of non co-operation
- c. Attitude to work (commitment/dedication).

**Table 1: Students Response to EIP (Meaning & Importance of cooperation)**

Rate the extent to which getting involved in extracurricular activities can help you to acquire the following knowledge, skills and attitude	SA	A	U	SD	D	Mean	SD
Understand the importance of working together with others	50	26	1	2	2	4.46	0.42
Develop interest in working with others (co-operative skill)	65	13	-	2	-	4.76	0.35
Score higher grades in the class	64	14	-	2	-	4.75	0.35

Standard reference mean = 2.5

Table 1a above shows that the mean ratings obtained for the various attributes measured (meaning and importance of co-operation), were greater than the standard reference mean of 2.5. This indicates that the students were of the view that the development and participation of extracurricular activities complement in-class teaching which can help them to acquire the following knowledge, skills and attitudes: importance of working together with other (4.46), co-operative skills (4.76). The small values of standard deviations obtained in all the responses indicate that students held similar views.

**Table 1(b): Students Responses to EIP (Conflict and Consequences of non co-operation)**

Rate the extent to which getting involved in extracurricular activities can help you to acquire the following knowledge, skills and attitude	5	4	3	2	1	Mean	SD
	SA	A	U	SD	D		
Reduce fighting in the school	63	15	-	2	-	4.74	0.36
Develop negative attitude to conflict	56	20	1	2	1	4.6	0.35
Relate well with my class mate	53	20	2	1	-	4.61	0.35
Become aware of consequences of non-co-operation	61	17	-	2	-	4.71	0.37

Standard Reference mean = 2.50

Three items assessed the level to which getting involved in extracurricular activities help them to reduce fighting in the school, develop negative attitude to conflict, relate well with others and aware of consequences of non-co-operation. The response choices included 1=Disagree, 2 = strongly disagree, 3= Undecided, 4 = Agree, 5=Strongly Agree. Data was analyzed. It shows that the mean ratings obtained for the various attributes measured, were greater than the standard references mean of 2.5. This indicates that the students were of the view that participation in extracurricular activities complement in-class teaching, which help them to acquire the following knowledge, skills and attitudes: reduce fighting (4.74), increase social relationship (4.61), negative attitude to conflict (4.6), aware of consequences of non co-operation (4.71). The standard deviations obtained indicate that the students held similar views

**Table 1(c): Student Response to EIP (Attitude to work)**

Rate the extent to which getting involved in extracurricular activities can help you to acquire the following knowledge, skills and attitude	SA	A	U	SD	D	Mean	SD
Be dedicated to any assigned duty	40	30	5	3	2	4.29	0.31
Develop self confidence and initiative	41	32	3	2	2	4.35	0.28
Understand the dangers of being a lousy worker	62	15	1	2	1	4.71	0.36

Standard reference mean = 2.50

Three items assessed levels of participation in attitude that can be acquired. The items are dedication to assigned duty, self confidence and initiative dangers of lousy worker. The response choice included 5 = strongly agree, 4 = Agree, 3= undecided, 2 = strongly disagree, 1 = disagree. The tables above shows that mean ratings obtained for the various attributes measured were greater than the standard reference mean of 2.5. This indicates that the students were of the view that the development and participation in extra-curricular activities complement in-class teaching which can help to acquire the following knowledge, skills and attitudes: dedication to work (4.29), self confidence and initiative (4.35) and awareness of dangers of being lousy worker (4.71). The standard deviation obtained indicates that the students held similar views.

## Research Questions 2

What evaluation strategies can best be used to monitor the effectiveness of social studies extracurricular package?

**Table 2a: Evaluation strategies and their effectiveness to monitor behaviour changes**

Evaluation Strategies	Behaviour Monitor	Effectiveness	
Checklist	Co-operative skills	High	Low
	Punctuality	“	“
	Commitment to tasks	“	“
	Ability to relate with others	“	“
	Efficiency in work	“	“
	Ability to resolve conflicts	“	“

Respondents rated high

**Table 2b: Attitudinal Instrument**

Variables	N	Mean	SD	t-cal	Critical Value	Df
CT1	80	5.28	1.6	5.472	1.972	158
ET1	80	6.96	2.2			
Attitudinal Instrument (Likert Scale)		Develop interest in work with others			4.76	0.35
		Reduce fighting in the class			4.74	0.36
		Relate well with others in the class			4.61	0.33
		Be dedicated to any duty assigned.			4.60	0.33
		Develop confidence and self initiative			4.35	0.28
		Develop interest in school activities			4.29	0.31
		Develop negative attitude to conflict			4.6	0.33

Table 2a&b above show that the best evaluation strategies that can be used to monitor social studies effectiveness are the checklist and attitudinal instrument (Likert Scale). These instruments yielded positive results in monitoring the changes in behavior of the students.

### Hypothesis 1

There is no significant difference in the development of co-operative attitude to work by students exposed to social studies extracurricular instructional package (EIP) and their counterparts exposed to the conventional social studies package.

**Table 3: Teaching without extracurricular Instructional package (CT1) Vs Teaching with EIP (ET1)**  
Not significant at  $P = > 0.05$

The result from the table 3 above indicates that there is significant difference in the development of co—operative attitude to work by students exposed to social studies extracurricular package and their counterparts exposed to the conventional social studies package in favor of ET1 with higher mean. Hence reject H1 its null form.

### Hypothesis 2

There is no significant difference in the ability to resolve conflicts by students exposed to social studies EIP when compared with their counterparts exposed to conventional social studies package.

**Table 4: Teaching without EIP (CT2) vs. Teaching with EIP (ET2).**

Variables	N	Mean	SD	t-cal	Critical Value	Df
CT2	80	5.74	1.81	4.283	1.972	158
ET2	80	7.01	1.93			

The result above indicates that the obtained t-cal 4.283 with a degree of freedom of 158 at 0.05 probability level is greater than critical value of 1.972. This shows that there is a significant difference in the ability to resolve conflicts by students exposed to social studies extracurricular package and their counterparts exposed to the conventional social studies package in favour of ET2 Reject null hypothesis.

### Hypothesis 3

There is no significant difference in the commitment/dedication to work by students exposed to social studies EIP compared with their counterparts exposed to the conventional social studies package.

**Table 5: Teaching without EIP (CT3) VS Teaching with EIP (ET3).**

Variables	N	Mean	SD	t-cal	Critical Value	Df
CT2	80	5.5	1.684	5.647	1.972	158
ET2	80	7.125	1.925			

\* P = > 0.05

With t-cal 5.647 as against a critical value of 1.972, there is significant difference in the scores of the two groups in favour of the ET3 with higher mean score of 7.125. This indicates that there is significant difference in the dedication/commitment to work by students exposed to social studies extracurricular package and their counterparts exposed to the conventional social studies package.

### DISCUSSION OF FINDINGS

The results of data analyzed showed that the development of extracurricular activities (EIP) in teaching concepts in junior secondary school social studies help the learners to acquire knowledge, skills and attitude. It also enhances learners understanding of such social studies concepts. This finding is in line with those of Rombokas (1995) Silkier and Guardiola (1999) and Stafford (1997) who found that students involved in extracurricular activities receive better grades than those who are not involved in extracurricular activities. In addition, they discovered that activities improve the overall student's intellectual and social development. The investigation also revealed that students exposed to extracurricular activities acquiring such positive learning outcomes, as self-confidence and initiative, cooperative skills, conflict resolution skills and commitment to work. All the attributes measured had mean ratings greater than 2.5 thus indicating that participation in extracurricular activities not only enhance academic achievement but build their character. This view is given credence by the works of MCNeal (1995), Rombokas (1995), Camp (1990), Gerber (1996), Marsh (1992), these researchers agreed that extracurricular activities affect the overall well being of the students. Stafford (1997) in his assessment instrument for the effect of extracurricular activities found that: cooperative living (57%) conflict resolution (50%) interpersonal relationship (63%) etc; thus yielding positive effect.

Hypothesis 1 analysis shows that students exposed to extracurricular instructional package ET1 have mean score of 6.96 and standard deviation of 2.2 while the control group CT1 taught with the conventional method had a mean score of 5.28 and SD 1.6 in favour of the experimental group with a higher mean score of 6.96. The result is consistent with other studies that found that students exposed to extracurricular activities learn how to compromise and work in a group, meet and interact with peers that may not be within their close group of friends and develop social skills (Rombokas 1995).

The result of testing hypothesis 2 shows that students exposed to treatment (ET2) have higher mean score of 7.01 and SD 1.93 while the control group CT2 have mean score 5.74, SD 1.81 thus t-cal

4.283 which is greater than 1.972 t-ratio with a degree of freedom of 158 at 0.05 level of significance. This indicates that there exists significant difference in the ability to resolve conflicts by students exposed to extracurricular instructional package EIP. The result is consistent with research findings of Stafford (1997) which discovered that extracurricular activities offer maximum opportunity of conflict resolution, interpersonal relationship and communication skills. Extracurricular activities develop team work and exercise their social skills and enable them to develop interest in learning social studies, and deter them from unruly behavior.

### RECOMMENDATIONS

The findings of this study and its consequent implications to education system and nation building make the following recommendations not only necessary but also imperative

1. Education benefits of extracurricular programs should be promoted to school.
2. Restructure teacher's workloads to accommodate their involvement in extracurricular programs by paying staff; more flexible time release from teaching; or restructuring to allow time for activities during school day.
3. More research is required to quantify relationship between extracurricular activities, and educational outcomes.
4. Government through ministry of Education should ensure that schools organize sports, excursion and other extracurricular activities to enrich the student's knowledge, reduce dropout, cultism and crime in the school system.

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## **An Assessment of The Effects of Problem Solving Instructional Strategies on Students' Achievement and Retention in Chemistry with Respect to Location in Rivers State**

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**Abstract:** The main purpose of this study is to determine how problem solving instructional strategies would affect students' achievement and retention in Chemistry with particular reference to River State. A pre-test, post-test, non-equivalent control group design was adopted. Two research questions and two hypotheses were respectively answered and tested. Purposive and stratified random sampling was used to select 428 SS II students from two rural and two urban local government areas of Rivers State. These students were randomly assigned to the two treatment groups. Problem solving with Model and Feedback – Correctives (PF), Problem solving with Model Only (PM), and the control Problem Solving by The Conventional Method (PC). The model used is a Generic Problem Solving Inquiry Model developed by Hungerford (1975). A researcher developed and moderated instrument, Chemistry Achievement Test (CAT) and lesson plans were used for the study. Data collected were analyzed using Mean, Standard Deviation (SD) and some gains of achievement and retention and that the hierarchical order of achievement is PF, PM and PC. No significant differences were observed in the post-test mean scores of urban and rural subjects in the achievement is PF, PM and PC. No significant differences were observed in the post-test mean scores of urban and rural subjects in the achievement and retention tests administered in the course of the study. Based on the findings, it is recommended that both rural and urban Chemistry teachers use problem solving instructional strategies, particularly that in which use of a model is supplemented with feedback-correctives in teaching.

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Key words: Instructional Strategies, Students' Achievement, Chemistry

### **1. Introduction**

Researchers on students' output in Science and Technology reflect poor performance (Okebukola, 1986). The several identified problems include low morale and poor preparation of teachers, over crowded classroom/inadequacy of laboratory and workshop facilities, poor attitude of students to work, gross under funding and inadequacy of rewards for excellence in science teaching and learning among others. As multi-dimensional as the problems associated with this trend are, the issue of emerging result-oriented delivery system appears to occupy a conspicuous position (Olaiyiwola, 2002). In an attempt to ensure purposeful/results oriented science delivery in schools, strategies such as activity oriented, guided-inquiry, cooperative learning, demonstration, humanistic, think and do, modified lecturer and many others have been employed by science teachers. Okebukola (1986, 1987), Ajewole (1991), Otuka (1991), Nwosu (1991), Akubuilu (2004) and Ojo (1992) did several works on cooperative learning, discovery/expository instructional methods, laboratory, think and do, acquisition and development of process skills and classroom interaction patterns respectively. These are

good reference point to the above observation. However, the specific problem of teaching science in urban and rural environments and whether urban students perform significantly better than their rural counter-parts when specific strategies are used have not been adequately investigated.

In recent times, however, government at various levels had been making concerted efforts to improve life in rural areas. The educational system is not let out; hence various education management commissions to ensure that qualified specialist teachers are sent to rural schools have adopted various policies. These efforts by the government notwithstanding, secondary schools in rural areas appear to be disadvantaged in comparison with their urban counter-parts. The fact is that most rural secondary schools are comparatively younger and are not as well established as most urban secondary schools. Furthermore, teachers are known to prefer postings in urban than in rural schools.

It has been concluded many times both descriptively and experimentally that there is lack of direct teaching of problem solving strategies in our schools; (Bello, 1985, Akubuilu 1995); that students

need practice in order to utilize the method effectively and that science teachers approve of this method in theory not in practice (Ndu, 1991). In spite of the established needs for use of problem solving in teaching basic sciences, literature on problem solving instructional strategies in Chemistry seem to be scanty in the Nigerian context, most especially in ascertaining the level of performance with respect to urban and rural locations of schools. This study therefore utilized three problem solving instructional strategies – problem solving with model and with feedback – corrective (PF), problem solving with model only (PM), and problem solving by the conventional method (PC) in a bid to determine the effects of these strategies on cognitive achievement and retention of urban and rural students in Chemistry.

### 1.1 Purpose of the study

- i. To determine the effect of problem solving instructional strategies on students' achievement and retention in Chemistry with respect to location.
- ii. To ascertain if significant differences exist in the achievement and retention means scores of urban and rural students taught by the various problem solving strategies.

### 1.2 Research Questions

1. What are the relative effects of problem solving instructional strategies (PF, PM and PC) on Students' Achievement in Chemistry with respect to location as determined by the Chemistry Achievement Test (CAT)?
2. What are the relative effects of problem solving instructional strategies (PF, PM and PC) on students' retention in chemistry with respect to location as determined by the Retention Test in Chemistry?

### 1.3 Research Hypotheses

The following hypotheses guided this study:

- HO<sub>1</sub>: There is no statistically significant difference in the post-test Chemistry achievement mean scores of urban and rural subjects taught Chemistry respectively by PF, PM and PC, as measured by the Chemistry Achievement Test (CAT)?
- HO<sub>2</sub>: There is no statistically significant difference in the Chemistry Retention mean scores of urban and rural subjects taught Chemistry respectively by PF, PM and PC as measured by the Retention Tests in CAT.

## 2. Method

### 2.1 Design

The study is quasi-experimental, employing the Pre-test, Post-test non-equivalent control group design. There was no randomization of subjects in the study. Intact classes were randomly assigned to the experimental and the control groups respectively.

### 2.2 Sample and Sampling Techniques

The sample consisted of 428 SS II students from twelve intact classes, sampled randomly from four senior secondary schools in Obio/Akpor and Port Harcourt Local Government areas and from Omuma and Tai Local Government areas of Rivers State. Both purposive and stratified random sampling techniques were employed in drawing the sample.

Initially, purposive sampling was used in drawing the participating secondary schools. This was because the investigator decided to use schools with at least three classes of SS II. To increase the representativeness of the sample, the method of stratified random sampling was applied. The population studied was stratified into two groups or strata (male and female), thereby excluding the co-educational schools. The schools in each stratum were further grouped into urban and rural. A male and female school each from the urban and rural substratum was randomly sampled by simple balloting by replacement. Four schools altogether emerged, two all males and two all females schools.

### 2.3 Administration of the Instruments

The research conditions (treatment and control) was for a period of eight weeks, after which all subjects were given a pre-test, then the research condition were given a post-test.

The PF and PM groups were instructed by the trained teachers using the appropriate teaching techniques mapped out for each group. For this group, the study adopted "Generic Problem Solving Inquiry Model developed by **Hungerford (1975)**. This instructional model outlines the typical steps one goes through in the scientific solution of a problem. It identified seventeen sequential students behaviours and twenty-one corresponding teacher behaviours groups into a six-stage model of problem solving. For the PF group, feedback – correctives, which focused on reinforcing students' thinking and correcting technical errors, were additionally given. Students in the PC group (the control group) were not exposed to the problem-solving model in use. They were taught by the conventional method of problem solving instruction in Chemistry (which involved providing tasks to be performed without any set procedures).

## 2.4 Data Collection

The instrument for data collection was a teacher-made Achievement Test on Chemistry (CAT). This test was a forty-item test consisting of three subsections of remembering, understanding and thinking. These subsections were developed to correspond to the knowledge, comprehension, application, analysis, synthesis and evaluation cognitive levels. It is a five-option multiple-choice objective test with items from the sections of Chemistry selected for the study. These sections are separation techniques, hardness in water, cracking alkanes to produce alkenes, fractional distillation of crude oil. The instrument was used for both the pretest, post-test and retention test. However, the post-test which was administered a day after the six weeks teaching was a disguised version of the pretest. The retention test was administered two weeks after the experiment. The internal consistency coefficient of CAT was established at 0.76. The temporal stability estimate of CAT was also established since it was to be used as retention test.

Lesson plans were prepared and used in teaching the two treatment groups (PF and PM) and the control (PC). The lesson plans in each of the cases reflected the instructional pattern mapped out for use. So three versions for the lesson plans drawn from each of the Chemistry contents were prepared and validated. The lesson notes served as models for

teachers used in the study. However, training was provided for teachers used for the treatment groups.

## 2.5 Data Analysis

Data for the study were analyzed using mean, Standard Deviations (SD) and Analysis of Covariance (ANCOVA). The mean scores of students in urban and rural schools were respectively calculated for each of the three groups (PF, PM and PC) in achievement and retention tests in CAT. This was used to answer the research questions. Analysis of Covariance (ANCOVA) was used to test the hypothesis in the study. Pretest scores were used as covariates, thus serving to adjust for the initial differences between and within groups.

## 3. Results

The results of the analysis are presented in the tables below according to the research questions and hypotheses of the study. All the hypotheses were tested at the 0.05 level of significance.

### Research Question 1

What are the relative effects of Problem Solving Instructional Strategies (PF, PM and PC) on Students' Achievement in Chemistry with respect to location as determined by the Chemistry Achievement Test (CAT)?

This research question were answered using data in Table 1:

**Table 1:** Pre-test and Post-test Mean Achievement and Standard deviations (SD) scores of Subjects in CAT with respect to Strategy and Location

Strategy	Types of test	Location			
		Urban		Rural	
		Mean	S.D	Mean	S.D
PF	Pre-Test	24.23	8.81	23.67	6.91
	Post-Test	67.27	11.37	66.64	8.13
PM	Pre-Test	24.87	11.18	25.43	9.95
	Post-Test	59.69	11.20	58.61	11.91
PC	Pre-Test	26.01	10.68	25.77	8.58
	Post-Test	55.78	12.03	55.61	10.54

Results in Table 1 reveal that the pretest mean achievement scores in BAT are much lower than the post-test mean scores in all the groups for both urban and rural subjects. This is because the pre-test-treatment-post-test design was adopted. Based on this observation the subjects in both urban and rural schools made some gains in achievement and for both groups the hierarchical order of achievement is PF, PM and PC.

### Hypothesis 1

There is no statistically significant difference in the post-test Chemistry achievement mean scores of urban and rural subjects taught Chemistry respectively by PF, PM and PC, as measured by the Chemistry Achievement Test (CAT).

This hypothesis were tested using data in Table II.



**Table II:** Two-way ANCOVA of Experimental and Control Subjects Achievement in CAT due to Strategy and Location

Source of Variation	Sum of squares	DF	Mean squares	F	Table F	Remark
Covariate	36383.207	1	36383.207	1023.154	3.86	S
Pretest	36383.207	1	36383.207	1023.154	3.86	S
Main Effects	12675.750	3	4225.250	118.821	2.62	S
Strategy	12674.563	2	6337.281	178.214	3.02	S
Location	0.593	1	0.593	0.017	3.86	NS
Interaction						
Strategy X	198.956	2				
Location			9.478	2.797	3.02	NS
Explained	44146.195	6	7359.699	206.910	2.12	S
Residual	14970.707	421	35.560			
<b>Total</b>	59116.902	427	138.447			

Results in table II showed that there is no significant difference in the post-test mean scores of urban and rural subjects in the Chemistry achievement tests. The null hypothesis is therefore accepted as stated.

**Table III:** Mean Retention and Standard Deviations (SD) Scores of the Subjects with respect to Strategy and Location in Chemistry Retention Test

Strategy	Location			
	Urban		Rural	
	Mean	S.D	Mean	S.D
PF	65.35	8.73	63.3	8.22
PM	54.72	11.63	53.07	12.09
PC	48.19	12.75	47.36	11.77
	56.08	11.04	54.58	10.69

The mean retention and standard deviations scores were calculated for the groups (PF, PM and PC) using Chemistry Retention Test scores of subjects in urban and rural schools. The data reveal that the mean retention score was highest for the PF strategy, followed by the PM and least with the PC for both urban and rural locating.

**Hypothesis II:** There is no statistically significant difference in the Chemistry Retention mean scores of urban and rural subjects taught chemistry respectively by PF, PM and PC as measured by the Retention Tests in CAT.

Data in Table IV were used to test this hypothesis.

**Table IV:** Two-way ANCOVA of Experimental and Control Subjects' Performances in Chemistry Retention Test Due to Strategy and location

Source of Variation	Sum of squares	DF	Mean squares	F	Table F	Remark
Covariate	38133.801	1	38133.801	1226.917	3.86	S
Pretest	38133.801	1	38133.801	1226.917	3.86	S
Main Effects	4132.742	3	1377.581	44.322	2.62	S
Strategy	4117.957	2	2058.979	66.246	3.02	S

Location	8.030	1	8.030	0.258	3.86	NS
Two-way	55.256	2	27.628	0.889	3.02	NS
Interaction						
Strategy X	55.256	2	27.628	0.889	3.02	NS
Location						
Explained	58313.469	6	9718.910	312.696	2.12	S
Residual	13085.094	421	31.081			
<b>Total</b>	<b>71398.563</b>	<b>427</b>	<b>167.210</b>			

In table IV showed that there is no significant difference in the post-test mean scores of urban and rural subjects in the retention tests in CAT with respect to location. Therefore, the null hypothesis case is accepted as stated.

#### 4. Discussion

The no significant different in the achievement of students due to location observed shows that students' achievement in chemistry is not dependent on the type of environment under which teaching takes place. There is uniform level of cognitive achievement for urban and rural students. This finding agrees with those of Ekpo (1986) and Fakunle (1986) while it disagrees with those of Okeke and Wood-Robinson (1980) who found significant difference between urban and rural subjects.

In retention test, (table IV) location was not significant. Also the interaction (strategy X location) is not significant. This shows that both urban and rural subjects in the PF, PM and PC groups retained similarly. The implication is that problem solving strategies (innovative or conventional), whether for urban or rural subjects aid retention, probably because problem solving is an activity method of teaching. This finding is in line with those of Tenebaum (1986) and Okebukola (1986), which asserted that any instructional mode, which elicits adequate students participation, has a profound effect on students' retention.

#### 5. Conclusions

From the findings of this study, chemistry teachers in both urban and rural schools should use activity methods such as problem solving instructional strategies. Problem solving instructional strategies, which result in improved cognitive development, acquisition of skills and retention of subject matter learnt could lead to improved cognitive development, acquisition of skills and retention of subject matter learnt could lead to

improved attitude towards solving life problems. These are required to enhance functionality in our education system. Chemistry curriculum should also be structured to aid teaching through problem solving.

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# 全息照相与再现的微观机制

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**摘要:** 本文从粒子观点出发, 运用惠更斯包络面概念、以及点光源辐射产生球形包络面观点, 以相干性很好的激光作为光源, 对全息照相和全息照相记录的再现进行了全新的理论分析, 从而证明, 光不具有波动性。那些象波动特征的光学现象, 是大量光粒子与实物体之间的一种相互作用, 其结果遵守宏观统计规律。  
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**关键词:** 点光源; 球形包络面; 全息照相; 全息照相再现; 同心圆簇; 杨氏干涉仪群

## 1. 引言

在近代光学理论中, 似乎用光的波动假设已成功发现并解释了全息照相和全息照相记录的再现。菲涅耳(A. J. Fresnel, 1788-1827)构想到, 透镜不一定只由玻璃制成, 它可以“画”在透明的薄板上<sup>[1]</sup>; 加伯(D. Gabor)<sup>[2-3-4-5]</sup>提出了一种两步光学成像法, 即现代称著全息成像方法。从时间角度看, 似乎是理论预言早于实践, 好象后来的实践证实了先前的预言。但是, 作者仔细分析了菲涅耳和加伯的全息理论和方法, 其中存在着很多问题和不切实际的成份。作者坚信光是一种微观粒子<sup>[6]</sup>, 并充分应用球形包络面概念和杨氏干涉仪<sup>[7]</sup>的工作原理, 获得了更加清晰的理论图像, 反映了客观事物的本质。另外, 近代光学理论中认为杨氏干涉仪是波动说所有有力证据, 其实, 杨氏实验不但没有证明光的波动性, 而且证实的正是光的粒子性<sup>[7]</sup>。

## 2. 全息照相的记录

### 2.1 实践方案一

加伯(D. Gabor)在1948年提出, 利用光的干涉, 可以记录物体的全部信息, 不需要透镜成像系统拍摄成全息<sup>[2-3]</sup>照片。如图1示, 设想有一理想厚度的透明薄板(理解为, 薄板是由单个单个的原子排组而成的二维平面材料), 在薄板上有一物点 $F$ (只讨论被照射物体的某一个点), 我们使用相干光束照射薄板, 这束光通常称著参考光。参考光照射物点 $F$ 时产生的反射光, 通常称著物光。将物光看成一个发光点, 这个次级点光源在同一时刻的光反射, 按照球形包络面观念以及本文作者曾经提出过的相关理论<sup>[6-7]</sup>, 这些光子是比较均匀(不是绝对)地分布在这个球面上, 这个由众多光粒子排列而成的几何球形阵面 $S$ , 就是一个球形包络面; 又因物光与参考光来自同一光源, 其涨落长度(或称波长) $\lambda_0$ 也相同。经扩束后的激光光束(相干光束)可以看成是由无数光子排列而成的一个“光子平面”, 或称平行包络面, 图1中用平面 $U$ 表示。

物点 $F$ 产生的球形包络面(其实为半球球面), 那么, 物点扩散的包络球面与参考光的平行包络平面相交叠于某点 $Q(a_i, x_i, y_i)$ ,  $n$ 为实验室所在透明气体物质(假定是均匀的)的折射率, 为了方便和直观, 我们以直线代替简化的包络平面, 以半圆方程代替半球面方程。

物点球形包络面 $S$ 的方程:

$$x_i^2 + y_i^2 = \left(\frac{c}{n} t_i\right)^2, \quad (1)$$

参考光平行包络面 $U$ 的方程:

$$x_i = \frac{c}{n} \left(t_i - \frac{k\lambda_0}{c}\right), \quad (2)$$

( $k = 0, 1, 2, \dots$ )

式中 $K$ 为自然数, 它表示参考光包络平面所落后的距离比物点的包络球面;  $\lambda_0$ 表示真空中光的涨落长度(或称波长),  $n$ 为空气折射率。解方程组得:

$$y_i^2 = \frac{2k\lambda_0 c t_i}{n^2} - \frac{k^2 \lambda_0^2}{n^2}. \quad (3)$$

交叠点前进并到达感光板上点 $P$ , 并设这个交叠点在感光板中心点 $O$ 附近不远处, 所以, 物光到达感光板(即胶片)的时间近似为:  $t \approx r_0 n/c$ , 代入式(3)我们得:

$$y_u^2 = \frac{2k\lambda_0 r_0}{n^2} - \frac{k^2 \lambda_0^2}{n^2}, \quad \text{略去二次项我们得式}$$

$$y_u \approx \sqrt{2k\lambda_0 r_0/n},$$

即是:

$$y_u = \sqrt{2k\lambda_0 r_0/n} \quad (n=1.0003, k=0, 1, 2, \dots). \quad (4)$$

$y_u$ 表示圆的半径,  $r_0$ 表示物点到胶片的垂直距离。

因此,从图1中分析,球形包络面 $S$ 与平行包络面 $L$ 的交叠区域最终在胶片上发生的光化学反应是一个圆环,干涉图样即是一系列的明暗相间的同心圆,两明纹之间是暗纹。经过一段(或足够)时间曝光后,感光板就将这物点的信息记录了下来。

现在我们分步讨论公式  $y_u = \sqrt{2k\lambda_0 r_0/n}$  .

当 $K=0$ 时,  $y_0 = 0$ , 这个圆就是一个点,

当 $K=1$ 时,  $y_1 = 1.414\sqrt{\lambda_0 r_0/n}$  ,

当 $K=2$ 时,  $y_2 = 2\sqrt{\lambda_0 r_0/n}$  ,

当 $K=3$ 时,  $y_3 = 2.45\sqrt{\lambda_0 r_0/n}$  ,

.....

即有:  $OA=1.414\sqrt{\lambda_0 r_0/n}$  ,

$AB=OB-OA=0.586\sqrt{\lambda_0 r_0/n}$  ,

$BC=OC-OB=0.45\sqrt{\lambda_0 r_0/n}$  .

显然,  $OA>AB>BC>.....$  .

在图1中,物点 $F$ 的包络球面不断扩散,与参考光的平行包络平面交叠轨迹线分别为 $L_1, L_2, L_3 \dots\dots$

等;这里需要说明的是,当物点的球形包络面与平面参考光同时到达感光板时刻,在感光板中央形成一个斑点;当落后一个距离 $\lambda_0$ 的平面参考光与球形包络面 $S$ 相交迭的轨迹 $L_1$ 终点在点 $A(L_1$ 表达为参考光平面落后物点 $F$ 球形包络面一个 $\lambda_0$ ),  $L_2$ 表示为参考光平面落后物点 $F$ 球形包络面二个 $\lambda_0$ , 依次同理,我们将这些轨迹线看成是光线束。因此,这些交叠点光子照射到胶片上即引起胶片中卤化银的光化学作用。又由于 $OA>AB>BC>.....$ , 所以在感光板上,相邻圆形环条纹之间的间隔是不均匀的,离感光板中心越远的区域,环纹间的距离越小,显示条纹越密集。

经过一定时间(在瞬间不可能有足够数量的光子发生作用跟胶片之间)照射后,在感光板上就记录下相关的光化学反应。所以在经历一定时间(至少不是瞬间照射)曝光后的感光板,经显影、定影和干燥后,形成一种类似于不规则的环状光栅结构的全息照片。理想一实践验证方案:如果我们将平行的相干光(经扩束的激光)的相邻包络面之间时间延长,即是说,在第一列包络面射出后间隔0.5秒再发射出第二列包络面,这样,无论照射多长时间,也不能得到全息记录,最多也只能得到中央区的一个斑点而已。

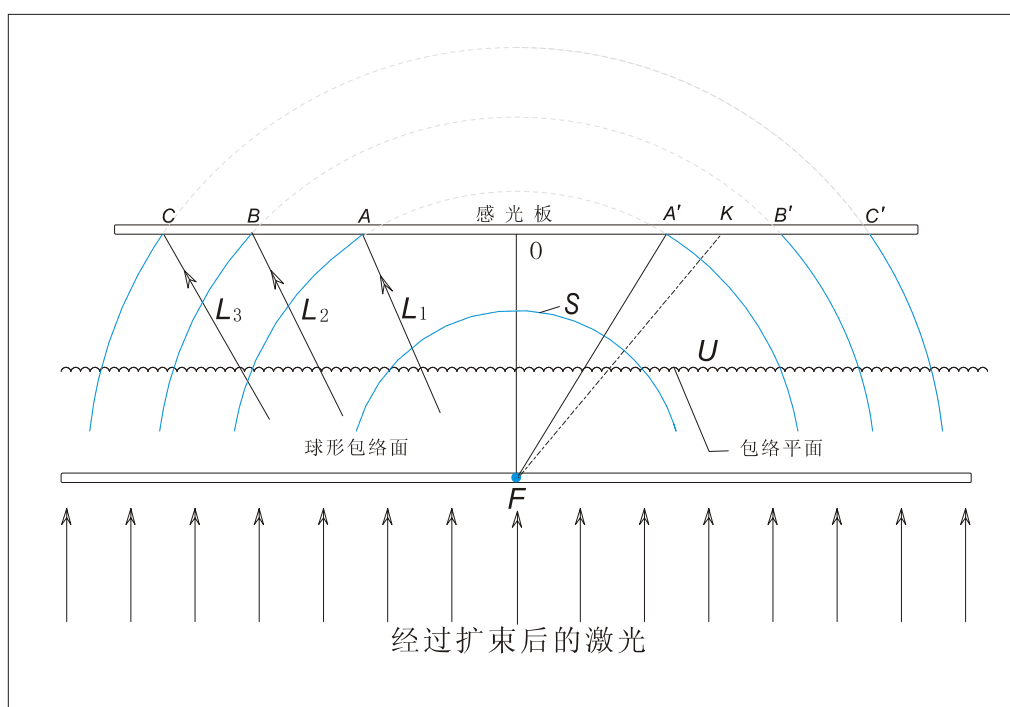


图1 一个全息照相系统

$U$ =参考光;  $S$ =物光;  $A, A'$  =干涉环纹

Figure 1. A holographic system [  $U$ = reference beam;  $S$ = object light;  $A, A'$  = circular interference fringes]

## 2.2 实践方案二

下面这一方法获得相近的效果。如图 2 示, 假设  $F$  为被摄物体上的任意点, 它发射一球形包络面 (由多个胡克球组成) 照射到感光板上, 点  $F$  到  $O$  的距离为  $r_0$ , 参考光垂直照射到感光板上, 物光和参考光是由同一光源经过“相关路径”处理的相干光束。在点  $O$  为零级干涉 (正好干涉加强), 设感光板上任意一点  $A$  到  $F$  的距离为  $r_k$ 。

物光从点  $F$  到感光板上任意点  $A$  和中心点  $O$  的几何程差为  $\Delta R = r_k - r_0$ 。  $n$  为实验室所在透明气体物质 (假定是均匀的) 的折射率, 则从点  $F$  到  $A$  和  $O$  的光程差为:

$$\Delta\Psi = n\Delta R = k\lambda_0 .$$

$$(\Delta R = r_k - r_0, k = 0, 1, 2, \dots) \quad (5)$$

凡是满足上式的点形成的一些以  $O$  为圆心、以  $y_u$  为半径的圆;  $y_u$  由下式给出:

$$y_u^2 = r_k^2 - r_0^2$$

$$y_u = \sqrt{2k\lambda_0 r_0/n + k^2 \lambda_0^2/n^2} .$$

略去高阶二次项, 我们得:

$$y_u \approx \sqrt{2k\lambda_0 r_0/n}$$

$$(n=1.0003, k = 0, 1, 2, \dots) \quad (6)$$

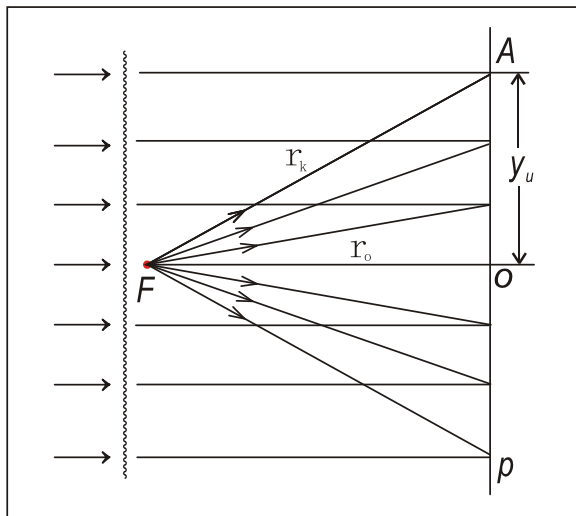


图 2 全息照片上的环纹

Figure 2. Ring pattern on the holographic picture

因此, 干涉图样是一系列的明暗相间的同心圆。在图-1 中所画出的是过同心圆的任意一条直径线。物点的反光为球形包络面, 而参考光是一组一组的由光子排列而成的光子平面, 这个光子平面与物点的球形包络面交叉重叠成一簇同心圆。两种方法的结果有一微小区别, 细心的学者不难发现, 公式 (3) 与

式 (6) 中有一符号相反, 虽然对结果不产生影响, 但物理过程是不相同。第一种方法很实在, 它是符合客观现实的, 后一方法有点机械和人为假设, 作者感觉出它有点类似于本末倒置。

## 3. 全息照相记录的再现

我们将图 1 中得到的感光胶片使用同样的参考光束照射它, 为了方便, 我们以同心圆直径上的明纹和明纹与明纹之间的暗区域作为研究对象, 如图 3 示。明纹  $O$  和  $A$  相当于能够透光的孔, 则暗区域为  $OA$ , 所以, 透光明条纹  $O$  和  $A$  跟暗区域  $OA$  就构成了一个微型“杨氏干涉仪”。紧接着, 明纹  $A$  和  $B$  跟暗区域  $AB$  构成第二个微型“杨氏干涉仪”, 依次同理。从感光胶片整体上看,  $OA$ 、 $AB$ 、 $BC$ ……等, 它们就组成了一个连续的微型杨氏干涉仪群。

微型“杨氏干涉仪”中两明条纹之间的距离为  $d$ , 根据式 (4) 的计称,  $OA > AB > BC > \dots$ 。再结合公式  $y_u = -\frac{ka\lambda_0}{nd}$  或  $y_u = \frac{ka\lambda_0}{nd}$  可知<sup>[7]</sup>,  $d$  越小

(意指两明条纹之间的暗区距离), 干涉条纹的偏离就越大。作者据此计算和几何作图都得到证明, 那些偏向感光板中心方向的“杨氏干涉条纹”(即光线束) 便会聚于点  $F$ , 这个聚会光点就是原物体的实像。

在使用参考光照射胶片时, 我们把参考光看成是涨落有序的相干光, 包络平面  $U$ ——光束的阵面 (经典理论称为光束的波阵面)。在杨氏干涉仪群中的零级干涉线均为平行光线, 一级和二级干涉线便会聚于点  $F$ , 一级干涉线的贡献最大, 三级四级以及更高级的干涉线均能对点  $F$  产生微小贡献, 但大都几乎是散射光。在这一过程中产生的另一束光则为发散状态, 观察者看到的便是实像点  $F$  的虚像。显然, 任何一个实物体都是由无数多个点构成, 物体上的每个点的信息都被记录在感光胶片上<sup>[4-5]</sup>, 这个全息图就是一个非常复杂的“杨氏干涉仪群”。当使用相应的相干光照射到全息相片时, 经过感光胶片上的“杨氏干涉仪群”的干涉效应, 各个像点又同时被再现。在图 3 中, 如果我们将照片的大部分区域用不透明屏挡住, 只留下一小部分  $AC$ , 照片中只有透过亮缝  $A$ 、 $B$  和  $C$  的光线束才对像点及虚像有贡献, 实像和虚像的交会区域仍然是  $F$  点和  $F'$  点, 只不过是会聚的光线数量较少而显示出强度 (准确地说应该是垂直于照射面光线的密集程度) 很弱比透过整体胶片刻, 这就是破损全息照片同样可以再现像而又没有完好照片现像清晰的真正原因。

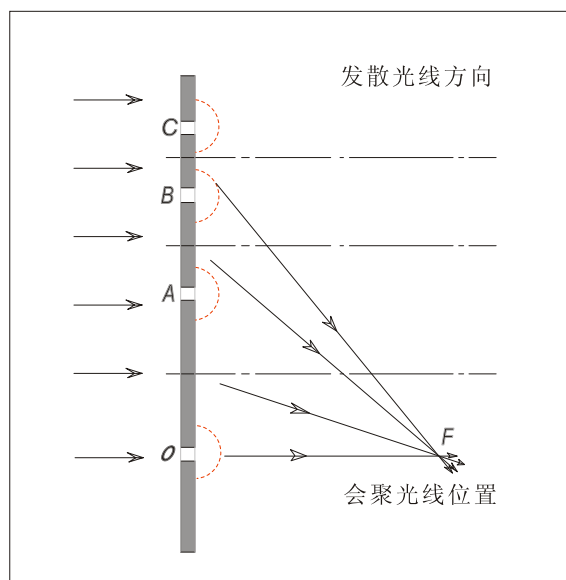


图3 照片生成的象和虚象

Figure 3. Photo-generated images and virtual image

#### 4. 镜与像的对称性证明

如图4示,当用光照亮物体,假设从物点 $F$ 发出(或产生)的球形包络面,是以物点 $F$ 为中心向外均匀扩散的球形包络面。

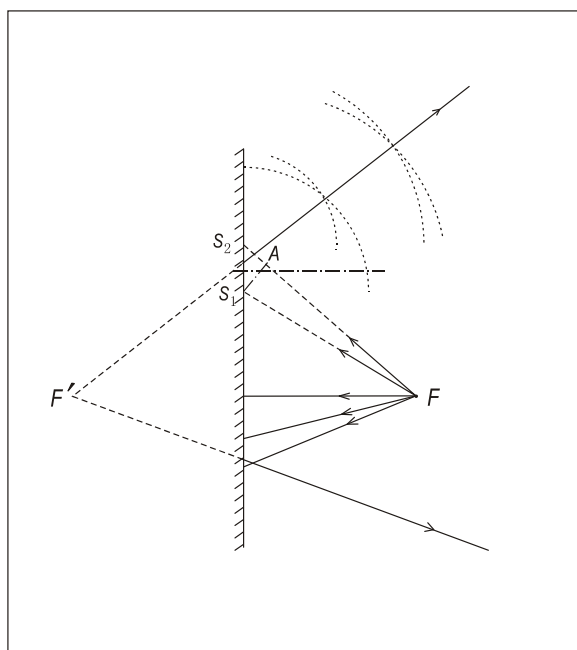


图4 物体在平面镜中的像

Figure 4. Objects like in a plane mirror

并且设想,在这个球形包络面上有两个“面元”的光线先后分别落于镜面上的点 $S_1$ 和 $S_2$ ,这两个面元的光分别在镜面上产生各自独立的次级球形包

络面,以 $S_1$ 和 $S_2$ 为中心呈球形向外扩散,这两个次级球形包络面在镜前空间域又相交叠,其公共交迭轨迹为图4中的一条射线,这条射线即是反射光的方向线,——它实质上不是一条光线,是对反射光出现几率最大区域的一种表述。在本讨论中只讨论了一个物点的一次球形包络面的两个面元对反射光束的贡献,在实践中是由大量物点和多次球形包络面的综合作用,由于视觉因素,众多反射光线的反向延长线就是物点 $F$ 的像点 $F'$ 。点光 $F$ 到 $S_1$ 和 $S_2$ 的几何程差为 $\Delta S = FS_2 - FS_1$ ,光程差为 $\Delta\Psi = n\Delta S$ , $n$ 为空气折射率( $n=1.0003$ )。在反射后,两个次级球形包络面的半径差就是这个几何程差 $\Delta S$ 。所以,为了讨论的简单化,就以几何程差为近似值进行作图和代数运算即可。

#### 5. 结束语

物光与参考光同时到达感光板时刻,在这个狭小区域(可以看作一个点)发生光化学反应,而当物光与参考光不同时到达感光板上的区域,认为没有发生光化学反应,从而使胶片上生成明暗相间的图纹,这就制成了全息照片。这里必须强调,暗条处也有光子存在,只是两份光子不同时到达而已。当:上一个包络面的光子被感光胶片吸收后,它又马上辐射出去(再次反和散射),而下一包络阵面的光子才到达感光胶片处被接收;根据本文的反射理论,上一球阵面的光子只是存在微弱的反射及散射,由于没有同时到达某个“点”的几份(两份或两份以上)光子出现,这个区域就不可能产生光化学反应,维纳(O.Wiener)的驻波实验也证实了这个论述。两个弧面交叠点及附近区域落足点的光子密度最大,光子的作用密度很大——呈交叉状态作用在感光板上的某一小区,在同时到达的那些光子的作用下产生光化学反应。当在实践中用相同参考光照射这张全息相片时,两明纹与一暗纹就组成了一个微型杨氏干涉仪,整个图纹就象是无数个连续排列的微型杨氏干涉仪群,在环纹的内侧,干涉光线束向着环中心方向,若干束光的聚焦,这个聚焦区域即为原物点;而环纹外侧的光束方向为发散光线,它不可能呈现聚焦状态,由于视觉因素,它在发散光线束方向的反向延长线聚焦为一点,就如同平面镜中的像一样,通常这个视觉点称为全息的虚像。

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## Holographic Recording and Reproduction of Holographic Micro-mechanism

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**Abstract:** From the particle viewpoint , the use concept of Huygens, and the point light source radiation spherical envelope, a very good coherence of the laser as the light source, on holography and holographic representation of the theoretical analysis of records. To prove that light, not the wave. Those optical phenomena such as wave characteristics, is light particles and the interaction between a physical body, the results of statistical rules to comply with the macro.

**Key words:** Point light source; spherical envelope; hologram; hologram reproduction; a series of concentric circles; Young interferometer group

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## Comparative Analysis Of The Allocative Efficiency Of Cassava Producers That Use External And Internal Inputs In Imo State, Nigeria

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### ABSTRACT

The current unsustainable farming practices, high demand for staple food crops especially cassava, observed low productivity and inefficient resource allocation by farmers motivated this study to comparatively analyse the allocative efficiency of cassava producers that used external inputs and those that used internal inputs in Imo State. A random sample of 100 each of the external and internal input user farmers were collected from a pre-survey sample frame of 400 farmers drawn from across the three agricultural zones of Imo State. Data on the farmers' socio-economic characteristics and the value of factors used and output produced were collected using structured questionnaire. The analyses were done using descriptive statistics and production function analytical tools. A critical analysis of the result of the production function indicates that the Cobb-Douglas production function best explained the relationship. Finally, the computation of the allocative efficiency of the two categories of farmers showed that both categories did not allocate resources efficiently. Therefore it was recommended among others that more efficient resource allocation procedure be sought for and subsequently disseminated to the farmers through the various change agents.

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**Key Words:** Sustainable; Allocative; External Input; Internal Input; Efficiency.

### INTRODUCTION:

The slow growth in staple food production in Nigeria and other Sub-Saharan Africa is attracting attention in the scientific community as well as in the political sphere (Onyegbula, 1999). Cassava (*Manihot esculenta crantz*) is a major staple food crop in Nigeria. It constitutes about 93% of the major starch staple (Olojede et al, 2000). Cassava is widely accepted by the local farmers and this is attributed to its width of ecological amplitude such as its adaptability to a wide variety of ecological and agronomic conditions (Carter et al, 1992).

The current national concern about the production and use of cassava and the subsequent policy directives on complementing the constituent of wheat flour with 10% cassava flour has attracted the attention of national and international research agencies towards ways and means of increasing the output and hence the productivity of cassava. Recently a research consortium led by the International Institute of Tropical Agriculture (IITA) Ibadan Nigeria and the National Root Crop Research Institute ( NRCRI) Umudike Nigeria developed improved cassava cultivars capable of boosting cassava output by 7% per hectare of land (IITA,1994). Besides, the National Seed Service

(NSS) has several programmes for Cassava, Maize, Sorghum and other Cereals aimed at multiplying the improved varieties in order to meet the demands of State Ministries of Agriculture. Despite these efforts per hectare, cassava production continues to decline (Sarma and Kunchai, 1991). Low cassava productivity may be due to dwindling resources owing to population pressure, environmental degradation, natural disaster and social conflicts. In addition to these factors, low productivity may also be due to inadequate supply of inputs, lack of improved technology and inefficiency in the use of the productive resources. However, if farmers are adequately provided with inputs and improved technology and not exposed to various input combinations that will enhance their efficiency, the problem of low productivity will persist. Olayide and Heady (1982) attributed the issue of low agricultural productivity to inability of farmers to make use of available resources efficiently. They further pointed out that this problem can be reversed if farmers are conscious of the efficiency of resource use.

Although increases in agricultural productivity are urgently needed, such increases need to be sustainable. Liebhardt, (1987) posits that agricultural sustainability involves minimizing the use of external

input and maximizing the use of internal inputs which already exists in the farm. In this study external inputs constitute inputs that are artificially manufactured or created, very capital intensive in procurement, usually purchased, depends on very high skill and technology to produce and use and not readily available to resource poor farmers; Internal inputs constitute those inputs that are naturally endowed, relatively very cheap to procure, do not require high skill to use, depends on indigenous technology, and very readily available and affordable to resource poor farmers.

Consequent upon the following factors that;

- cassava is a very important staple food crop in Nigeria and the world at large,
- 
- there is obvious low productivity of cassava despite various efforts by research institutions to improve on its production,
- the low cassava productivity is caused by inefficiency in the allocation of available farm resources,
- there is need for sustainability in every agricultural production practice, and
- that agricultural sustainability involves minimizing the use of external input and maximizing the use of internal inputs which exist on the farm, this study aimed at comparing the allocative efficiency of cassava producers that used external inputs and those that used internal inputs in Imo State, stands justified.

It was hypothesised that cassava producers that used external and internal inputs do not allocate resources efficiently.

## MATERIALS AND METHODS

This study was conducted in Imo State. There are three agricultural zones in the state namely Okigwe, Owerri and Orlu. The topography is generally undulating with conspicuous soil loss due to gully erosion in many areas. The state has high agricultural potentials with available arable land for the growth of tropical crops as yams, cassava, maize, cocoyam, plantains and bananas. Cassava is a staple food generally produced in the survey area (Anuebunwa, 1990). The soils are known to be generally acidic having a  $P^H$  between 5.0 and 5.5 (ISMANR, 1986). It was estimated that 84% of the total land area is potentially productive with 48% being devoted to the production of annual crops under the traditional bush fallow system while the rest 36% is under tree crops (ISMANR, 1986).

Imo State has tropical climate characterised by high rainfall and temperature ranges of 1500mm to 2300mm and  $34^{\circ} C$  to  $37^{\circ} C$  respectively. Correspondingly, the vegetation is tropical rainforest that has suffered lots of deforestation. The occupation of majority of the inhabitants is farming. Almost every family engages in farming as a primary or secondary occupation, cultivating mainly arable crops like cassava, yam, cocoyam, maize, vegetables and tree crops like Oil palm, coconuts, oranges, mangoes and numerous others. The production systems vary from smallholders multiple cropping using internal inputs to those using external inputs additionally.

To ensure that a representative sample of farmers in the State was used in this study, a multi-stage sampling technique was adopted in sample selection. Firstly, a pre-survey sampling frame of 400 cassava farmers was drawn from across the three agricultural zones of Imo state with the aid of the registers of the Village Extension Agents (VEA). Out of this frame, 80 respondents were randomly selected from each of the three agricultural zones to give a sample size of 240 respondents. Furthermore, pre-tested questionnaire were administered to them by the researcher with the assistance of VEAs and some trained enumerators.

Owing to factors like wrong information, mutilations on the questionnaire and some questionnaire that were not returned, some of the distributed questionnaire to the respondents were rendered void and not used in analysis. Hence only 200 questionnaire which is made up of 100 external input users and 100 internal input users were used in the analysis. Information that bothered on the farmers socio-economic characteristics, inputs used and outputs produced in physical and value terms were collected and analysed.

## Analytical Procedure

Descriptive statistics such as mean was used to analyse the socioeconomic characteristics of the cassava producers. Data were also analysed using the production function model. Four functional forms were used. They are Double log, Semi-log, Linear and Exponential functional forms. The production function model is implicitly specified as follows,

$Q_{yi} = f(L_d, L_b, C_n, F_z, O_m)$  and Model 2 for internal input user farmers is similarly stated as follows

Where

$i = 1$  for external input users, and  $2$  for internal input users.

$Q_y$  = Value of Cassava (N)

$L_d$  = Land in hectares

$L_d$  = Labour in mandays

$C_n$  = Capital in (N)

$F_z$  = Fertilizer in tons.

$O_m$  = Organic manure in tons.

It is expected a priori that the coefficients of  $L_d$ ,  $L_b$ ,  $C_n$ ,  $F_z$ , and  $O_m > 0$ .

## RESULTS AND DISCUSSIONS

### Socioeconomic Characteristics of Cassava Producers

The Socio-economic characteristics of the cassava producers on the average are presented in table 1.

**Table 1. Socio-Economic Characteristics of Cassava producers on the Average**

VARIABLE	MEAN VALUE	
	External input users	Internal input users
Age (years)	51	53
Educational level (years)	13	7
Household size (number of persons)	5	11
Farm size cultivated (ha)	2.32	1.94
Labour input (mandays)	46	42
Quantity of fertilizer/Organic manure used/ha (tons)	0.84	0.48
Expenditure N/ha	64,956	49,845
Revenue N/ha	93,750	106,443

Source: Survey Data, 2005.

Table 1 shows that both categories of cassava farmers are middle aged. However those that used external input are more literate with 13 years of formal education, have less household size of 5 persons, possess 2.32 hectares of farm land, and use higher tonnage (0.54) of fertilizer than those that used internal inputs with 7 years formal education, 11 persons in a household, 1.94 hectares of farm holding and 0.48 tonnes of Organic manure use. The result is indicative of the effect of education on awareness and adoption of improved technologies such as fertilizer use. Also more household size of internal input user farmers may have favoured the use of bulky organic manure, its generation and handling in the farm. However higher farm size encourages inorganic fertilizer use due to unavailability of enough organic manure to sustain large farmland cultivation.

### Estimation of Production Function of Cassava Producers

Table 2 Shows the Multiple Regression Results of Cassava Producers that Used External Inputs.

**Table 2. Multiple Regression Results of Cassava Producers that Used External Inputs**

VARIABLES	Linear function	Double-log function	Semi-log function	Exponential function
Land ( $L_d$ )	7477.91 (2.803034)**	0.035102 (0.307704)	3246.80 (0.979859)	-0.27934 (-1.31374)*
Labour ( $L_b$ )	-785.75 (-1.33814)*	0.1761 (0.70217)	-1290.6 (-0.1771)	0.026019 (0.555915)
Capital ( $C_n$ )	0.465911 (1.45997)*	0.53503 (3.298664)***	9896.47 (2.1002292)**	7.14E05 (1.25909)*
Fertilizer( $F_z$ )	3346.34 (0.629082)	-0.78094 (-20.8584)***	4374.86 (4.021613)***	-0.19477 (-0.45928)
Constant	239779.7	2.315	64376	5.78
$R^2$	0.103	0.838	0.194	0.035
F-Value	2.732	123.24***	5.741	0.875
E	63990	2.07	6.0169	5.07

\*\*\* = Significant at 1%    \*\* = Significant at 5%    Source: Survey Data, 2005.

Table 3 Shows the Multiple Regression Result of Cassava Producers that Used Internal Inputs.

**Table 3. Multiple Regression Results of Cassava Producers that Used Internal Inputs.**

VARIABLES	Linear function	Double-log function	Semi-log function	Exponential function
Land ( $L_d$ )	2018.28 (0.63083)	-0.01197 (-0.17949)	3444.45 (0.70135)	-0.13678 (-0.3456)
Labour ( $L_b$ )	2468.84 (1.954354)	0.189205 (1.070734)	6826.99 (0.524604)	0.030618 (0.40218)
Capital ( $C_n$ )	0.218668 (0.96389)	0.734148 (9.047122)***	7565.78 (1.2666002)*	0.31389 (0.013789)
Organic Manure ( $Om$ )	50156.21 (0.704047)	0.100879 (0.941956)	7935.99 (1.006128)	0.585919 (1.101348)
Constant	11214	3.02	-8175.99	-
$R^2$	0.0645	0.487	0.0345	0.17
F-Value	1.625	22.60 ***	0.8544	0.6553
E	99726.69	1.37	101778.2	1.74

\*\*\* = Significant at 1%

\*\* = Significant at 5%

Source: Survey Data, 2005.

**Allocative Efficiency of Cassava Producers**

Table 4 Shows the Allocative Efficiency Indices for cassava producers that used External Inputs.

**Table 4: Allocative Efficiency Indices for Cassava Producers that Used External Inputs.**

Input	Marginal Value Product(MVP)	Marginal Factor Cost (MFC)	Efficiency Index $W_i = MVP/MFC$	Implication
Land	0.035102	3500	0.00001002	Inefficient Allocation (over-utilized)
Labour	0.1761	550	0.00035	Inefficient Allocation (over-utilized)
Capital	0.53503	1	0.53503	Inefficient Allocation (over-utilized)
Fertilizer	-0.78094	50,000	-0.000016	Inefficient Allocation (over-utilized)

Source: Survey Data, 2005.

Table 5 Shows the Overall Elasticity of Production of External Inputs Used

**Table 5: Overall Elasticity of Production of External Inputs Used**

Input	Factor Coefficient $e_i$	Implications
Land	0.035102	
Labour	0.1761	
Capital	0.53503	
Fertilizer	-0.78094	
Summation of $e_i$	-0.035	$e_p < 0$ (Negative returns to scale)

Source: Survey Data, 2005.

Table 6 Shows the Allocative Efficiency Indices of Cassava Farmers that Used Internal Inputs.

**Table 6: Allocative Efficiency Indices for Cassava Producers that Used Internal Inputs.**

Input	Marginal Value Product(MVP)	Marginal Factor Cost (MFC)	Efficiency Index $W_i = MVP/MFC$	Implication
Land	-0.01197	250	0.000047	Inefficient Allocation (over-utilized)
Labour	0.189205	100	0.0018	Inefficient Allocation (over-utilized)
Capital	0.734148	1	0.734148	Inefficient Allocation (over-utilized)
Organic Manure	-0.0100879	5000	-0.000020	Inefficient Allocation (over-utilized)

Source: Survey Data, 2005.

Table 7 Shows the Overall Elasticity of Production of External Inputs Used

**Table 7: Overall Elasticity of Production of External Inputs Used**

Input	Factor Coefficient $e_i$	Implications
Land	-0.01197	
Labour	0.189205	
Capital	0.734148	
Organic Manure	-0.0100879	
Summation of $e_i$	0.901	$e_{p < 1}$ (decreasing returns to scale)

Source: Survey Data, 2005.

## DISCUSSION

Tables 2 and 3 presented results of multiple regression analysis in four functional forms, namely Double-log (Cobb-Douglas), Semi-log, Linear and Exponential forms. It is very obvious from these tables that the Double-log functional form gave the best fit in both models for the two categories of farmers. Therefore it was selected as the lead equation and used for discussion and further analysis.

In table 2 (farmers that used external inputs), the coefficient of multiple determination  $R^2$  is 0.838. This implies that the variation in the dependent variable has been explained up to 83% by the model showing strong relationship between the endogenous variables and the exogenous variables. Also in table 3, the  $R^2$  is 0.48, which implies that 48% of the variation in cassava output are explained by the joint action of the independent variables included in the model. Besides, the F-value in tables 2 and 3 are 123.24 and 22.6 respectively. These values are significant at 1% indicating that the model gave a good fit to the data. Finally, the t-statistic shows the degree of significance of the independent variables in explaining the variation in the dependent variable.

The results of table 2 shows that two exogenous variables out of four tested are significant at 1% level. They are amount of Capital (Cn) used and quantity of Fertilizer (Fz) used. The positive coefficient of capital (0.53) implies that change in the quantity of capital is directly proportional to the change in the value of cassava produced. Also the quantity of fertilizer used is significant at 1% with a negative coefficient of -0.78094. The negative sign implies that there is an inverse relationship between the value of cassava and the quantity of fertilizer used; which means that the higher the quantity of fertilizer used, the lower the value of cassava produced and vice versa. When the allocative efficiency of cassava producers that used external inputs were computed as shown in table 4, it was found that all the farm resources were over-utilized implying inefficiency in allocation because the marginal factor costs (MFCs) were higher than the marginal value products (MVPs) in each case. This invariably means that these inputs land, labour, capital, and fertilizer should be increased in quantity or quality to ensure efficiency in production.

Furthermore, when the overall elasticity of production of the external inputs were computed as

shown in table 5 using the coefficients from table 4, it yielded  $-0.035$ , that is  $e_p < 0$ . That implies a negative return to scale of production. In conclusion we fail to reject the null hypothesis  $H_0$  and conclude that farmers who used external input do not allocate resources efficiently.

Similar to the result of table 2, the result of table 3 shows that out of four independent variables tested, only one shows a very significant relationship in the variations observed on the dependent variable. That is to say that only capital out of land, labour, and organic manure has a very significant effect on the output of cassava. Looking at the coefficients of the independent variables, it was observed that the coefficient of land is  $-0.01197$ . The negative sign implies that the quantity of land used by cassava producers that used internal input is inversely related to the value of cassava produced. This implies that the higher the size of land, the lower the value of cassava and vice versa. This usually implies that bringing more land into cultivation does not guarantee higher value of cassava if there is no more capital to invest as capital is the only significant factor to the value of cassava produced under internal input use. Also the coefficient of labour is  $0.1892$ . The positive sign also implies that labour use is directly proportional to the value of cassava produced. Similarly, the coefficient of capital is  $0.734$ . The positive sign shows a directly proportional relationship to the value of cassava produced. The coefficient of organic manure is  $0.1$ , which implies a directly proportional relationship also. Finally, when the allocative efficiency was computed as shown in table 6, it was found that all the resources employed by cassava producers who used internal inputs were similarly over-utilized, signifying inefficient allocation because the marginal factor costs (MFCs) are higher than the marginal value products (MVPs) in each case. Also when the overall elasticity of production of the internal inputs was computed using the coefficients as shown in table 7, it yielded  $0.901$ , which means ( $e_p < 1$ ). That implies decreasing returns to scale of production, which is not still within the recommended optimal region of production. In conclusion therefore, we fail to reject the null hypothesis, and say that farmers who used internal input do not allocate resources efficiently.

#### CONCLUSION AND RECOMMENDATIONS

It is noteworthy to recall at this point the finding of (Olayide and Heady, 1982) that the problem of low agricultural productivity was identified as the inability of farmers to make use of available farm resources efficiently; and therefore draw the inference from this study that both categories of farmers who used external and internal

inputs do not allocate resources efficiently. This would have negatively affected the level of cassava productivity in the study area. Besides, it could be the resultant cause of low level of food production as observed by Idachaba (1991) and Ehui and Spencer (1990).

Consequently, more efficient resource allocation process should be sought for by our co-research fellows and appropriate results fully disseminated to the farmers through the extension agents. Also, considering the implications of use of external inputs which is not a sustainable practice, it is also recommended that an indebt study into a more efficient allocation of internal inputs should be intensified and funded by various agencies that promote researches in agriculture. Finally, recycling or incinerating plants capable of converting garbage and other household and industrial wastes into usable organic manure should be encouraged since it has been found to ensure agricultural sustainability.

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15/10/10

# 光在不同环境中运动的基本规律

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**摘要:**光的运动,它无非是在真空中或非真空区域两种情况。反射和折射,其实是一个事物的两个方面。光在反射过程中,反射角等于入射角时,反射光束中的光线数量最多最密集;但并不是所有的反射光线都遵循古典反射定律,还有很多反射光线是沿任意方向的,只不过那些光线数量很少而显得非常弱。作者研究认为,折射光线与反射光线是同时产生的,不同颜色光在同一透明物质中的“速度”不同而引起相应折射角不同。[杨发成. 光在不同环境中运动的基本规律. *Academia Arena* 2010; 2(11):103-109]. (ISSN 1553-992X)

**关键词:**光的运动;光的折射;光的双折射;光的反射;偏振光

## 1. 引言

光的运动、折射和反射,看起来是一个古老话题,从恩培多克勒(Empedocles, 公元前490--430年)、欧几里得(Euclid, 公元前300年)、牛顿、惠更斯及麦克斯韦等,无论从哪个方面讲,都给出了看似很科学的理论。也许人们会认为今天再讨论这个问题是一种多余,尊敬的唯物论者,只要细心思考本文的论述,您会领悟到什么是辩证唯物论,什么是机械唯物论。

## 2. 概念

在波动光学中对光线的定义<sup>[1]</sup>大概是:取一个几何尺度可以忽略的光源,让它的光通过不透明屏上一个很小的开孔,到达屏后空间的光将充满一个区域,它的边界(光锥的边)看起来好像是清晰的。只要这个区域的大小与孔的线度相比可以忽略,可以认为光线锥的边缘是清晰的,即 $\lambda_0 \rightarrow 0$  极限情况下边缘变锐<sup>[2]</sup>,这时,我们可以定义,一个无限小的孔确定一个无限细的光锥——光线。作者研究认为,光是一种微小粒子,简单定义为:在真空环境中,一份光粒子的运动速度相对于发射它的源为 $C$ ,它的轨迹就是一条光线;由许多光线合在一起叫做光束。

## 3. 平行光束在透明物质中的行进速度

如图1示,设一单色光束是由许多条平行光线合在一起(一狭小区域)构成的,光束与曲线- $C$ 相交于 $M$ 和 $N$ ,并构想这曲线- $C$ 是由单个单个的原子并列而成。在光束的正交轨面(包络面) $L_1$ 上的光子-1和光子-2分别与曲线上的粒子发生作用, $M$ 和 $N$ 点分别产生两个胡克参考球<sup>[3]</sup>,这两个胡克参考球重叠的包络面为 $L_2$ ,这是因为光子被吸收后再发射,这个过程要经历一个时间过程(哪怕很短),而光子-3是从真空环境中穿刺而过,运动到 $L_3$ 位置。显然,正交轨面(包络面) $L_2$ 落后于 $L_3$ 一小段距离,这就是光在透明物质(气体、液体或固体)中速度小比真空中的原因。关于透明体,认为是,光可进入其中而不

发生可察觉的减弱(例如空气,玻璃)。光在透明物质(气体、液体或固体)中的运动,光子同样是在实物粒子之间的真空空间中运动,而实物粒子在吸收和发射光的过程中经历了一次能量的上涨和回落<sup>[3]</sup>,这个涨落周期,就影响了它的定向迁移(运动距离),所以,其速度变小比真空环境中。

## 4. 光的折射

光的折射定律最先由斯涅耳(W.Snell, Snellius, 约1580--1626)于1621年从实验上发现,但这个定律首先由笛卡儿(R.Descartes, 1596--1650)<sup>[4]</sup>发表在他的折射光学(*Dioptrique*)一书中。在实际的生产实践中,通常的透明物质材料并不是由单独一层原子构成的二维平面(构想由单个单个原子排列成的一条直线就称著一维材料),是由若干层二维平面材料重叠而构成的一定厚度(三维材料),如图2所示。

设入射光束从真空(或第一透明物质 $n_1$ )射到界面 $AB$ 上,光束在真空(或第一透明物质 $n_1$ )中的正交轨面(包络面)为 $AC$ ,为了分析简便,就以真空当做第一透明体。光在第二透明物质 $n_2$ 中的多层及多次作用,由图1的理论分析可知,光线束在透明物质中的定向“迁移”速度小比真空中。为了简明分析,暂不用光学长度概念 $[CB]$ 和 $[AE]$ 等。

在界面上 $A$ 点,密物质中的 $r_2$ 小于真空中的 $r_1$ ,而 $r_1=BC$ 。当 $C$ 点光粒子到达点 $B$ 时刻, $A$ 点的光线已到达密物质中空间域的点 $E$ ,光从点 $A$ 在第二透明物质 $n_2$ 中到达点 $E$ 时刻所经历时间为 $t$ ,即是以 $r_2=Vt$ 为半径的球形空间域。显然, $BE$ 表示光束在第二透明物质 $n_2$ 中的正交轨面(包络面),于是本文推证公式如下:

$AE/AB = \sin \alpha$ ,  $BC/AB = \sin \theta$ , 所以有:  
 $\sin \theta / \sin \alpha = BC/AE$ . 由于 $AE=Vt$ ,  $BC=Ct$ .

我们得到:

$$\sin \theta / \sin \alpha = C/V = n.$$



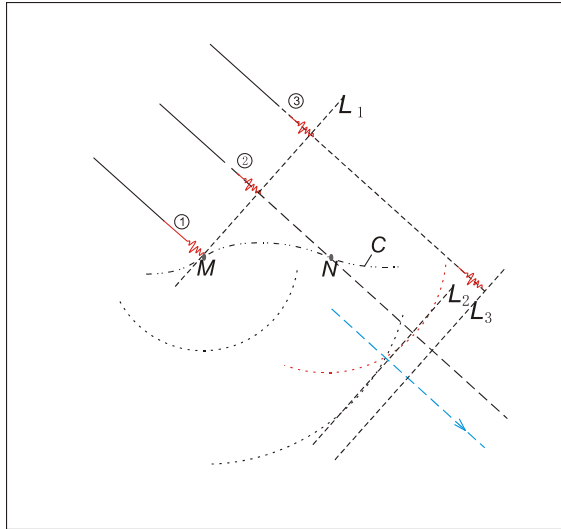


图 1 在透明物质中的光速

Figure 1. The speed of light in transparent materials

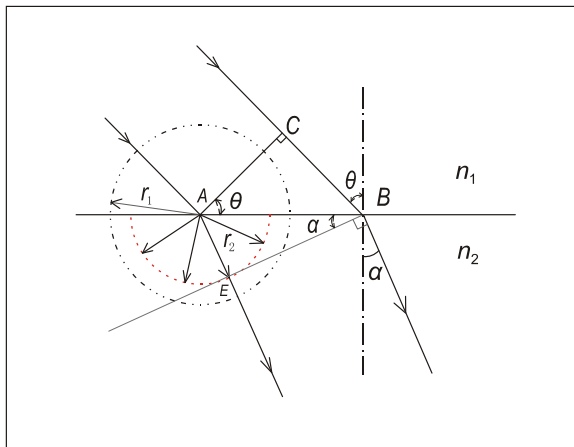


图 2 光线束在不同透明体中的行为

Figure 2. Light beam in the different transparent body of the behavior

5. 光的双折射构想

由于晶体的特殊结构，从分子体结构<sup>[5]</sup>层面上看，与光相互作用的原子或粒子的空间分布如图 3 示。晶体表面层原子是 A、B、C 和 D 等，次表层为 A'、B'、C'、D'……。当入射光按图 4 射入晶体，A 和 B 粒子生成胡克参考球形成的包络面扩散光线束称著正常光束，简称 O 光。也就是说，晶体表层原子是 A、B、C、D 和 E 产生的光线束遵守折射定律，称著正常光束。那么，紧邻次表层的粒子 A' 与表层粒子 B 生成胡克参考球形成的包络面扩散光线束不遵守折射定律，称著异常光束，简称“e”光。A' 与 B、B' 与 C、C' 与 D……。作者认为，惠更斯提出的椭球波解释双折射现象不合理。

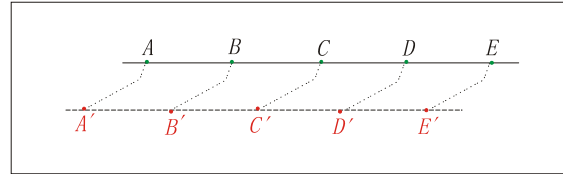


图 3 晶体结构构想图

Figure 3. Crystal structure of concept plan

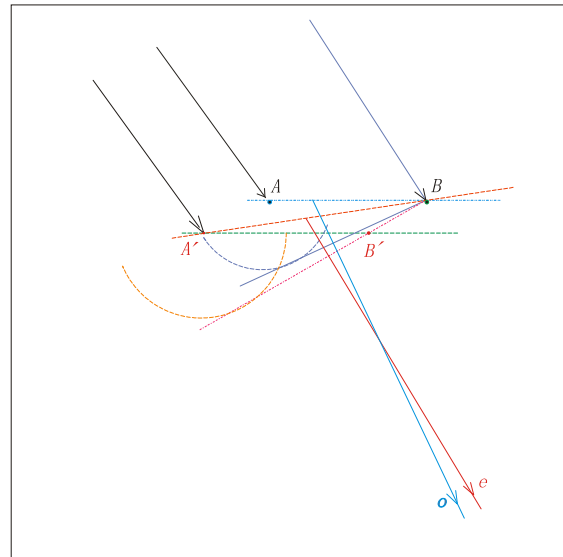


图 4 正常折射和异常光束

Figure 4. Normal and abnormal beam

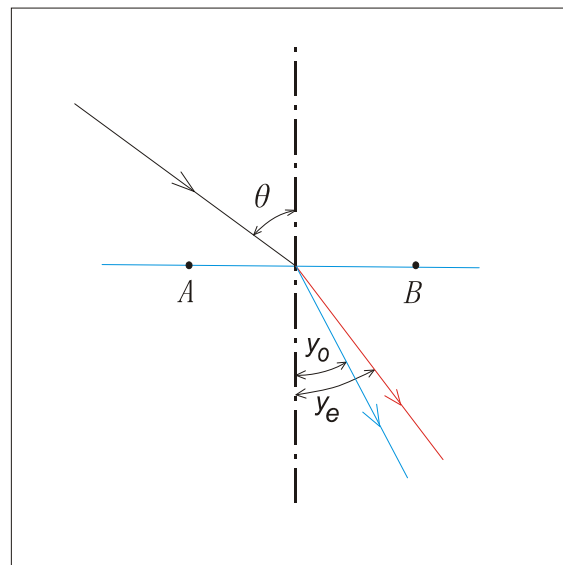


图 5 正常折射角和异常折射角

Figure 5. Refraction angle of normal and abnormal

6. 光的反射

6.1 反射角等于入射角的反射光线

如图 6 示，设 AB 是一光滑反射平面，过 A 点作入射光线束的正交轨面（包络面）AC，当点 C 的光

子到达点  $B$  时刻, 点  $A$  光子产生的胡克参考球<sup>[3]</sup>即是以  $BC$  为半径的一个圆球, 为了这个目的让我们过点  $B$  作一切线  $BD$ , 切点为  $D$ 。过点  $G$  作  $BD$  的垂直线  $GH$ , 我们的任务是证明  $GH$  是否等于  $BK$ , 如果证明  $GH$  等于  $BK$ , 才能证明由次级发射点  $G$  和  $A$  分别产生的胡克参考球有公共切线是  $BD$ 。其它次级扰动点产生的胡克参考球半径长度的证明方法同理。

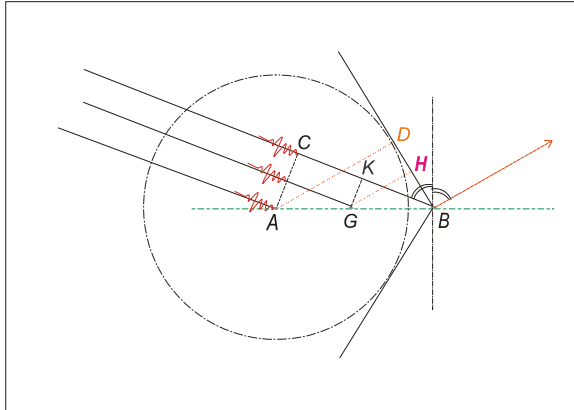


图6 反射角等于入射角

Figure 6. Equal angles of reflection and incidence

证明: 过点  $G$  作  $AC$  的平行线  $GK$ , 所以三角形  $BKG$  和  $BCA$  相似 ( $\triangle BKG \sim \triangle BCA$ ), 由此得出  $BK/BC = BG/BA$  (1)

直角三角形  $BHG$  和  $BDA$  相似, 由此得出  $HG/DA = BG/BA$  (2)

$BK/BC = HG/DA$ , 又因为  $DA = BC$ , 所以  $BK = HG$ 。又因  $\angle KBG = \angle HGB$ , 而法线垂直于  $AB$  面, 反射角等于入射角。由此, 入射光线束的正交轨面 (包络面  $AC$ ) 垂直于入射光线束及邻近处, 在  $AC$  面上的光线密集程度为最大, 反射面  $AB$  上所产生的包络面交叠形成的反射光束中光线条数及密集程度也最大; 这就是, 人们通常所认识的反射光线, 这个反射光线束的反射角等于入射角。

## 6.2 反射角等于折射角不等于入射角

如图 7 示, 由一细束光线入射到反射体  $AB$  上, 并假想这个特殊反射物是由单个单个的原子有序排列而成的一维材料 (一条无限细的“透明”直线)。

为了分析简便, 将这细束入射光线放大后进行分析。当一束准单色光照射到这个“透明的一维材料” $AB$  上, 其中, 一部分光子跟  $AB$  线上的粒子发生相互作用, 另一部份光子从实物粒子之间的空隙空间穿刺而过。作者暂时讨论与  $AB$  线上粒子相互作用的那些光子的行为和表现。过点  $A$  作入射光束的任意切线 (或切面)  $AC$ , 这个切面  $AC$  不一定是正交轨面, 从

光度学方面理解此面为光度学照度面, 由作者的胡克参考球观点及惠更斯包络面理论<sup>[3]</sup>作示意图 7。

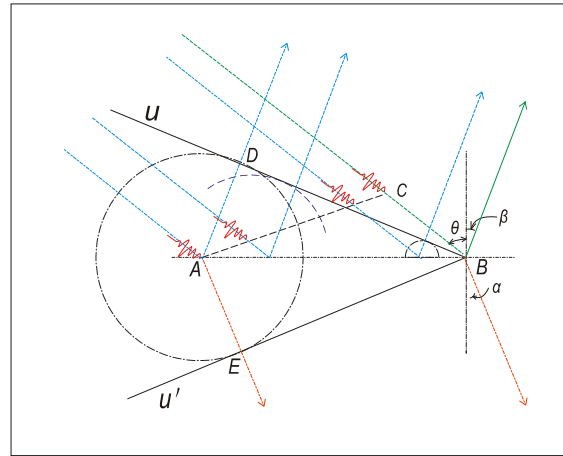


图7 理想化实践

Figure 7. Idealized practice

由于空气折射率非常接近真空, 为了方便就将光程简化成几何长度而用于作图。从  $A$  依次到  $B$ , 即得到一系列胡克参考球, 这些胡克参考球的公切面 (惠更斯包络面) 即为图 7 中的  $BD$  和  $BE$ , 显然, 这些胡克参考球的公共切面为一圆锥面, 垂直于包络面沿着  $AD$  方向的光线为反射光线, 沿着  $AE$  方向的光线就是折射线。反射光线和折射线是同时产生的, 并且以  $AB$  线为对称轴, 很明显, 反射角  $\beta$  等于折射角  $\alpha$  不等于入射角  $\theta$ 。本文略去详细证明过程。如果我们将图 7 中的点  $C$  向着点  $B$  靠近, 在  $AC$  面上的光线密集程度越来越小, 所以, 垂直于包络面  $BD$  和  $BE$  的反射光和折射线密集程度越来越弱, 反射角  $\beta$  也越来越小, 当点  $C$  跟点  $B$  完全重合以后, 反射角减小到零; 接下来, 并以点  $C$  (在  $B$  点位置) 为定点按顺时针方向转动“ $AC$ ”切线 (反射面  $AB$  不动), 这时的反射光线与入射光线在法线的同一侧, 本文图略。

作者研究认为, 在实践中的反射面, 是由无数“透明”的一维材料有序排列而成的二维材料, 透明的折射物质又是由若干层二维材料的重叠 (三维材料), 反射光束就是由若干层二维材料的共同作用 (不是仅仅限于界面物质最表层), 是反射光线在反射方向上的宏观统计; 折射光束在透明密物质中的“定向迁移”变慢而引发偏折。

## 7. 分析

惠更斯原理大意是: 波所到达的每一点都可以看作是新的波源, 从这些点发出的波叫做子波; 而新的波面就是这些子波在同一时刻所到达位置的包迹。

如果依照惠更斯原理, 图 8 中的包络面只有  $S_2$  存在, 就没有包络面  $S_3$  的存在, 从本文的第 3、第 4

和第 5 章节分析, 惠更斯原理所描述的就是那个所谓的折射光束。在惠更斯原理中没有包络面  $S_3$ , 也就没有反射光线束的存在。依照作者《在胡克参考球观念下诞生的新理论》一文中提出<sup>[3]</sup>: 在真空中, 一份光量子出现在以源点为中心半为  $Ct$  的球面上, 这个数学模型称为胡克参考球; 由两个或两个以上的多个胡克参考球球面在同一时刻所到达位置的包迹, 称著包络面。光束通过不同折射率透明物质边界及附近, 物质与光的相互作用下形成包络面, 垂直于包络面方向运动的光微粒, 也就形成了光的折射和反射。作者认为, 垂直于包络面  $S_1$  行进方向的众多光线的平行光束, 应称著“集光”光束, 它是由众多胡克参考球沿着同一方向的综合贡献。本文作者坚持认为, 光是一种粒子, 它与“电或磁”无多大关系, 光在透明密物质中包络面(正交轨面)的定向迁移变慢而引发偏折。根据惠更斯原理及本文的作图方法, 在目前还无法作出光密物质中光束的负折射行进方向。因此, 那种所谓具有负折射性质的左手征材料, 人类从实验中有可能很难制造出这种材料, 即使能通过技术手段制造出负折射性质的材料, 它的物理机制也不遵守麦

克斯韦电磁波理论, 或有些类似纳米材料表现出不守常规的一些特性。

如果光束在金属界面发生反射, 物质界面最表层不存在完全反射模式, 虽然光强度随透入深度呈强衰减, 但总有一个很小的深度在金属中; 大量光子在这个狭小区域中经多次的往复反射, 从而决定了金属的高损耗和高反射特性。

光速常数起因的构想: 从实践中知道, 物质是由原子为个体堆集而成的, 而原子又是由更基础的微粒组成。现代科学实践证实, 如电子等一些基本实物粒子具有高速自旋, 假想电子是一个球体, 它自旋的“赤道”线上速度最大, 光子即是沿这个“赤道”线的切线方向辐射出去<sup>[3]</sup>, 所以, 它离开电子或其它粒子的瞬间就具备着这个常数  $C$  的速度值, 本文作者在《在胡克参考球观念下诞生的新理论》中已有图文论述。这只能是一种假想和猜测, 目前还没有实验和理论支持它。一份光子是怎样被实物粒子吸收, 又是怎样被再次发射, 其具体过程尚不清楚待研究, 但在实践中通常都认为, 反射光的速度与入射光的速度几乎是一致的为  $C$  (是否有变化尚待深入工作)。

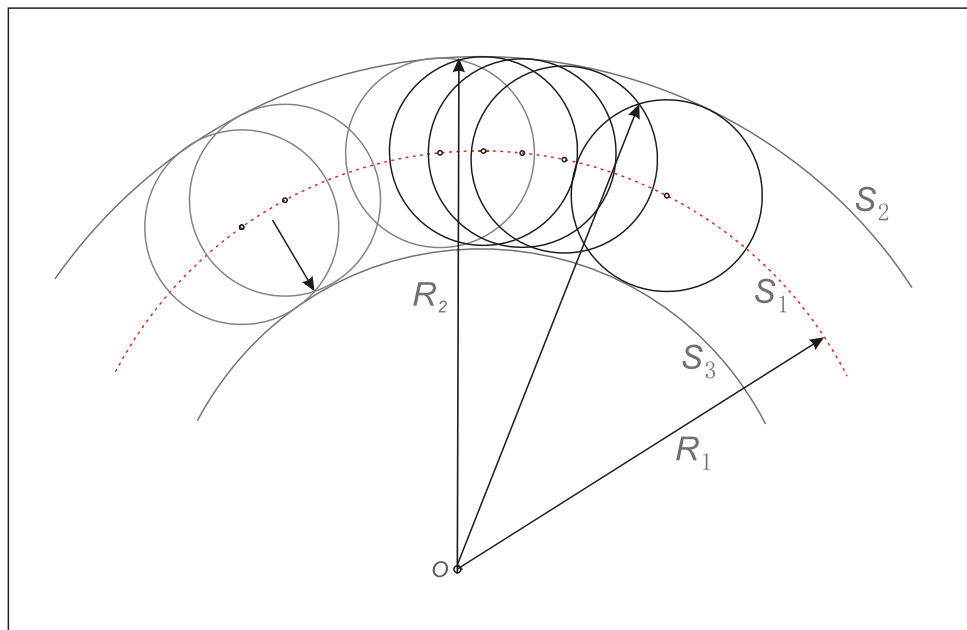


图 8 光在透明物质中的行为

$S_2$ =折射光包络面;  $S_3$ =反射光包络面

[引自 杨发成, 中国科技论文在线 <http://www.paper.edu.cn/>, (2010-07-30) . ]

Figure 8. Light acts in a transparent substance [ $S_2$ = Envelope of light refraction;  $S_3$ = Envelope of reflected light ]

### 8. 测定单色光涨落长度的方法

依据本文作者在《关于微观粒子波动图象的再思考》一文中的论述<sup>[6]</sup>，得出与干涉亮纹相对应的表达式

$$x = -\frac{ka\lambda_0}{nd}$$

，此公式为用于计算  $X$  轴负值方向上的

$$x = \frac{ka\lambda_0}{nd}$$

的条纹位置，显然， $X$  轴正方向上的条纹位置表达式

为  $x = \frac{ka\lambda_0}{nd}$ 。在真空环境中，式中  $n=1$ ，相邻亮带的

间隔（两明条纹之间的距离）为  $\Delta x = \frac{a}{d}\lambda_0$ ，所以，

在实验中测出这几个量，就可以计算出这个  $\lambda_0$  值，这个  $\lambda_0$  是相邻两球形包络面之间的距离。这个

长度值是否是一个涨落长度（人们通常称的“波长”）呢？见图 9，当某一点光源中的各个元光源，它在

能量的涨落过程中，并设想它在辐射光子的时刻不吸收外界的能量，正在吸收光子能量时刻的粒子不向外界辐射能量。

所以，在点光源中的各个元光源向外的辐射，刚好间隔半个涨落周期；如果我们将相邻两球形包络面之间的距离约定为一个“波长”值，那么，

点光源中的各个元光源能量的一次涨落，光程则为两倍“波长”。言下之意，在实验中测得的“波长” $\lambda_0$ ，

实际上是一份光量子所占据的“几何空间”，这个“几何空间”并不是光子自身的几何长度（一个不太恰当的比喻：一个篮球占据着一个球场，一张桌子占据着一间客厅；那么，测得的这个球场，并非是篮球的几

何尺寸）， $\lambda_0$  比光子的几何长度大些。

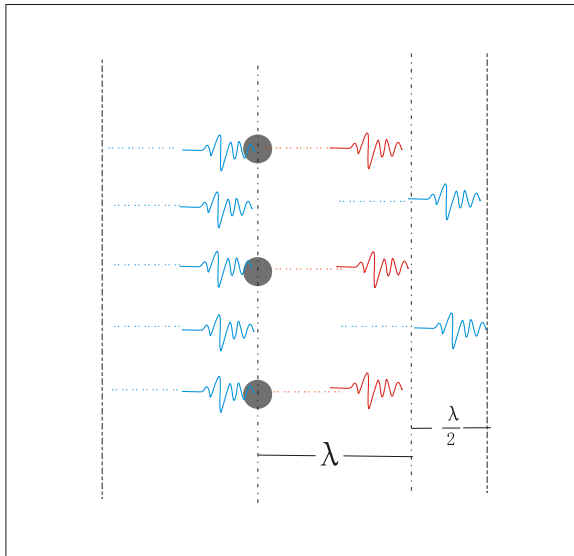


图 9 实验中测得的“波长”值

Figure 9. Experiment measured the “wavelength” value

作者认为，当某一发光粒子完成一次能量的上涨与回落，它也就完成了一次能量的吸收与辐射，这个

过程所经历的时间为一个“经历周期”；如果它不再吸收外界能量，也就不再重复上次行为。所以，我认为用“周期”较为恰当比“频率”。从实践可知，红光的涨落“周期”长比紫光，红光的能量小比紫光，因此，光子能量大小与“周期”成为相反的增长，是否是成反比例，还尚待深入的理论工作。

### 9. 偏振光概念

在偏振光研究中，当代人们常用电磁波观点去理解，作者研究认为光是一种粒子，它与“电和磁”无

关，这偏振观念下的横向振动从何而来呢？这不得不让我回到古代去。大意是这样：牛顿认为，光线具有“侧边”，不同方向具有恰到好处的光微粒；在牛

顿之后一个多世纪，法国学者马吕斯运用牛顿微粒观念提出，自然光线内微粒取向无规则，在通过晶体或相应反射时，它会以一定的形式取向；这种按一定取向的光微粒叫做偏振光。本文作者也坚持认为是这样的，如图 10 示。

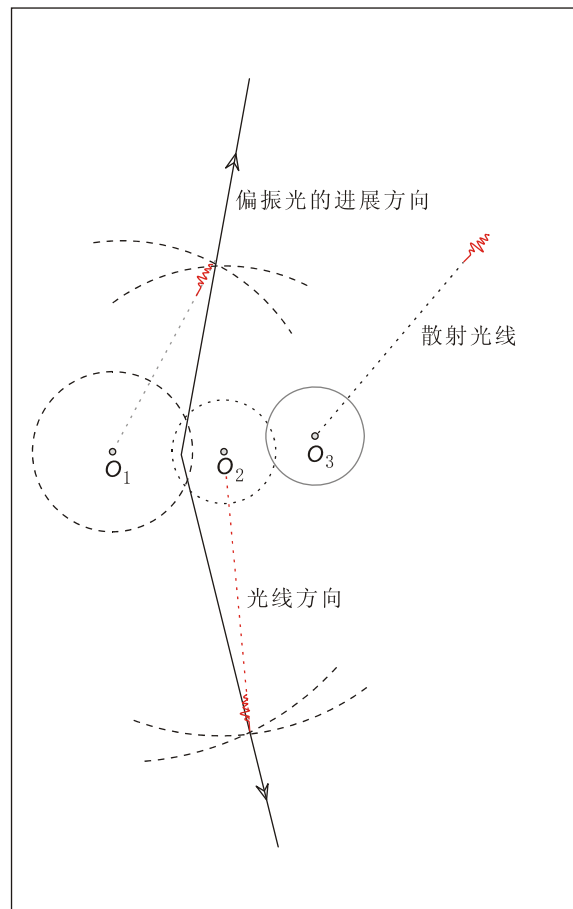


图 10 光线和偏振光的方向

Figure 10. The direction of light and polarized light

设有两个球形包络面在各自的扩散过程中它们相互交叉重叠，交迭的轨迹则是一个圆形光锥，这个

圆锥母线轨迹面上的光粒子出现的几率是两个球形包络面的共同贡献。所以，这个轨迹面上的光粒子出现的几率为最大比其它区域。从几何体上分析，圆锥母线轨迹面上的一小段，就象圆锥底周上的一小段弦线，近似视之为直线。我们再回过头去看杨氏干涉仪实验，两个次光源的球形包络面的公共交迭轨迹线，正好是圆锥母线轨迹面上很小的一段，这就决定了它在屏上是一条状亮纹，这个条纹垂直于双孔之连线，按照牛顿与马吕斯定义的偏振光概念，杨氏干涉亮条纹也许可能就是偏振光。从图 10 我们悟出一个道理，在自然界中，几乎全都是偏振光照亮的世界，一个点光源中的各个元光源所产生的胡克参考球，相邻或不相邻的胡克参考球相交叠的轨迹都是具有一定方向的。比如，太阳发射的光芒，就是无数的无规则的偏振光的自由取向，光线束的方向，就是这个圆锥母线扩展的轨迹方向。偏振光束的进展方向与光线的方向，严格地讲，它是有区别的，参见图 11。光线之速度为  $C$ ，而偏振光束的进展速度应小于  $C$ 。

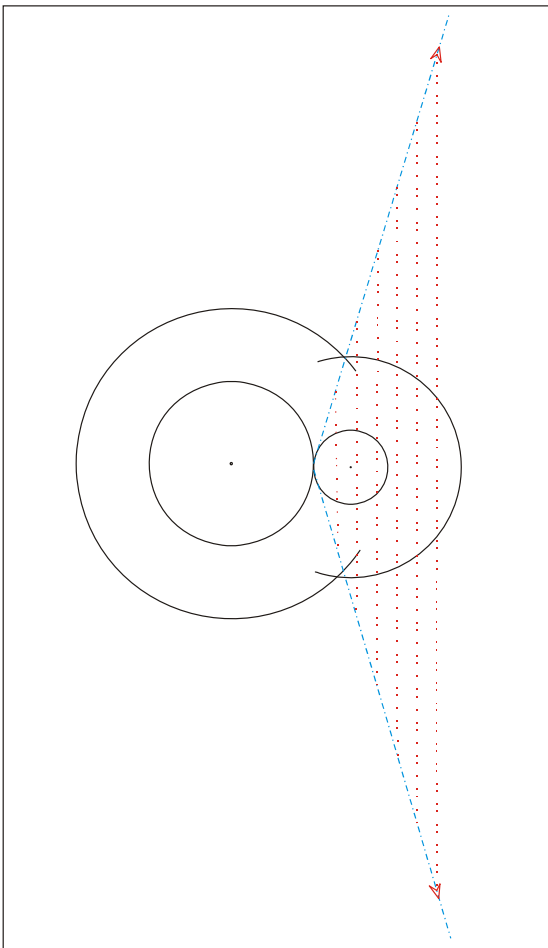


图 11 圆锥母线的扩展方向

Figure 11. The direction of the beam along the cone generatrix

## 10. 马吕斯定律

用光的粒子性推证马吕斯定律，如图 12 示。当自然光通偏振片后，沿着透光狭缝透射出去的光线就称其为偏振光，即是说，偏振光是沿一定方向排列的光微粒（偏振片将入射光分成了一行一行的）。显然，另一部分被透明“槽”之间的“暗”边缘所吸收或散射，即是不能通过的那一部分光线。当检偏振片与起偏振片的透光狭缝相平行时刻，令透过检偏振片光的平均强弱程度（马吕斯称它为强度）为  $I_0$ 。

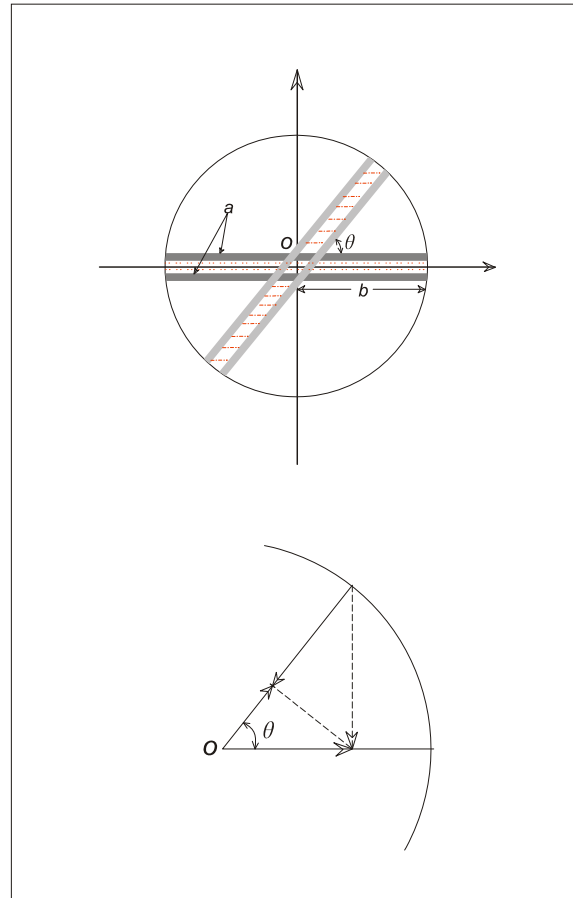


图 12 马吕斯实验图示

Figure 12. Experimental schematic Marius

为了这个目标我们假设，透过检偏振片上过中心点  $O$  亮缝  $a \times b$  的光线数量为  $Q=2abI_0$ ，而在  $2ab$  面上包含着亮缝和暗纹，现就以这个面积  $2ab$  为研究对象。当检偏振片以中心点  $O$  转一角度  $\theta$ ，在面积  $2ab$  中只有沿  $X$  方向分量的光线才有透过检偏振片的可能，显然， $Y$  分量的光线则被暗条纹吸收和散射而耗损。 $2ab$  在  $X$  方向分量为  $2ab \cos \theta$ ，则光线数量为  $Q_1 = 2abI_0 \cos^2 \theta$ ；同理， $2ab$  在  $Y$  方向的分量为  $Q_2 = 2abI_0 \sin^2 \theta$ ，这个分量即是被阻挡的光线数

量；显然， $Q_1 + Q_2 = 2ab(\cos^2 \theta + \sin^2 \theta)I_0$ 。

在这一过程中必须遵守光线数量守恒，透射光的数量与被阻挡光线数量之代数和应等于入射光线总数量。

通常情况下认为透射光线是平均分布在检偏振片上，分布的强度为 $I_i = Q_i / 2ab = I_0 \cos^2 \theta$ 。

显然，只有透过检偏振片的光才对光线分布的密度有贡献。那么，被暗条纹吸收和阻碍而损失的光强度为 $I'_i = I_0 \sin^2 \theta$ ，这个量对光的损失有贡献。在粒子观念下的光强度，其实就是单位面积上的光线数量平均值的多或少，故而，本文从光的粒子性出发同样推证出马吕斯实验定律的数学表达式。

## 11. 结束语

本文研究的是光源（自然光）相对实验器件静止或速度较低与光速相比较可忽略情况下的一种近似探索，不涉及到相对光源作高速运动的参考系，并且点光源发光是稳定持续的，球形包络面也是稳定持续的向外扩散；如果点光源是只发射一次闪光，我们就称它为脉冲闪光，这个脉冲闪光就是一个球形包络面。本文对光的相关现象作了大量详细的工作，其出发点不外乎就是充分运用胡克参考球模型及惠更斯包络面概念，这些光学现象，都是在特定条件下大量光粒子作用的宏观统计。关于菲涅耳亮斑、驻波、衍射和“受激”辐射等问题，用次光源理论很好地定性分析与说明。本文只讨论了光粒子与实物体完全作用后又完整地辐射出去，这个过程光子能量保持不变情况下的特性探索，没有涉及一份光子与界面的不完

全作用下的能量损变，这将涉及黑体辐射等复杂性。前面讨论过，能量的一次上涨和回落亦可称能量的一次振动，这个基本振动点即为一个振子或元光源。增能辐射有两种情况：它辐射的光子能量是入射光能与实物微体（元光源或一个振子）自身具备的某部份能量作为“一份”辐射出去，这就是实物微体的损能辐射；或它同时吸收（或第一份光子吸收结束还没辐射又吸入第二份光子）两份低能光子后的一次泻能——意味着在特定条件下的“红光变紫光”，这份光子的能量略小比两份入射光子能量总和，是由于有些损耗等因素所致。本文暂不探索这方面的诸多问题。

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# Light in Different Environments the Basic Law of Motion

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**Abstract:** The movement of light, only two cases , in the vacuum and non vacuum. Refraction and reflection of light, in fact two sides of a thing. Reflection of light in the process, the angle of reflection equals an angle of incidence, the amount of light reflected beam largest and most densely. However, not all of the reflected light will follow the classical law of reflection, a lot of reflected light along any direction, but is rather that a small number of very weak light. Of studies suggest that, refraction of light generated by the same time also had a reflected light, different colors of light, in the same transparent material in the “speed” is not the same.

**Key words:** The movement of light; refraction of light; optical birefringence; reflection of light; polarization light.

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