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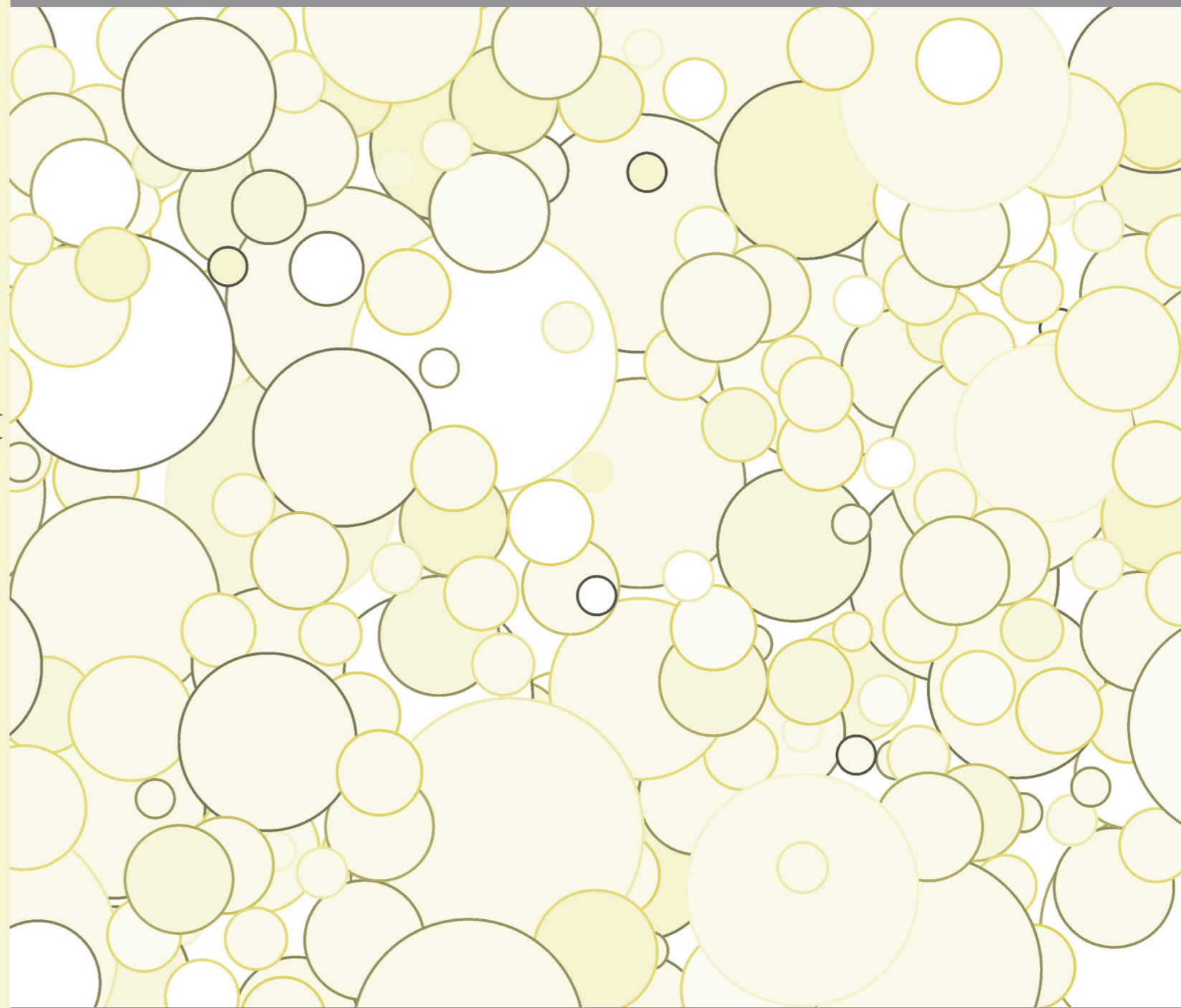
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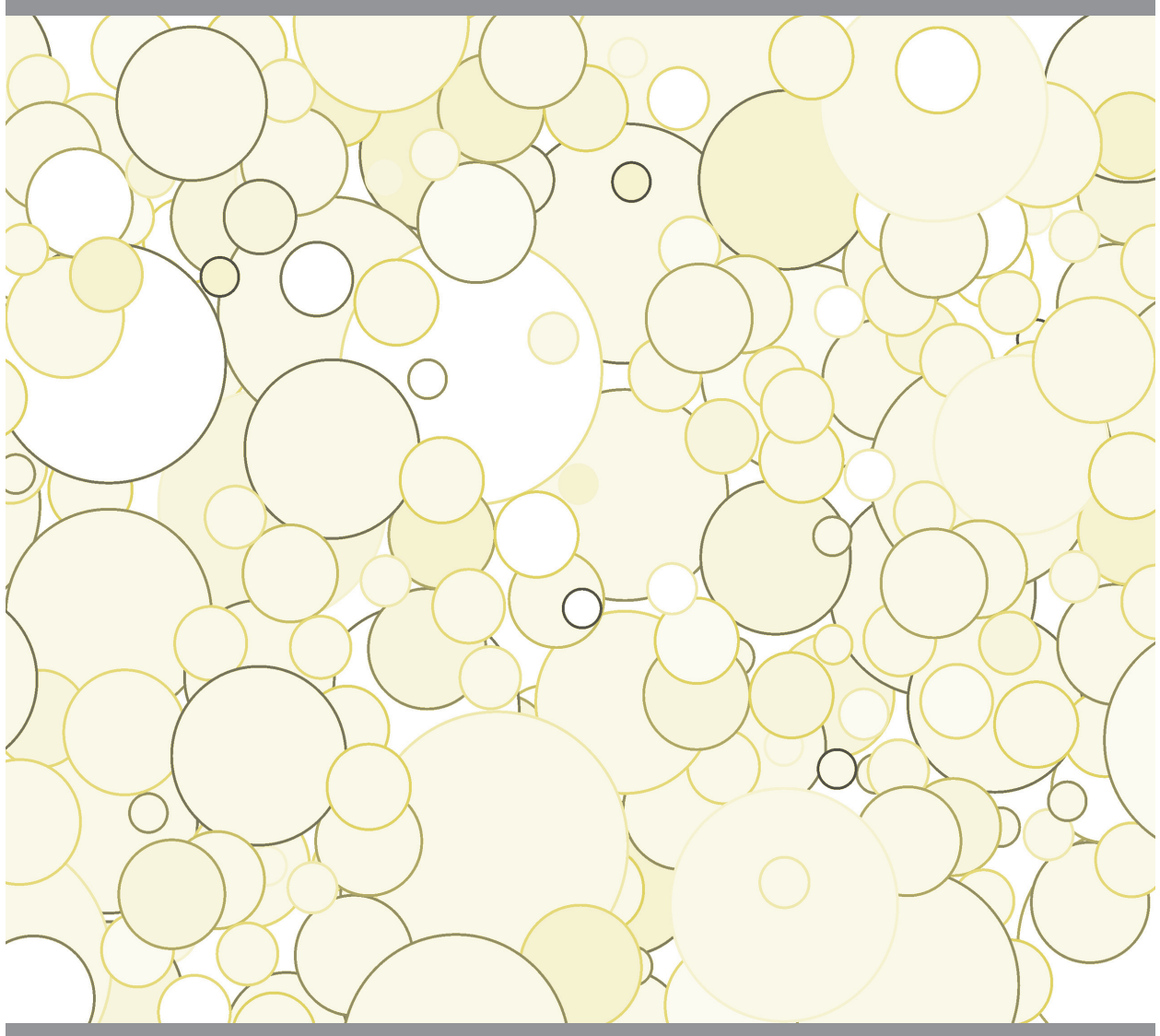
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学术争鸣

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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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(7) Results.

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Role of Convex Optimization with Nonlinear Programming: Problem Review

Ritu Sharma , Dr. Mayank Pawar, Dr. Sanjeev Rajan

¹Research Scholar, Hindu College, Moradabad²Teerthanker Mahaveer University, Moradabad³Hindu College, Moradabad

Abstract: In this paper we study the convex optimization problem with non linear programming. In this is a problem where all of the constraints are convex functions and the objective is a convex function if minimizing, or a concave function if maximizing.

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Keywords: convex optimization, Concave Optimization, non linear programming, Convex function.

Introduction

There is in general no analytical formula for the solution of convex optimization problems, but (as with linear programming problems) there are very effective methods for solving them. Convex optimization methods work very well in practice, and in some cases can be proved to solve the problem to a specified accuracy with a number of operations that does not exceed a polynomial of the problem dimensions. [1]

We will see that interior-point methods can solve the problem in a number of steps or iterations that is almost always in the range between 10 and 100. Ignoring any structure in the problem (such as sparsity), each step requires on the order of

$$\max\{n^3, n^2m, F\}$$

operations, where F is the cost of evaluating the first and second derivatives of the objective and constraint functions f_0, \dots, f .

We cannot yet claim that solving general convex optimization problems is a mature technology, like solving least-squares or linear programming problems. Research on interior-point methods for general nonlinear convex optimization is still a very active research area, and no consensus has emerged yet as to what the best method or methods are. But it is reasonable to expect that solving general convex optimization problems will become a technology within a few years. And for some subclasses of convex optimization problems, for example second-order cone programming or geometric programming, it is fair to say that interior-point methods are approaching a technology. [1]

Role of convex optimization in non convex problems

In this paper we can focus primarily on convex optimization problems, and applications that can be reduced to convex optimization problems. But

convex optimization also plays an important role in problems that are not convex.[1]

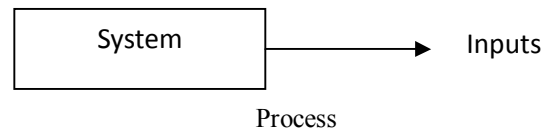


Figure (a): Optimization Problem

Convex heuristics algorithm for non convex optimization

Convex Optimization is a mathematically rigorous and well-studied field. In linear programming a whole host of tractable methods give your global optimums in lightning fast times. Quadratic programming is almost as easy, and there's a good deal of semi-definite, second-order cone and even integer programming methods that can do quite well on a lot of problems.

Non-convex optimization (and particularly weird formulations of certain integer programming and combinatorial optimization problems), however, are generally heuristics like "ant colony optimization". Essentially all generalizable non-convex optimization algorithms I've come across are some (often clever, but still) combination of gradient descent and genetic algorithms. [2]

Nonlinear optimization

Nonlinear optimization (or nonlinear programming) is the term used to describe an optimization problem when the objective or constraint functions are not linear, but not known to be convex. Sadly, there are no effective methods for solving the general nonlinear programming problem. Even simple looking problems with as few as ten variables can be extremely challenging, [3] while problems with a few hundreds of variables can be intractable. Methods for the general nonlinear programming problem therefore

take several different approaches, each of which involves some compromise. [6]

Consider the following non-linear programming problem

(P) Minimize $f(x)$
subject to

$$g_j(x) \leq 0, \quad j=1, 2, \dots, m \quad x \in X$$

where f and g_j , $j = 1, 2, \dots, m$ are real valued functions defined on $X \subseteq \mathbb{R}^n$. Let $X_0 = \{x \in X \mid g_j(x) \leq 0, j=1, 2, \dots, m\}$ denote the set of feasible solutions, which is also called the constraint set.

Since 1951, there has been tremendous growth in the field of non-linear programming problems. There is no single method which gives accurate solution of a non-linear programming problem. Some of the well known algorithms used in such situations are Golden section method, Fibonacci search method and conjugate gradient method discussed by Avriel [7]. Many of the non-linear programming problems have been successfully studied by linearizing the function and finding solutions to the corresponding linear programming problems.

LOCAL vs. GLOBAL OPTIMUM

The fastest optimization algorithms seek only a local solution, a point at which the objective function is smaller than at all other feasible points in its vicinity. They do not always find the best of all such minima, that is, the *global solution*. Global solutions are necessary (or at least highly desirable) in some applications, but they are usually difficult to identify and even more difficult to locate. An important special case is *convex programming*, in which all local solutions are also global solutions. Linear programming problems fall in the category of convex programming. However, general nonlinear problems, both constrained and unconstrained, may possess local solutions that are not global solutions. Geometrically, nonlinear programs can behave much differently from linear programs, even for problems with linear constraints. As shows, the optimal solution can occur:

- a) At an interior point of the feasible region;
- b) On the boundary of the feasible region, which is not an extreme point; or
- c) At an extreme point of the feasible region.

As a consequence, procedures, such as the simplex method, that search only extreme points may not determine an optimal solution.

Conclusion

In this paper we can study the role of convex programming is the non linear Optimization problem. And it can view the different type of problem in different method and here we can solve the convex optimization method. And in this paper we can see the non linear programming problem can solve with convex heuristic optimization method and solve the problems.

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阿基里斯与乌龟悖论难不住希格斯场 ——非线性希格斯粒子数学讨论(11)

笄科伯

Recommended by 王德奎, y-tx@163.com

摘要: 我们说阿基里斯与乌龟悖论难不住希格斯场, 因为高端希格斯场物理方程也要求是可微或可导的, 这类似进入希格斯场也要进入“点内”。于是我们又可以说, 希格斯类似鲁滨逊走到了“芝诺坐标”的门口, 他看到了“点内”空间。

[笄科伯阿基里斯与乌龟悖论难不住希格斯场. *Academia Arena* 2013;5(2):3-11] (ISSN 1553-992X).
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关键词: 芝诺悖论 实无穷 潜无穷 极限 芝诺坐标

一、应行仁谈芝诺悖论困扰现状

物质有实无穷和潜无穷, 真空有实无穷和潜无穷; 思维有实无穷和潜无穷, 存在有实无穷和潜无穷。一句话, 极限有实无穷和潜无穷。应行仁教授在《阿基里斯与乌龟的悖论解决了吗》一文中说, 实无穷认为无穷是可以达到的, 这时无穷级数的和等于它的极限值。潜无穷认为无穷是一个过程, 不是实在的东西。在这个观点下, 无穷级数求和只能不断逼近它的极限, 而不是等于它。这个观点导致阿基里斯永远陷在追赶乌龟的过程中。应行仁说, 毕达哥拉斯学派主张 $1 > 0.9999\dots$ 是赞成潜无穷观点。在他以后的亚里士多德倾向潜无穷, 但在阿基里斯与乌龟的问题上含糊其辞。以后的数学家从欧几里德开始, 专注于有限问题。一直到牛顿和莱布尼茨的微积分, 才采用了实无穷的概念, 将导数表示为两个无穷小之比, 积分为许多无穷小的加权和。

实无穷的思想滥用, 产生了很多问题和混乱, 导致数学第二次危机。到了魏尔斯特拉斯, 他驱逐实无穷, 由潜无穷的概念发展出严谨的极限概念, 重铸分析的基础。百多年后, 康托尔又在集合论中将实无穷请回来。在 20 世纪 60 年代, 鲁滨逊把无穷小量请了回来, 从而建立了非标准分析。但如今数学的直觉主义学派仍然反对实无穷。

应行仁教授说, 到现在中外数学、物理和哲学期刊, 讨论实无穷、潜无穷及芝诺悖论的论文, 争论仍然没有结束。即芝诺的阿基里斯与乌龟的悖论的破解, 经过两千多年兜了一圈又回到实无穷与潜无穷的争论中。他说他的文章有许多跟贴, 但都没有认真跟随文中的逻辑, 而急于给出自己的反应; 并只是基于教科书里关于极限的知识, 从来没有想过初等微积分教科书中, 实无穷假设的理由和困境。而各种文库、百科、科普给出的都是不同程度似是而非的答案。而他也只是引导大家, 来思考这

些困扰着数学大师和哲人难题答案的历史变迁和现状。

量子中国起步于“物质无限可分说”之程, 且能回避极限的实无穷和潜无穷。例如量子中国开创的第三次超弦革命其标志的自手术理论, 它的核心的三旋就已经把“点”高度组织化。再看所谓跑得最快的阿基里斯永远追不上跑得慢的乌龟的芝诺的阿基里斯与乌龟的悖论, 是说阿基里斯因为首先必须跑到乌龟的起跑点, 这时候乌龟已经往前爬了一段路。当他赶上这段路时, 乌龟又向前进了一些---这是无论什么时候, 阿基里斯追到了乌龟当前的位置, 乌龟在这段时间内又向前爬拉开了距离, 这个差距虽然在缩小, 但一直存在; 在这无穷追赶过程中, 不会为零。因此跑得慢的乌龟永远领先, 无法被超越。回应这里应行仁教授的“阿基里斯与乌龟的悖论”的正面挑战, 也许最好的方法是建立“芝诺坐标”。因为纯粹的几何图形或静止的几何图形, 没有加进时间, 也没法加进动力, 这是一种缺陷, 并可影响到物理学等许多学科。

后来虽然从欧几里德几何发展到拓扑学, 发展到微分流形, 企图弥补这种缺陷, 但仍然留有迹印。例如前苏联物理学家 B·C·巴拉申科批评爱因斯坦的引力理论存在能量困难, 就持这种论据。所谓相对论中的能量困难, 是指爱因斯坦的几何场, 和描述各类微观客体的能量场, 两者的物理实质是根本不同的, 不能把一个归结为另一个, 甚至在引力场很弱的极端场合下, 也不能导入能量概念。

当然, 原则上可以存在不用质量、能量和冲量这三个概念来描述的现象和客体, 但在对客体之间的传递作运动学描述的条件下, 这种放弃就会引起严重的问题。回顾一下黎曼的高维曲面, 黎曼把力与几何等同起来给人的启迪, 是作了一番变换说明的: 一个生活在一张纸上的二维书虫动物种族, 放在一张弄皱的有着立体感的三维纸上, 这些书虫们

如果不运动,它们会推断它们所处的新世界仍是完全平坦的,或者说它们身子所处的状态仅是随着这些三维空间的变形而变形,只是在它们开始作运动的时候,才能觉察出有一种神秘的看不见的力、质量、能量、冲量、张量、矢量等东西的存在。

这可以看出力与几何是一种分离的结合。而爱因斯坦的广义相对论的数学表达,正是在他的密友、数学家格罗斯曼的帮助下,才从黎曼等人的工作中找到所需的特殊数学工具,可以说黎曼的伟大工作几乎是逐字逐句地在爱因斯坦的原理中找到了真正的归宿。但同时也给他的广义相对论带来了力与几何有分离的痕迹。对此,三旋则是一开始就结合着空间也结合着时间,结合着几何也结合着能量的,是赋予空间和时间与动力的等效。更有可能三旋是一种时间理论,而不是一种空间理论,原因是它使时空出现多方向协变,例如球面运动只给出了两种时空方向,即正反转,而三旋却给出了62种时空方向,从而为多主体系统内的量子缠结打开一扇窗,使时空在更大方向上去容纳各种理论和现象,且能给出简并的处理。

几千年来,人们都重视空间理论,而在时间理论上开拓不大,即使有开拓,如超弦理论,也是从多维空间启发中,发散时间,并无类似笛卡儿三角坐标式的开发空间动量的形象性。而且用三角坐标,时间也总是一维的。三旋理论冲出了这种桎梏:时间可以是多方向协变并存的,而且三旋的综合会出现观察效应上的不同性。反过来看高维、多维,不管能解释多少效应,最终还是要落实到人的观察、实验、意识、理解上,而人对时间的观念是一维的,所以一维的时间总是要作为简并、简化的数学手段,使现存的许多数学公式对自然的描述既有合理的一面,也有歧义。

一维的时间总是单向的,所以有虚、实或正、负的区别。而三旋时间坐标的多向性,可以认为时间总是“实”的,没有“虚”的,这与笛卡儿空间坐标虽引出了虚时间,即时间可以倒流,但空间总是“实”的一样。三旋的“实”时间坐标也可以引出了“虚”空间,如做梦及想象中的空间是虚的,但外部的时间却是正的。这从中也不难理解时间总是实的及三旋的多时空结构;但多时空结构不一定是三旋,因为三旋不能从欧氏几何、伽利略变换、相对论等理论中直接导出,它主要是从实践观察中,从自然全息中感悟出,再回到数学中去寻找答案。

现在有一种复合时空理论,有许多虚值,因为它是点粒球体式的复合时空,不是圈态环面式的复合时空,这种点粒球体式复合时空,取的是 x 、 y 、 z 轴和时间 t ,虽没有涉及类圈体的情况,但它所引起的争论,却蕴含着现实意义的哲学底蕴。即在西方科学和学术已经千锤百炼证明行之有效的基

论方法层次上,如何将中国传统医学哲学的“阴阳、表里、寒热、虚实”覆盖在所谓的量子、空间子、时间子、质点、以太、太极子、炁子、旋子、细胞、原子、分子、部分子、瞬子、轴子、弦子等各类名称粒子的东西之上,使“点内空间”和“自手术”自组织程序,能有效地植入?

有意思的是,芝诺悖论提供了一种反常识的怪论,也许能帮助创造一种奇迹:让毕达哥拉斯学派把图形与数紧密结合的谋图及其现代继承者,再次出现切口。因为古希腊时代,正是毕达哥拉斯把自由的科学形式赋予几何学,用纯粹抽象的形相来考虑它的原理,并研究具有非物质的、理性的观点的定理,从而改造了几何学;在他们找到了无理数的实质的理论,并认识已发现了宇宙图象结构的顶盛时期,出现的芝诺悖论。这个悖论,涉及对空间的点的定义的争论。

因为过去希腊人一直认为点是位置的单元,所以由有限点组成的任何长度都可以通约,也就是可以找到某个最小的长度基元。但如果认为点没有大小,又为何可以认为长度是由有限个点组成的呢?于是巴门尼德与芝诺等人担忧,数学作为一门精确科学是否还有可能?即把时空作为点的堆集的这种关于宇宙和谐性的空间基础研究出现的危机,导致了毕达哥拉斯学派的瓦解。下面我们将探讨芝诺悖论对现代科学的冲击。

二、杜国平探析潜无穷和实无穷

南京大学现代逻辑与逻辑应用研究所的杜国平教授也认为:“没有任何问题能像无穷那样如此深刻地影响人类的精神——任何一个问题都不曾如此有效地激励人们的心智;也没有任何概念比无穷更需要澄清”——约公元前611-546年米利都学派的阿那克西曼德就说:“任何东西,如果不是本原,就是来自本原;然而无限者没有本原,因为说无限者有本原就等于说它有限。它作为本原,是不生不灭的。凡是产生出来的东西,都要达到一个终点,然而有终点就是有限。所以说,无限者没有本原,它本身就是别的东西的本原,包罗一切,支配一切。”但我们却认为,作为虚拟世界,可以化简为一种数字化生存,而且数联系信息传输也是一种数字化生存。

化简的数字,在数轴上是一些点。从应行仁教授谈芝诺悖论困扰现状,到杜国平教授探析潜无穷和实无穷,都没有正面回答为什么到现在,很多人还以为“点”无奇特可言?因为如果人们对“点”的认识不清,那么要揭示芝诺悖论、实无穷、潜无穷、极限等难题,就是一句空话。其实数学的点,已经是一个高度组织化了的点。

即使微分流形的概念和构造,也是从欧氏空间的概念和有关的构造脱胎而来的。

n 维欧氏空间是 n 维微分流形最简单的例子和模型。然而 n 维欧氏空间不能用直观的方法去建立，只能通过公理化的方式将它建立在 n 维向量空间及 n 维欧氏向量空间的基础上，这虽然可行，但却掩盖了它难以逃出沿点线面体发散的巢穴：

(1) 黎曼几何张量的突破仍是从点体出发的流动，而没有产生向物体内部作运动的反向思维；

(2) 向物体内部作运动的想法来自物质无限可分的观念，然而一般的物质无限可分说，也类似黎曼采用旧的点体观，即它是把物质分成类似无限个更小的球面，而没有产生“自手术”的向物质内部作孔穿过的想法；

(3) 传统数学中运用的环面，无三旋。遇到类似地球磁场兼有环面问题，也仅是从一般的整体直观外表去认识，没有看到宏观物体虽类似不能穿过地球，但从微观来说，如磁场磁力线，仍可以从北极出南极进作运动；这就构成了一个从球面转变到环面“变脸”的自手术的整体运动。

(4) 所谓“圆点哲学”、“圆圈哲学”，也主要是指事物由旋转运动而形成的完美曲线和球形态。例如它所讲的自旋、循环、周期、整体、大小、层次、无限律、同构律、变化律、全息律、和谐律、均衡律、交换律、逆向律、双旋律、因果律、宏观宇宙之圆、中观万物之圆、微观世界之圆、人体结构之圆、人生环形跑道之圆、社会及发展回旋破圆和求圆之圆、人思维螺旋辩证之圆、自然之圆、人工之圆、限度之圆、非圆之圆、误区之圆、美学之圆、分合之圆、全球之圆、统一之圆、包容之圆、系统之圆、圆满之圆、实圆生复圆、圆旋弦实旋生复旋、旋|非旋亦此亦彼，等等，都是主要以球面的自旋、循环、周期之圆取象为中心的，没有更多地考虑自手术式的类圈体的三旋规律；

(5) 如果把趋于无穷小的点以圈态三旋取象，微积分的求和，不作必要的规定是困难的。如此等等，使一些著名的疑难问题饶有兴趣。

(6) 例如有人说，一切斥力、引力都是由于物质的旋转所形成的。道理是，一个球体只要让它旋转起来，在赤道处会产生斥力，由赤道向两极引力开始逐渐增大。如地球有引力，便是来自于它的自转带动了周边气体等微小物质，这些物质在地球周围都是由赤道向两极中心旋转。人站在赤道上应该被排斥而并没有被吹起来，是因为太阳同时也给了地球一个很大的压力。其次太阳也在旋转，那比地球的力场要大得多；还有银河力场会更大。这些力场都在首先压向地球赤道，在赤道上旋转起来；在力场相互对接之后，剩余的力，就是旋转的空间粒子，都会旋回它们自身。地球相比太阳银河来说要小得多，它在赤道的斥力全部被压制，这也就是为什么从赤道向两极重力逐渐增大的原因。

电子周围的磁场也是如此。由于电子自旋速度极高，转速越快力场也就越强。无论任何物质，只要放在某个地方就会受到周边粒子甚至是像辐射这样的能量的撞击，它们会填满周边任何空隙，电子自旋它们便会跟着旋转起来，由此产生了磁场。电子绕核旋转与地球绕太阳旋转稍有不同，它本身应该像太阳一样有一个固定的自转、公转轴，但由于和地球相比它太小了。空间粒子对它来说已经很大了，这些粒子不停的和电子碰撞，它是稳定不下来的。这里面还有原子核的作用，空间粒子也会作用在原子核上，核本身并不稳定，振幅也会很大。当质子和中子相遇时，它们彼此都是高速旋转，自身有很强力场，彼此相互吸引。引力比斥力大，可能是表面比较平整，它受的力场更多，宇宙、银河、太阳、地球到电子等微小物质，都会对它施加力，但斥力仍不能为零。弱力可能是由于粒子数差别较大，或是旋转力等很多方面不同，一个粒团把另一个粒团撞碎了，而碎裂的粒团已不是一个整体，迟早要瓦解。以上都可看成没有点内空间概念。

这里有人问：如果力起源于旋转，可否根据一圆一方，圆即方，方即圆；圆非圆，圆可代表一组波幅按指数增大的电磁波；三旋非三旋，亦非弦；旋弦非形非质，亦形亦质等力的碰撞截面图，测定其表面积、表面平整度、旋转速度、传递力场粒子的密度，而快速测出是何种粒子、粒团？但这里也涉及无穷或极限实无穷、潜无穷等问题。

杜国平教授说：人们对于无穷的认识基本上可以分为两种，一种是潜无穷，一种是实无穷；德谟克里特认为原子是无穷小完成了的无穷小，因为原子本身是不能再分的。这就是一种实无穷的观点。柏拉图也是实无穷论者。第一次明确区分潜无穷和实无穷的是亚里士多德。他认为只有潜无穷，而没有实无穷。无穷只能是一种潜在的存在，而不能是一种实在的存在。他不同意柏拉图的实无穷而坚持彻底的潜无穷观点。自此以后，两种无穷观此消彼长直至今日。我国古代也同样分为潜无穷和实无穷两种。先秦典籍《尚书》中有无穷一词：“公其惟时成周，建无穷之基，亦有无穷之闻。”

惠施的《历物十事》也提出著名的：“至大无外，谓之大一；至小无内，谓之小一。”这是历史上第一次指向探讨“点内空间”。杜国平说，同一时期提出的“辩者二十一事”命题，其中有一个命题就为“一尺之捶，日取其半，万世不竭”，这里显然包含了典型的潜无穷思想。将无穷引入了数学，晋代数学家刘徽提出，使用内接正多边形(正多边形)来求圆的面积，其中的“割之弥细，所失弥少，割之又割”，“以至于不可割，则与圆周合体而无所失矣”，则显然也包含了潜无穷和实无穷思想。但中国古代的学者没有像古希腊学者那样直接地将无穷、潜无

穷和实无穷作为自己的研究对象。

原因之一就是没有像阿基里斯永远追不上龟这种芝诺悖论具有的普及性和传播性；即使至欧几里德对无穷采取笼统的排斥态度，但到 15 世纪随着文艺复兴，无穷又重新引起人们的重视。如开普勒成功地使用无穷小量分析方法，求得一些曲面体的体积。牛顿和莱布尼茨使用无穷小分析方法，各自独立地提出了微积分理论。这一时期的数学家基本上都是实无穷论者。随着微积分在实践和工程上所获得的成功，实无穷占据了主导地位。但是无穷小量毕竟不是 0，著名的贝克莱悖论使得这一矛盾更加激化，导致第二次数学危机对于微积分的理论基础的建构显得更加迫切。到 19 世纪柯西和魏尔斯特拉斯的极限理论，贯彻的彻底的潜无穷观点给微积分增强的严格的理论基础，使潜无穷又逐渐取代了实无穷的优势地位。19 世纪末 20 世纪初康托尔是个彻底的实无穷论者，他建立的无穷集合的理论被看作是一个完成了的实体，为希尔伯特等众多数学家所接受，成为数学的一个基础理论。但也产生了不同的流派，如集合论悖论导致的第三次数学危机，直觉主义派坚持潜无穷，公理集合论派坚持实无穷，众多数学家则摇摆不定。

杜国平教授例举鲁宾逊，说他就是这类无奈。原因是 1964 年鲁宾逊提出两个主要原则：(1)无穷集合不论在实际上或理论上都不存在，或关于无穷集合的任何陈述或大意陈述，在字面上都简直无意义。(2)但是我们还应该如通常那样去从事数学活动，还是应该把无穷集合，当作似乎是真实存在的那样。对此杜国平对潜无穷、实无穷基本内涵及其相互关系的探析是：实无穷论者认为，无穷是一个现实的、完成的、存在的整体。潜无穷论者认为，无穷并不是已完成的，而是就其发展来说是无穷的，无穷只是潜在的。

如康托尔在《集合论基础》一书中指出：自然数序列 1, 2, 3, ... 是从 1 开始，通过相继加 1 而产生的。这种通过相继加 1 定义有序数的过程，被称为“第一生成原则”。将全体有穷整数集合称为第一数类，用(I)表示，显然其中无最大数。用一个新数 ω 来表示它的自然顺序没有什么不当之处，这个新数 ω 是紧跟在整个自然数序列之后的第一个数——第一个超穷数。这里的 ω 是一个数，而不是微积分中的变量 ∞ (无穷大)。 ω 是“实无穷”，而 ∞ 只是“潜无穷”。从 ω 出发，运用第一生成原则，可以得到一个超穷数序列： $\omega, \omega+1, \omega+2, \dots, \omega+v, \dots$ 。由自然数序列 1, 2, ..., v, \dots ，到上面这个超穷数序列，这一过程运用的是“第二生成原则”：给定任意实整数序列，如果其中无最大数，则可产生一个新数，它作为这个序列的极限，定义为大于此序列中所有数的一个后继。康托尔的无穷是分层次的，

一层上的无穷比其前一层上的无穷“更大”。例如所有几何曲线的数目比所有平面上点的数目大，而所有平面上点的数目又比所有整数的数目大。

希尔伯特认为：“在分析中，我们只是把无限大和无限小当作极限概念，当作某种正在到来、正在发生的东西来研究，即我们研究的是潜无限……或者当我们把一个区间的点看作同时存在的许多事物的总体时，这种无限性称为实无限性。”美国数学家丹奇克指出：“无穷的概念既不是实验的天然物，也不是逻辑的必然物；而是数学的必然物。我们对头脑的这种肯定也许是一种纯粹的幻想，然而它却是一种必要的幻想了。”以色列数学家马奥尔认为：“自然数 1, 2, 3, ... 的集合是潜无穷的，因为每一个自然数都有一个后继者，然而在计数过程的每一个阶段——无论这个阶段进展到何种程度，我们遇见的元素的数目仍然是有限的。从另一方面讲，实无穷涉及到的过程在每个阶段上已经得到了无穷多次重复。整数集在按照其‘自然’顺序：……, -3, -2, -1, 0, 1, 2, 3, ... 排列时，就包含一个实无穷集，因为在每一个阶段都已经有无穷多个整数出现。”

俱往矣，还看量子中国经历各种复杂的如改革开放前以阶级斗争为纲、改革开放后以经济建设为中心的考验，在实、潜无穷物质与真空、思维与存在的实践总结中获前驱。

三、芝诺坐标解运动与界面之谜

大约在公元前 445 年，年近 65 岁的古希腊杰出思想家巴门尼德与年轻的苏格拉底发生了最为惊人的智力冲突。在今天看来，这些争论的焦点是：思维与存在、物质与真空存不存在界面？巴门尼德认为：如果不存在界面，即物质世界是整体式的，现实是一个没有变化的统一体，那么运动尤其是不可能的。言下之意，巴门尼德赞成常识内的事物是有界面的。但反对的人很多。芝诺为支持他的老师巴门尼德，设计了几个强有力的混淆常识领域里的运动与界面的悖论参加辩论，希腊神话中的飞毛腿阿基里斯追不上龟的悖论就是其中之一。

芝诺是这样论证的：在赛跑的时候，跑得最快的永远追不上跑得最慢的，因为追者首先必须达到被追者的出发点，这样，那个跑得慢的必定总是领先一段路。这里芝诺故意留下陷阱：不提无穷小的差距能否合成一段有限的距离，让人往里跳；而把真实的意图即思维与存在、物质与真空存在界面隐藏起来。

两千多年以来，芝诺悖论诱发了无数场直接的论战，众多试图驳斥芝诺的数学家和哲学家无一不掉进他的陷阱：即认为是解决运动从本质上说是不能发生的问题，而停留在对无穷小的距离或时间作求和极限的数学分析上。但意犹未尽的人却认为，

这种数学分析还不完备。因为芝诺悖论的关键是思维与存在、物质与真空存在界面，而不是运动的本质是不可能发生或不能结束。因为在宏观世界上任何一个有理智的正常人，即使连算术也不懂，也熟悉运动的发生与停止，跑得最快的人一定能追上跑得最慢的龟，难道有高深智慧的巴门尼德和芝诺不明白？

所谓人追上龟，是指人与乌龟接触的那一刻，因此只要人与乌龟之间的差距小于乌龟或人体的尺寸，这就是一个界面。小于这个尺寸，不能把赛跑的龟分了还看成龟，也不能把赛跑的人分了还看成是人。即在小于这个界面内，既不能藏下一只龟，也不能藏下一个人，除非有往点内穿的本领。这是一个跨界问题。如果承认有这种跨界，就是承认有芝诺悖论反驳的一面：物质世界是整体式的，现实是一个没有变化的统一体。但宏观世界的真实情况不是这样，即没有超界的高能，真空是不易撕裂的。在小于乌龟或人体的尺寸下，乌龟或人的身体总有一部分要露在这个界面外，因此人与龟的身体必然会接触，即人能追上龟，芝诺悖论不成立。

1、芝诺坐标系与复合时空论

要说明众多对芝诺悖论的解答不完备，需要建立芝诺坐标系。用 X 轴代表物质与真空，用 Y 轴代表思维与存在，作成平面直角坐标系，定交点为 O，箭头一边为正，另一边为负。正的表示不需要意会理解的思维与存在、物质与真空，负的需要意会理解的思维与存在、物质与真空。如此构成的坐标系把万事万物分成了四个象限。

第 I 象限属于自然界、宇宙以及人类社会不需要意会理解的事物，包括爱因斯坦的相对论真空。第 II 象限描述了镜像、梦幻一类的反映，以及部分的大脑贮存、书画贮存、音像贮存，电脑中的虚拟生存。镜像、梦境似乎可视可听，是不需要意会理解的思维与存在，但它们显现的空间是虚的、模糊的，是一些需要意会理解的物质与真空。类此，还有不能重复验证的 UFO、特异功能等类报告。第 III 象限的东西，不论思维与存在还是物质与真空，都需要用意会才能理解。如无穷小量，类似于将小数散布到整数之间，只要你能想象着写出来，它就始终比零大，而比一个任意数小。无穷小量事实上的确存在并不是直接表明的，在研究它们的过程中，不仅产生了数学上的内部集合论，模糊数轴理论，而且产生了物理学上的弦论，即物质分到 10^{-35} 米的线度，粒子并不是一个无维的点，而是一条长度不大于 10^{-35} 米的细线或微小圈。第 IV 象限的真空场及真空效应，不同于第 I 象限的相对论真空，而具有量子论的特色，即真空空间并不是完全空的，它充满着小的量子起伏。这些起伏可以看成是波，即是物理场内的波动。这些波具有所有的可能的波长并

且在所有方向上运动。我们不能检测出这些波，因为它们只是短暂地存在并且是很微小。这种真空效应是实在的，但也是需要意会才能理解的思维与存在。

上面就是芝诺坐标系。运动在它的四个象限内是不平权的，即存在反常和宇称的不同。芝诺坐标系存不存在？它与现实有没有联系呢？可以说，有许多热点、难点的科学、哲学争论，都间接与此有联系。例如中国科学院院士何祚庥与天津大学教授崔君达关于复合时空的论战，就是典型的一例。在这场争论中，

崔君达虽然用数学分析得出四个象限，但也把运动在四个象限中的芝诺坐标界面舍去了，从而得出第 I 象限中的夸克和其它象限中的夸克无差别，而一同泼掉，这是何祚庥所反对的。当然崔君达也正确地指出何祚庥所坚持的那种没有变化的无限可分式的统一体的层子是不存在的。

2、模糊数轴与内部集合论

模糊数轴理论发现了芝诺悖论阿基里斯追不上龟中隐含的“数锥”，并揭示出芝诺悖论孕育着的“数环”和“数旋”思想。无穷小量的倒数是无界数，因为一个无穷小量非常小，其倒数将会非常大，因此有无穷大的性质。但无界数尽管大，它是有限的，因而比数学中产生的真正无限的数小。这些无界数存在于一种介于普通的有限标准数和无限标准数之间的过渡区中。有意思的是，如果用模糊集合理论研究这种数目的无穷大，可以说它们也是一种特别的模糊集合。模糊数轴正是把这些“无穷大”、“无穷小”问题揽到一起来解决。例如即使认为宇宙是无穷大。那么宇宙的边界也是处在模糊数轴集的模糊带或模糊圈之中，在此基础上形成了模糊宇宙学的概念。

在对芝诺悖论的驳斥中有一种方法叫内部集合论，是美国数学家鲁滨逊提出的一种实践拓扑学的非标准分析法。鲁滨逊说：实数可以用一条被称为实线的直线上的点表示，它由整数（正整数和负整数）、有理数（能够表为分数的数）和无理数（不能表为分数的数）等三类标准数组成，而与它们相联系的无穷小量则称为非标准数。这为无穷小在数学上取得了一定的地位。因为 19 世纪的数学家们为无穷小发明了一种技术替代法，即所谓的极限理论；该理论是如此周全，众多研究者都能把无穷小从芝诺悖论中驱逐出去。与极限理论不同，鲁滨逊认为无穷小为运动的细节提供了细微的观察。他的非标准分析法不是把无穷小驱逐出去，而是把人的观察责任驱逐出去。这与我们对芝诺悖论要划清运动与界面的看法是接近的。而鲁滨逊建立的实践拓扑学也与模糊数轴相一致。

因为鲁滨逊认为无穷小非标准数比任何正标

准数小而比零大，模糊数轴上聚集在整数周围的混合非标准数，是标准数加减无穷小量得来的。模糊数轴上，每一个标准数周围都聚集着这样的混合标准邻居。两个名数之间的算数差必然是名数，因而也是标准数。如果这一差值是无穷小，就违反了无穷小比所有标准数小这一定义。

这一事实的结论是，一个无穷小间距的两个端点不能用名数来表示，因此一个无穷小的间距永远都不能通过测量来获得，无穷小永远都停留在观察范围之外。在时间方面也如此，尽管我们能够把一个标准数表示至小数点后任何有限的位数并利用这一近似值作为一个测量标记，但我们不能接近这个展开小数的无界尾去改变一个数字而定义出非标准的无穷小地接近的邻近值。作为测量标记，只有标准名数才是有效的，利用它们的非标准邻近值用作测量是虚幻的。

3、微积分与不可积因子

微积分虽与无穷小有联系，但注意的重点，微分在于求两个无穷小量之比的极限，积分在于求无穷小量总和的极限，这两者后来都容易使人忽视微分对运动界面变化的揭示。例如，设 M_0 是曲线 L 上的一个定点， M_1 是动点，引割线，当点 M_1 沿曲线 L 趋近 M_0 时，割线 M_0M_1 的极限位置 M_0T 就成曲线 L 在点 M_0 处的切线。无穷小量使曲线变成了切线，这个界面的变化，即路程在时间的无穷小分割中变成了速度界面，速度在时间的无穷小分割中变成了加速度界面，这是多么不同寻常的深刻变化。

其次，微积分求解都要求函数反映的曲线是连续的和光滑的，但其实在微观领域的观察，曲线并不是那么光滑和连续。韦尔的统一场论研究表明，在无穷小的空间，存在不可积因子。他指出：一个真正的无穷小几何必须只承认一个长度从一点到与它无限靠近的另一点转移的这一原则。这就禁止我们假定在一段有限的距离内，长度从一点转移到另一点的问题是可积的，尤其是当方向的转移问题早已证明是不可积时更不能这样假定。这样，不可积标量因子的想法便产生了，电磁势 A_i 也由此产生，于是韦尔的理论可以把电磁学在概念上纳入一个不可积标量因子的几何想法之中。

我们从麦克斯韦的电磁场理论可以知道：变化的磁场产生电场，变化的电场产生磁场，变化的电场和磁场总是相互联系，形成一个不可分离的统一场。这同模糊数轴的无穷小量数环、数旋现象是多么相似。

4、大脑实验与思维这把刀子

芝诺坐标不同于平面对顶角。对顶角是平面上两条直线相交，继续延伸过去形成的两个相等的角，因此对顶角是平权的。芝诺坐标则是点外与点内的

对顶角，即两条直线相交，延伸的不是平权的空间，而是向交点内的“空间”，这只能用意会来理解。如果把把这个模式拿到现实生活中去寻找，会很自然地同大脑联系起来。把视角看成从一点出发引申的两条直线。视线向相反的方向的延伸，不伸向脑外而是脑内，即是向“点”内的延伸，这叫做大脑贮存。大脑贮存不仅是现实物质的储存，而且还是一部分负物质、负空间、负量子在我们宇宙中的一种贮存。例如做梦，有时能看到活生生的人、树，有活动空间，难道这不是一种真实思维的负物质、负空间、量子量的贮存吗？

其次，这种芝诺坐标与崔君达的复合时空坐标也不同。崔君达是把芝诺坐标的四个象限再分成四个平权的直角坐标，这样一个时空变成了 16 个象限（ 4×4 ），这里思维与存在、物质与真空是被绝对地分开了。事实并非如此，例如正常人能直观理解的物质与真空普遍存在于现实世界，它们既能存在于同一个象限，即第 I 象限，又能反映到其它三个象限，但其它三个象限不一定能有这种平权，这是芝诺坐标的人择原理。例如点内的空间，比如大脑做的梦境，它不可再分成四个象限，而与现实的对应物没有交叉。因此即使数学逻辑能推证出 16 个象限，而这里的数学逻辑也仅是芝诺坐标第 II 象限的反映反复，并没有走出第 II 象限，正像量子模型没有走出第 II 象限一样。但人类科学理论反映上的困难，并不是自然界的困难。高能实验在发展，真实的夸克在反映。

现在可以来总结芝诺悖论了：在芝诺坐标的第 I 象限，阿基里斯和乌电是可观察可直接测量的宏观尺寸量，速度有差异的赛跑，身体能接触，芝诺悖论不成立。如果阿基里斯和乌龟是不可观测的小量，它们就可能处于第 III 象限，这有两种处理：一是极限分析无穷小量求和有限极，芝诺悖论不能成立；二是无穷小量的内集论分析，不能测量标记的无穷小量被排除在可观察责任之外，芝诺悖论难以判断。芝诺悖论是以书面知识存在于第 II 象限，实际已存在两千多年了。芝诺为这种存在作的类似惯性定律式的辩护：运动不可能发生或结束的哲理，有可能存在于第 IV 象限的真空效应中：真空中的量子起伏，遵循海森伯测不准原理，运动似有似无。并且真空中的高能粒子碰撞实验也说明，有时粒子越分，质量愈大，数目会越多，这是与人们常识相左的地方。

芝诺坐标是一把思维刀子，它支撑着大脑实验。思维这把刀子有时比真实的刀子更厉害。例如铁刀子虽可以劈开木材，高能加速器这把“刀子”虽可以把强子粉碎，但它们都还对轻子没有办法。然而思维这把刀子却可以把轻子“剖开”，研究它们的前夸克结构。

芝诺坐标揭示了芝诺悖论进攻的是人们对思维与存在、物质与真空的局限性，这有助于打磨人类思维的这把刀子，并将大大推进当今科学与哲学的发展。即芝诺悖论的价值在于促进人们思考。它的解决带来了从三角坐标、极坐标到芝诺坐标、三旋坐标观念上的突破和新理论的建立。三角坐标、极坐标把阿基里斯与乌龟的距离除这两者的速度差，算出了什么时候阿基里斯追上乌龟，但这不叫破解悖论。三角坐标、极坐标计算与推理相矛盾的常识是对的，但矛盾依然存在。面对悖论的逻辑推理，不用芝诺坐标、三旋坐标的答案来说明，推理难破解其层次的荒谬。亚里士多德的解释是这样，阿基米德的说明是这样，柯西的答案是这样，只是给出了悖论常识一方可能被超越时的边界数值，而没有跨过这永远不会为零的间隙。应行仁和杜国平两教授所谓这要涉及到数学上实无穷和潜无穷的哲学争论，实际也没有破解其层次的荒谬。

四、非标准分析推陈出点内空间

倒是美国数学家 1960 年鲁滨逊提出的非标准分析，与进入“点内”空间的假设接近。例如，“点内”是环面并存在三旋，如果事物运动因不作“大数因子”限定而能“进入”点内，那么像飞毛腿阿基里斯追不上龟、苹果落不到地、箭飞离不远弓多少之类的悖论是可能成立的。证明如下：这些东西运动大小事先没有“大数因子”限定，即这些东西在流逝中如果能变小进入点内，点内如果又存在环面，由于环面不同伦于球面，就不会出现像球面上圆心与球心重合的那些圆的“直线”虽然最长，以及这些直线即使出发时似乎是平行的，但是也要相交。并且相交，还不是一点而是两点的情况，即只要运动在球面，芝诺悖论不成立。但是如果是在环面上，因为圆线可以变为扭状，其平行线可以象一组互相环绕的圆以扭转的形式位于一层环面上，芝诺悖论可以成立。

1、这就是说，由于环面存在三旋，那么进入这种“点内”的龟、阿基里斯、苹果、火箭等这些东西，就有可能好似永远停留在“点内”的环面上，并且由于阿基里斯跟龟进入点内的时间有差别，还会有相位的不同。即在环面上赛跑的轨道还会是两条平行的直线，而不是在一条直线上。由此不管阿基里斯与龟的赛跑的速度差别多大，即使在环圈体的同一层环面上，运动也难在同一点相交。证毕。

但是两千多年，不管是平常人还是数学家、哲学家，很多人都掉进了芝诺与其老师巴门尼德设置的这个陷阱里，因为他们辩驳芝诺悖论使用的武器，只能用如常识性观察的无穷小极限求和之类的公式，这不显得太粗糙了？他们低估了这两位古哲人的智力。如果芝诺他们连常识性的知识都分不清，怎能提出一系列有相同数学背景的悖论命题。

2、美国数学家鲁滨逊 1960 年创立非标准分析时，使用与进入“点内”空间的假设接近的办法，使非标准分析产生出既联系又有区别于标准分析的意思。因为标准分析是指柯西等人用极限方法建立起来的微积分理论。微积分同微分几何一样，强调函数的光滑和连续，但鲁滨逊看到：狭义相对论实验证明的光速不变，实际表明的是是一条光线从宏观来看是连续的，即光轴不仅连续而且均匀；但从光的电磁理论上思维，光波是电磁波，而电磁波是由变化的电场圈态与变化的磁场圈态交替产生的，即从微观上看，光轴不仅不连续，而且不均匀。这反映在数字流形上，那么标准分析称的实数集合研究的有理数和无理数的集合，是指实数与直线上的点一一对应，实数的集合能是连续的吗？

因此鲁滨逊创立的非标准分析才认为：除实数之外，还应引进新的无限小量和无限大量，统称为超实数。超实数集合用 *R 表示。从宏观上看 *R 的数轴与数轴 R 一样，但从微观上看并不相同。在超实数轴上的每一点内，有许多非标准实数。这些非标准实数彼此相差无限小，形成一个有内部结构的点，这称为“单子”。每个单子只有一个标准实数。从标准实数来看，点与点是连续的；然而从点有内部结构来看，点与点又是间断的，超实数轴 *R 正是连续与间断的对立统一。

看来鲁滨逊已经走到了“大数因子”的门口，但他转向了。因为他只看到了“点内”是一些球面的景象，是球面的间断与连续，而没有看到还有圈态三旋的连续与间断，这本来在电磁波传播分析中的三旋场变换就已经充分地表现出来了。当然，在“点内”，是既可以存在环面又可以存在球面的，有时仅是人的选择的不同而矣。

鲁滨逊的不足，因非标准分析，解决只是微积分学中求导、求和问题。但拓扑学中的约当定理，已证明在某些方面平面与球面等价，而与环面相区别。微分只因采用球面更方便而已，如求函数 $f(x)$ 在 D 点的导数，按照标准分析在曲线 $f(x)$ 上求 D 点的导数，指的是要求动点无限趋近于零但又不能等零；作微分三角形 $\triangle ABD$ 只能是近似的：在点以外要把弦与弧等同起来，在直觉上是想不通的；但在非标准分析中，允许动点 A 进入 D 点内，取 D 点“放大”的情况看，微分三角形 $\triangle A'B'D'$ 比 D 点还要小，设 $\triangle A'B'D'$ 是点内三角形，因而在点内把弦与弧等同起来，在直觉上是可以想象的。

但具体在哪些情况下，点外的事物能够进入“点内”，上面非标准分析仅是从微分求导上作了说明。遇到芝诺悖论一类的问题，它虽然比微积分极限求导、求和说得更在理，但它的内集论也仅是排除了人的观察责任的论证，这更证明非标准分析的内点奇景也是以球面取象；这种球面取象的结果当

然也同微积分求导求和的结论一致：芝诺悖论不成立。因为球面上的两条大圆直线平行，仍然会在极轴两端相交，因此即使进入点内，飞毛腿阿基里斯也必然遇到龟。非标准分析排除人的观察责任，只是它的高明之处。

例如鲁宾逊允许动点进入点内的非标准分析，为无穷小运动的细节提供了细微的观察。因为在非标准分析的超实数轴 $\ast R$ 上，实数点由整数、有理数和无理数等三类标准数组成，而与它们相联系的无穷小量则称为非标准数。无穷小非标准数比任何正标准数小而比零大，每一个标准数周围都凝聚着这样的混合标准邻居。另外，表示成 n 和 $n+1$ 的无界非标准数，则是无穷小量的倒数，因为一个无穷小量非常小，其倒数将会非常大。但无界数尽管大，但它是有限的，即每一个无界数都比标准数大，而比无限实数小。

这样非标准分析不是把无穷小驱逐出去，而是为把人的观察责任驱逐出去作了准备：两个名数之间的算数差必然是名数，因而也是标准数。如果这一差值是无穷小，就违反了无穷小比所有标准数小这一意义。这一事实的结论是，一个无穷小间距的两个端点不能用名数来表示，因此一个无穷小的间距永远都不能通过测量来获得，无穷小永远都停留在观察范围之外，即无论是芝诺还是其他任何人，都将无法用图表示出一个移动的目标，在这一难以接近的区域内的进展情况。这样，我们就不必对解释我们无法观察的情况负责。这里有三层意思：A、从无法观察或无法测量判断，排除物体可以随便改变形状大小进入点内的可能；B、进入点内的无穷小，不会移动超出临近的实数；C、如果非标准分析的内点奇景不仅有球面，还有环面，那么芝诺悖论也不能成立。

3、狄拉克的“大数之谜”提示的是：我们人以及世间的事物，已经进入“点内”式的宇宙。即这个点，在量子力学方面是以无量纲大数 10^{39} 为特征的宇宙。这是芝诺悖论证明的界面：如果龟相对阿基里斯的线度趋近于无穷小数，即“大数”之倒数，龟变得有如中微子那么小，龟就有可能进入地球这个“点内”，消失得无影无踪，飞毛腿阿基里斯当然就追不上了。这就是“大数因子”生出的多样性；也是“大数因子”对局域性与全域性之间的不协调问题，提供的理解。因为在“大数因子”的判定下，某个事物相较能进入“点内”，就类似意味着函数能发生一次可微或可导，方向也会产生转折。

4、我们说阿基里斯与乌龟悖论难不住希格斯场，因为高端希格斯场物理方程也要求是可微或可导的，这类似进入希格斯场也要进入“点内”，由此质量生成的模糊圈态可用模糊集理论直观证明：用一个数（隶属度）来表示某个元素对集的关系，这

个数可以在0（即0%）到1（即100%）间取值，这就是隶属函数。如“年轻人”这类不能成为集的概念，利用隶属函数就能取得合法的身份，变成为新意义下的“集”。但这种集的边界是不清晰的，所以叫它“模糊集”。有了模糊集的隶属度概念，就能举一反三建构模糊数轴，并能用来研究无穷小量。例如有的分数能化成循环小数或不循环小数，即它们的小数点后面的位数可以无限延长下去，无穷小量与此类似。也就是说这些数的尾数边界是模糊的，但如果把隶属度看成是小数点后第 n 位，这一定下来它们的集就能取得一个确定的值。即模糊数轴的隶属函数是两个定数之间的集合，反映出一种陷落或数锥式的运动，这是不同于现代模糊数学之处。

例如，如果规定实数是在一根直线上，虚数是在直线外，那么从0.9, 0.99, 0.999……以及1.01, 1.001, 1.0001……这种从两端向中间无限陷落而不可接近或离开1的集合状态，可以理解为整数既是奇点又具有奇环性或数旋性，它周围存在陷落。这种陷落靠模糊数轴实数集和虚数集联系起来，从而使我们的数轴变活了。联系希格斯质量，也变成了一种量子整数线旋圈态，模糊地可感觉到它有粗度、在转动，显现出鲜明的层次与阶段之分。即整数点到粒子的自然意义，实际是空间量子圈态线旋的奇环性表现。

以上模糊数轴的分析除直线上的数是实数外，也说在它的陷落周围还存在虚数，构成了整数连续与分立之间的链状统一。反过来看质量空间，过去通常是用没有去联系普通点和这种点组成的直线坐标描述。即使1920年韦尔用微分对空间作规范场分析时，也采用是这种普通数轴而不是模糊数轴，所以他没觉察出会有虚数项。但后来杨振宁教授沿规范场分析，用相位因子补上这个虚数项，即方程差了一个 i ，即 -1 的平方根。

5、类此，量子质量除实数外也可存在虚数。于是我们又可以说，希格斯类似鲁宾逊走到了“芝诺坐标”的门口，他看到了“点内”空间。我们还可以说，不局限自然科学的物质，从思维科学角度来考虑“物质”。这正是我们中国人喜欢把“质量”泛化的方式。是否可以用自然科学评价“物质”的质量来评价社会科学“做事”的质量？

众所周知，希格斯场只是用来说明基本粒子“质量”起源的理论，是把基本粒子在希格斯场遇到的“阻力”的大小，来等价于该物质的“质量”的。这里的“阻力”既有希格斯场的原因，也有物质自身的原因。从自然科学的物质的“质量”来说，从牛顿开始，是与“力”、动量、能量相关。那么“质量”泛化能类比希格斯场吗？能。

因为“阻力”也是“力”的一部分。不管是“斥力”还是“引力”，都是克服“阻力”，所以泛化质

量类似计量“斥力”还是“引力”，也有类似在希格斯场里的“阻力”。不管是成功还是失败的“做事”，也是类似克服“阻力”或被“阻力”拦住的结果。如果希格斯场已经被扩容为“芝诺坐标”，可知更难不住对“质量”泛化的破解。反之，自然阿基里斯与乌龟的悖论已包括在其中了。

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The Effect of Light and Dark Conditions on the Feed Intake and Growth of the African Catfish (*Clarias gariepinus*, Burchell, 1822)

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Abstract: The effect of the presence or absence of light on the feed intake and growth performance of *Clarias gariepinus* fingerlings were studied. Triplicate group of ten (10) fish with an initial mean weight of 3.90g were randomly distributed into six plastic tanks containing fifty (50) liters of water. They were fed with a commercial feed for a period of seven weeks. The result obtained showed that feeding of *Clarias gariepinus* fingerlings either in dark or light conditions does not influence their growth performance as there were no significant differences ($P=0.05$) in the mean feed intake, weight increase, feed conversion ratio, specific growth rate and survival rate of fish fed under dark conditions and fish fed under light conditions.

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Keywords: light, dark, feed intake, feed utilization, growth performance, feeding rate.

1. Introduction

The African catfish *Clarias gariepinus* (Burchell, 1822) is the most important farmed fish in Nigeria today. Its rapid growth at high densities, ability to breathe air and to withstand poor water quality, and its tasty flesh make *C. gariepinus* an excellent candidate for aquaculture (Appelbaum and Kamler 2000).

Rearing of the fingerlings of *C. gariepinus* is the major challenge facing the aquaculture of *C. gariepinus* (Verreth, 1994). Several biotic and abiotic factors are known to constitute "stressors" of fish in aquatic environment. These environmental conditions such as temperature, salinity, photoperiod, oxygen availability and water velocity could influence the growth of fish, as well as affect their performance (Berg *et al.*, 1992).

According to Aderolu *et al.* (2010), feeding by fishes depends on the interactions between the fish and its environment including stock density, time, day length, season, etc. Study has shown that fingerlings of *C. gariepinus* reared in continuous darkness show a better growth rate than those reared in continuous light or normal photoperiod. Leading to the suggestion that restriction of light may be used in *C. gariepinus* culture for enhancement of growth (Appelbaum and Kamler 2000).

Fish can be classified into species that rely predominantly on vision, and those that rely more on chemical, tactile or electrical senses (Appelbaum and Kamler 2000). The feeding of *C. gariepinus* is dependent on sensory organs other than the visual senses (Mukai and Lim, 2011).

This study aims to determine if there exists any difference in the rate of feed intake of *C.*

gariepinus fingerlings fed under dark and light conditions and also determine the effect of this on the growth performance of *Clarias gariepinus* fingerlings.

2. Materials and Methods

2.1 Area of Study

The study was conducted at the zoological garden of the Department of Biological Sciences of the University of Abuja, located in Gwagwalada Area Council, Abuja. Gwagwalada is about 55 kilometers from the Federal Capital City of Nigeria and is located between Lat. $8^{\circ}55'$ and $9^{\circ}00'N$ and Longitude $7^{\circ}00'$ and $7^{\circ}05'E$. There are two seasons (the dry and wet season) yearly. The dry season starts in October and ends in March while the wet season is from April to September with a mean total rainfall of approximately 1,650mm per annum. The temperature of the area ranges from $30^{\circ}C$ to $37^{\circ}C$ yearly with the highest temperature recorded in the month of March (Balogun, 2001).

2.2 Experimental Procedure

Sixty (60) African catfish *C. gariepinus* fingerlings with average weight of 3.9 g were obtained from a local hatchery in Kuje Local Government Area, FCT Abuja and transported to the experimental unit in aerated polyethylene bags.

Fish were acclimatized to laboratory conditions for one week and ten fingerlings were randomly distributed into six plastic tanks containing 50L of water. Fish were kept under natural photoperiod of approximately 12/12 hours light/dark cycle and the experiment carried out in triplicates. Three tanks were kept in a room that had blinds that

were covered during feeding so that feeding was done in the dark while the other three tanks were left outside and feeding done under normal photoperiod. They were fed the Coppens fish feed (2mm) for 48 days from the month of August to October, 2012. Feeding was done daily at (8.00-9.00am) and (5.00-6.00pm).

2.3 Data Collection and Analysis

Data on fish growth characteristics were recorded weekly. Feed conversion ratio, specific growth rate and mortality were determined as follows:

(i) Specific growth rate (SGR) (g/day) =
$$\frac{(\text{Loge } W2 - \text{Loge } W1) \times 100}{T2 - T1}$$

Where:

W2 = Weight of fish at time T2 (final)
 W1 = Weight of fish at time T1 (initial)

(ii) Feed conversion ratio (FCR) =
$$\frac{\text{Total feed consumed by fish (g)}}{\text{Weight gain by fish (g)}}$$

(iii) Percentage Survival Rate =
$$\frac{(N_o - N_t)}{N_o} \times 100 \%$$

Where:

No = Number at the start of the experiment
 Nt = Number at the end of the experiment

2.4 Statistical Analysis

The results were presented as mean ± standard Deviation. Data were subjected to t-test analysis (P<0.05).

3. Result

The mean feed intake of the fingerlings of *Clarias gariepinus* fed in light and dark conditions for the seven weeks were 162±0.30g and 176.70±5.30g respectively. Furthermore, the initial and final mean weight of the fingerlings fed under dark condition for a seven weeks were 5.70±0.30g and 31.0±2.5g respectively while initial and final mean weight of the fingerlings fed under light condition for a seven weeks were 5.10±0.30g to 28.70±1.50g respectively. However, the mean FCR of the fingerlings fed under light and dark condition for the seven weeks were 0.97±0.07 and 0.98±0.10 respectively. The mean SGR of the fingerlings fed under light and dark conditions were 3.28± 0.20g/day and 3.32±0.10g/day respectively. The mean percentage survival rate of the fingerlings fed under the dark and light conditions for seven weeks were 90%

The growth performances of the fingerlings for a period of 7 weeks are presented in Table 1.

Table 1: Mean growth data of juvenile *C. gariepinus* in the light and dark conditions

Parameter	Light	Dark
Mean Feed Intake (g)	162±0.30	176.70±5.30
Initial weight (g)	5.10±0.30	5.70±0.40
Final weight (g)	28.70±1.50	31.10±2.50
Mean FCR	0.97±0.07	0.98±0.10
Mean SGR (g/day)	3.28±0.20	3.65±0.10
Survival Rate (%)	90	90

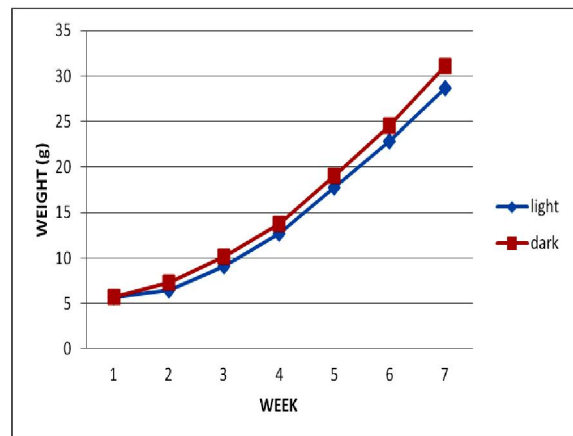
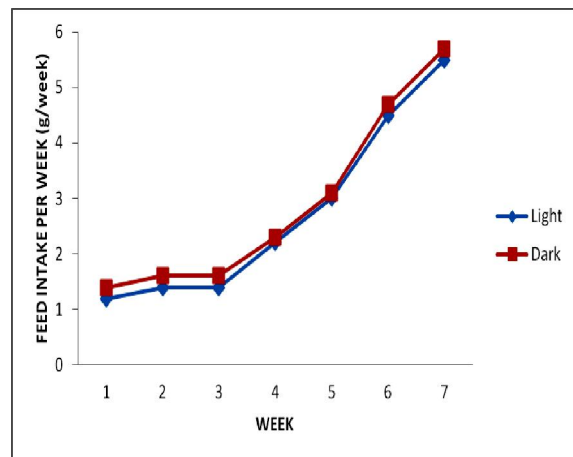


Figure 2: Comparative mean weight of the fingerlings of *Clarias gariepinus* fed under light and dark conditions for seven weeks

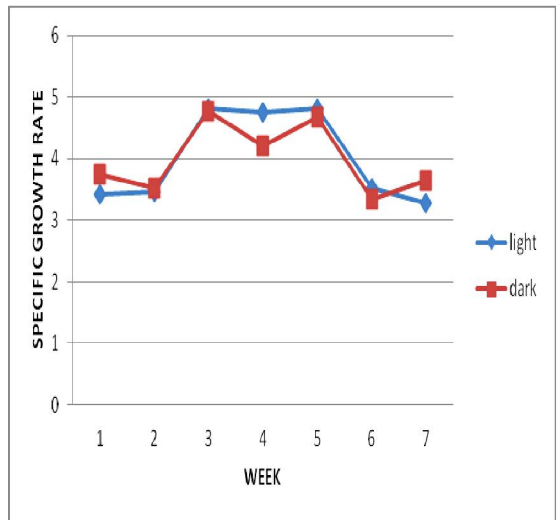
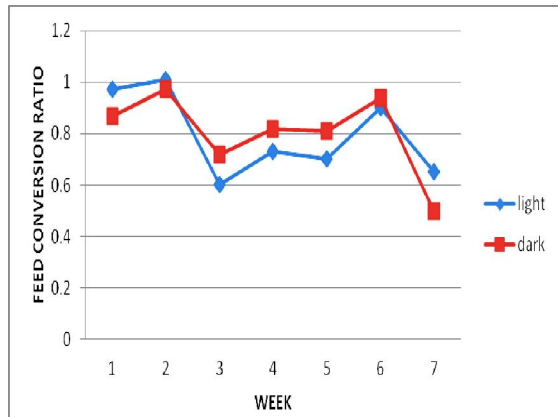


Figure 4: Comparative mean specific growth of the fingerlings of *Clarias gariepinus* fed under light and dark conditions for seven weeks

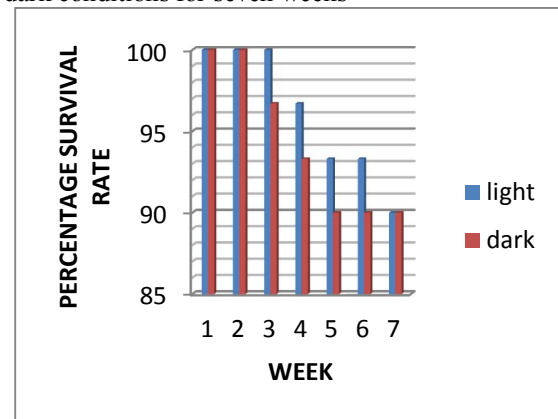


Figure 5: Comparative mean percentage survival rate of the fingerlings of *Clarias gariepinus* fed under light and dark conditions for seven weeks.

4. Discussion

The mean feed intake of fingerlings fed under dark conditions was slightly higher than feed intake of fingerlings fed under light conditions (see Figure 1). Although this difference was not significant ($P=0.05$). This is in agreement with Mukai and Lim (2011) who found that ingestion rates under light versus dark conditions did not vary significantly. This may be due to the ingestion rate of the African catfish being dependent on chemo-sensory senses rather than visual or mechanical senses (Mukai and Lim, 2011). Mustapha *et al.*, (2012) showed that fingerlings cultured in dark conditions exhibited higher growth rate and increased body weight but these were attributed to better food conversion efficiency, suppression of swimming activity, aggression and stress in dark rather than an increased feeding rate. It has been suggested that the increased growth rate of *C. gariepinus* reared under dark conditions may be the result of energy that would have been expended on the above activities being invested in body growth (Appelbaum and Kamler, 2000; Mustapha *et al.*, 2012).

The final mean weight of the fingerlings of *C. gariepinus* fed under dark conditions were slightly higher than the final mean weight of the fingerlings fed in the light condition although these differences were not significant ($P=0.05$).

Fish fed under dark and light condition had almost the same mean feed conversion ratio. No significant difference ($P=0.05$) was found in the SGR for the fingerlings fed both in the light and dark conditions. The percentage survival rate of the fingerlings fed under light and dark conditions were the same.

In conclusion, in the early life of *C. gariepinus*, feeding in either dark or light conditions does not necessarily increase the feeding rate and growth performance.

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Effects of Inorganic Nutrients on Survival of Eggs and Larvae of *Clarias gariepinus*

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Abstract: The effects of inorganic nutrients (nitrate, sulphate and phosphate) on survival of eggs and larvae of *Clarias gariepinus* from fertilization to complete yolk absorption were investigated. Fertilized eggs were incubated at fourteen levels of nitrate ranging from 0.02 – 700mg/L, sixteen levels of sulphate ranging from 0-1000mg/L and ten levels of phosphate ranging from 0-500mg/L. The hatching rate was highest (73.24%) at nitrate concentration of 70mg/L while larval survival was highest (26.09%) at nitrate concentration of 150mg/L. The hatching rates of the eggs exposed to 70-150mg/L were significantly higher than those obtained from other nitrate concentrations including dilution water (0.02mg/L NO₃⁻.N). The larvae exposed to nitrate concentrations other than this range (70-150mg/L) died before the end of yolk sac period. Hatching rate was highest 80-81% at sulphate concentrations of 100-120mg/L while larval survival was highest (63.33%) at sulphate concentrations of 100mg/L. The sulphate concentrations other than 50-130mg/L had zero percent survival. Phosphate concentrations up to 80mg/L had no effect on incubation time. Abnormalities in hatchlings were observed beyond 20mg/L and increased with increase in phosphate concentration. No eggs hatched at 500mg/L and the highest larval survival of 52.17% was obtained at 20mg/L phosphate. These data suggest that maximum normal hatching and larval survival of *Clarias gariepinus* may be anticipated if the concentration of nitrate is within the range of 70-150mg/L and sulphate is about 100mg/L. A phosphate concentration within 5-20mg/L is recommended for optimal normal hatching and high viability of *Clarias gariepinus* eggs.

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Keywords: fish eggs; incubation; rearing; water quality; yolk sac larvae

1. Introduction

The African catfish, *Clarias gariepinus*, is rapidly gaining status as prime aquaculture species in a number of African, Asian and European countries (Ariole and Okpokwasili, 2012a). In Nigeria, it is in high market demand as table fish, being tasty and scaleless. Like many other organisms early developmental stages of *Clarias gariepinus* are probably the most sensitive stages of its life cycle. Developmental problems may often be induced by unfavourable abiotic environmental factors (Adebayo *et al.*, 2007).

The effects of water hardness (Molokwu and Okpokwasili, 2002a), pH (Ariole and Okpokwasili, 2012b) and indigenous probiotics (Ariole and Okpokwasili, 2012c) on the embryonic development and larval survival of *Clarias gariepinus* have been reported. The microbial flora status in *Clarias gariepinus* hatchery systems has been established (Molokwu and Okpokwasili, 2002b). No work has yet been published on the effects of inorganic nutrients such as nitrate, sulphate and phosphate on the developmental biology of *Clarias gariepinus*.

A thorough understanding of the responsible ecological factors such as nutrients and their specific limiting ranges is desirable to maintain optimal rearing conditions (Ariole and Okpokwasili, 2012b). Nutrients are of particular interest because due to

increased agricultural and industrial activities, there is an increasing evidence of groundwater pollution by these nutrients (Prakasa Rao and Puttanna, 2000) and borehole water is the water source for most Nigerian fish hatcheries. Furthermore, industrial waste water, household waste water, runoff from a hazardous waste site or naturally decaying material can put these nutrients into waterways, rivers, lakes and streams (Rutkoviene *et al.*, 2005). These nutrients will enhance the growth of aquatic vegetation or phytoplankton and algal blooms disrupts normal functioning of the ecosystem, causing a variety of problems such as a lack of oxygen needed for fish and shellfish to survive. Eggs and larvae of fish, like all other higher organisms are particularly susceptible to toxic substance (Köprücü and Aydın, 2004).

Destruction at this stage of development has fast effect on the size of fish population although adult fish may be tolerant to a certain level of toxicity. The number of spawned eggs and their survival rate are the most common indicators of the long-term impact of pollutants on fish reproduction (Pandey, 2000). The hatchability of eggs and survival of larvae from exposed parents may reflect both pollutant induced change in eggs structure which decrease fertilization rate and tetralogical effects resulting in deformed embryos (Köprücü and Aydın, 2004). The survival of eggs, larvae and fry which are

particularly vulnerable to pollutants have a major impact on population dynamics (Adebayo, 2004).

Therefore, this study was conducted to determine the effect of nitrate, sulphate and phosphate on *Clarias gariepinus* from fertilization to complete yolk absorption. This knowledge would help improve management of tropical fish hatcheries.

2. Materials and Methods

The eggs of *Clarias gariepinus* were obtained from the hatchery at the African Regional Aquaculture Centre (ARAC) Aluu, Port Harcourt by artificial breeding of the brood fish (Ariole and Okpokwasili, 2012c). Final maturation followed by ovulation was induced in female spawners with hormone treatment. The riped eggs were procured by stripping and milt was procured by dissection of a male donor. Few drops of milt solution were added onto the eggs and the sexual products mixed by gentle shaking of the bowl.

The fertilized eggs were distributed into 5L circular plastic tank (30cm in diameter) containing different nitrate concentrations. Nitrate solutions were made by dilutions of a stock solution of sodium nitrate (NaNO_3) to final concentrations ranging from 0.05 to 700mg/L. Each concentration had three replicates. The fertilized eggs were also distributed into 5L circular plastic tank (30cm in diameter) containing water at different sulphate concentrations. Sulphate solutions were made by dilutions of a stock solution of sodium sulphate (Na_2SO_4) to final concentration ranging from 5-1000mg/L. Each concentration had three replicates. The fertilized eggs were, again, also distributed into 5L circular plastic tank (30cm in diameter) containing different concentrations of phosphate. Phosphate solutions were made by dilutions of a stock solution of potassium dihydrogen orthophosphate (KH_2PO_4) to final concentrations ranging from 5 to 500mg/L. The dilution water was used as control. Each concentration had three replicates.

The tap water base (dilution water) analyzed according to the method given by APHA (1998) had a pH of 6.5, total alkalinity of 9.0mg/L, total hardness of 10mg/L, sulphate concentration of 0.00mg/L, nitrate concentration of 0.02mg/L and phosphate concentration of 0.00mg/L. No phenolphthalein alkalinity was found. The initial number of fertilized eggs in each tank was noted (Tables 1, 3 and 5). The dead eggs and larvae were removed with forceps and the percentage survival calculated (Tables 1, 3, and 5). The duration of incubation time (from fertilization to first hatch) was recorded for each nitrate and sulphate concentration. The hatched eggs were counted and the percentage determined based on the total hatched larvae.

During larval rearing, incubation remnants, dead larvae and waste matter were siphoned off everyday to avoid any form of stress and 50% of the water in each tank was replaced. Three developmental periods were defined - the egg period, the hatching period and the yolk-sac period. The egg period began from the time of placement and ended when the eggs began to hatch. The hatching period began when the first eggs hatched and ended when all eggs had hatched. The yolk-sac period extended from the end of the hatching period until the yolk-sacs of the fry were absorbed (yolk-sac absorption was determined visually). The percentage survival of eggs and larvae at the end of each developmental period were determined.

2.1. Statistical analysis

The percentage hatchability and larval survival were analyzed using one-way analysis of variance (ANOVA). Duncan's multiple range test (DMRT) was used to determine differences ($p < 0.05$) between tested groups. All statistics were performed using SPSS 10 for Windows.

3. Results Analysis

The incubation time increased from 17 hours at nitrate concentrations of 0.02-0.05mg/L to 22 hours at nitrate concentrations of 200-700mg/L (Figure 1).

The mean hatching rate decreased from 37.80% at nitrate concentration of 0.02mg/L to 15.00% at 0.5mg/L and then increased to 73.24% at 70mg/L and thereafter declined to 20.37% at nitrate concentration of 700mg/L (Figure 2). Abnormalities in the larvae were observed beyond 150mg/L and increased with increase in nitrate concentration (Figure 2).

The effect of nitrate on egg and larval survival presented in Table 1 revealed that the hatching rates of the eggs exposed to 70-150mg/L were significantly higher than those obtained from other nitrate concentrations including dilution water (0.02mg/L $\text{NO}_3^- \cdot \text{N}$).

Furthermore, the larvae exposed to nitrate concentrations other than this range (70-150mg/L) died before the end of yolk sac period. Highly significant differences were observed in hatching rates and also in larval survival at the different nitrate concentrations ($p < 0.05$) (Table 2). Hatching rate was highest (73.24%) at 70mg/L while larval survival was highest (26.09%) at 150mg/L. These data suggest that maximum normal hatching and larval survival of *Clarias gariepinus* may be anticipated if the concentration of nitrate is within the range of 70-150mg/L.

The incubation time increased from 17 hours at sulphate concentrations of 0-20mg/L to 22 hours at sulphate concentrations of 300-1000mg/L (Figure 3).

Abnormalities in the larvae were observed beyond 170mg/L and increase with increase in sulphate concentration (Figure 4).

Table 3 revealed that the larvae exposed to sulphate concentrations other than 50-130mg/L had zero percent survival and that the highest larval survival of 63.33% was recorded at 100mg/L.

The hatching rates of 80.36% and 80.90% recorded at 100mg/L and 120mg/L respectively were not significantly different, but were significantly higher than other hatching rates ($p < 0.05$) (Table 4). These results indicate that the optimum sulphate concentration for normal hatching and larval survival of *Clarias gariepinus* is about 100mg/L.

The effects of water soluble phosphate on incubation time and hatching rate presented in Figures 5 and 6 respectively revealed that phosphate concentrations of up to 80mg/L had no effect on incubation time but rather a pronounced effect on hatching rate was evident. Abnormalities in larvae were observed beyond 20mg/L and increased with increase in phosphate concentration with a maximum of 50% at 320mg/L (Figure 6). Moreover, no eggs hatched at 500mg/L and the highest larval survival of 52.17% was obtained at 20mg/L phosphate (Table 5).

Results of the analysis of variance and Duncan's multiple range test ($p < 0.05$) indicated that there were no significant difference in hatchability at 5, 10 and 20mg/L phosphate and that the hatching rate at these concentrations were significantly higher than hatchability at 0, 240 and 320mg/L (Table 6). Furthermore, there were significant differences in larval survival with the peak of 52.17% at 20mg/L phosphate (Table 6). These observations suggest that the optimal normal hatching and larval survival of *Clarias gariepinus* may be expected if the concentration of water soluble phosphate is within 5-20mg/L.

4. Discussion

The results of the effect of nitrate on survival of eggs and larvae of *Clarias gariepinus* shown in Figures 1 and 2 and Tables 1 and 2 imply that nitrate affects the suitability of water for use in *Clarias gariepinus* hatchery and that *Clarias* eggs and yolk sac larvae are sensitive to high levels of nitrate beyond 150mg/L. It has been reported that nitrate-nitrogen levels of below 90mg/L seem to have no effect on warm-water fish, but salmon and other cold-water fishes are more sensitive (EPA, 2002).

The results of the effect of sulphate on survival of eggs and larvae of *Clarias gariepinus* shown in Figures 3 and 4 and Tables 3 and 4 imply that sulphate affects the suitability of water for use in *Clarias gariepinus* hatchery and that *Clarias* eggs and larvae are sensitive to high levels of sulphate beyond 100mg/L. To protect freshwater organisms in British Columbia, water guideline of 100mg/L maximum for dissolved sulphate, measured as SO_4 , is recommended (EPD, 2000).

These results of the effect of water soluble phosphate on survival of eggs and larvae of *Clarias gariepinus* shown in Figures 5 and 6 and Tables 5 and 6 imply that *Clarias gariepinus* eggs and larvae are sensitive to high levels of phosphate and low levels of phosphate enhanced egg and larval survival. The deformed larvae were incapable of normal locomotion and survival. The deformities developed as a result of interference of phosphate in cell differentiation and morphogenesis. This effect had been demonstrated for some pesticides in Common carp (Köprücü and Aydin, 2004). High levels of phosphate are toxic to fish (Halvorson and Smolowitz, 2009) and pollutants are known to affect the metabolism of carp (*Cyprinus carpio*) at certain stages of development (Köprücü and Aydin, 2004).

All three inorganic nutrients investigated in the present study namely nitrate, sulphate and phosphate enhanced egg hatchability and larval viability of *Clarias gariepinus* at concentrations higher than the dilution water. It is possible that food reserve in the yolk was exhausted during hatching and the developing embryos perhaps utilized the nutrients from the external water medium. The uptake was presumably mediated through the permeable cell membrane by a cationic exchange mechanism. Incubation of eggs below or above the range optimal for hatching and rearing may result in malformation of the embryo. Molokwu and Okpokwasili, 2002a stated that if the incubating medium, for fresh water fish egg, has a lower ionic concentration (hypo-osmotic) than the egg, premature bursting of the egg from excessive water absorption may occur and that a hyper-osmotic medium will prevent proper swelling of the egg or even dehydrate and shrink the egg causing spinal damage to the larvae. This may be why deformities (because of spinal damage of the larvae) were observed beyond 150mg/L NaNO_3 , 170mg/L Na_2SO_4 and 20mg/L KH_2PO_4 in this study. Spinal flexures of the larvae appeared to be a common response to various environmental stresses during ontogenic development (Molokwu and Okpokwasili, 2002a).

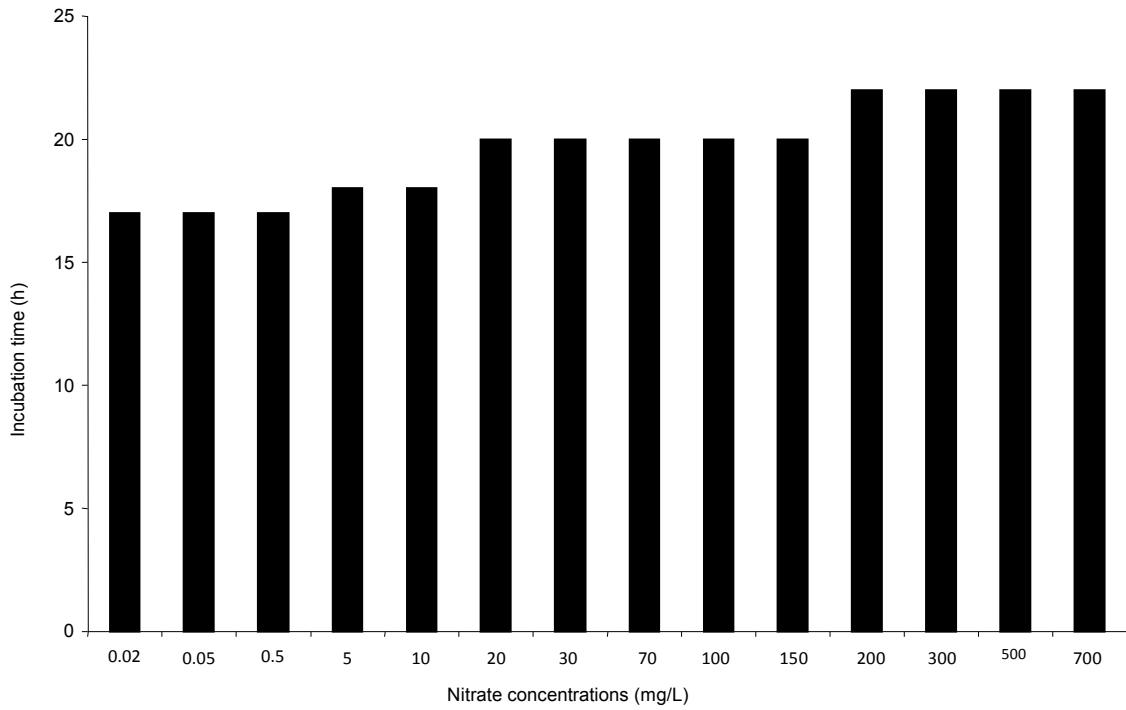


Figure 1: Incubation time to hatching of *Clarias gariepinus* eggs exposed to different nitrate concentrations

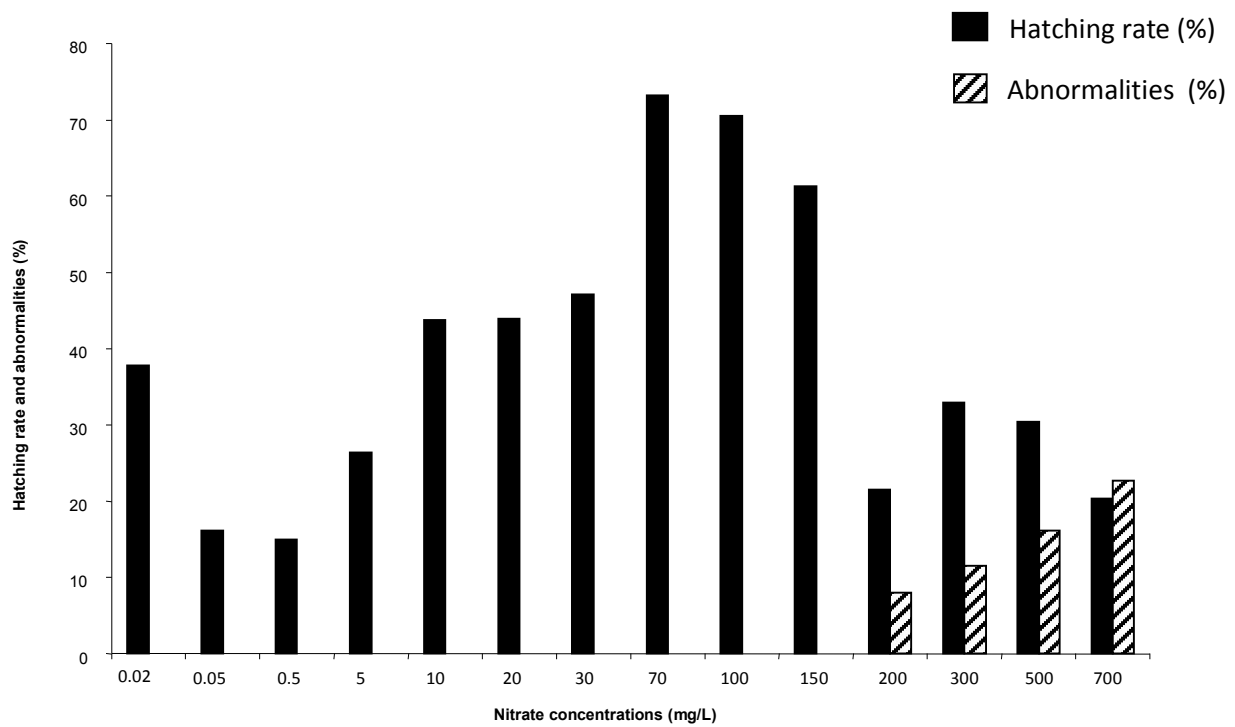


Figure 2: Hatching rate and percentage abnormalities of *Clarias gariepinus* eggs exposed to different nitrate concentrations

Table 1: Survival of *Clarias gariepinus* eggs and larvae exposed to different nitrate concentrations

Nitrate concentration (mg/L)	Egg period			Hatching period		Yolk sac period		
	Initial number of eggs	Survivors to hatching period	Egg survival (%)	Survivors to end of hatching period	Survival from end of egg period (%)	Survivors to end of yolk sac period	Survival from end of hatching period (%)	Survival from end of egg period (%)
0.02*	127	48	37.80±0.42	42	87.5±0.46			
0.05*	105	17	16.19±0.24	13	76.47±0.57			
0.5*	180	27	15.00±0.18	15	55.56±0.31			
5*	91	24	26.37±0.71	19	79.17±0.21			
10*	96	42	43.75±0.64	40	95.24±1.03			
20*	107	47	43.93±0.10	44	93.62±0.99			
30*	53	25	47.17±0.33	24	96.00±1.10			
70	71	52	73.24±0.83	52	100.00±0.0	10	19.23±0.53	18.96±0.68
100	78	55	70.51±0.58	53	96.36±0.63	10	18.87±1.12	18.18±0.76
150	75	46	61.33±0.14	46	100.00±0.0	12	26.09±1.02	26.09±0.23
200*	116	25	21.55±0.72	20	80.00±0.34			
300*	79	26	32.91±0.72	22	84.62±0.45			
500*	102	31	30.39±0.86	22	70.79±0.59			
700*	108	22	20.37±1.94	20	90.91±0.83			

*All yolk sac larva at these concentrations died before the end of yolk sac period

Table 2: Mean (±SD) comparison for *Clarias gariepinus* egg hatchability and larval survival at different nitrate concentrations

Nitrate concentrations (mg/L)	Hatchability (%)	Larval survival (%)
0.02	37.80 ^x ±0.42	0 ^x
0.05	16.19 ^m ±0.24	0 ^x
0.5	15.00 ⁿ ±0.18	0 ^x
5	26.37 ^z ±0.71	0 ^x
10	43.75 ^c ±0.64	0 ^x
20	43.93 ^c ±0.10	0 ^x
30	47.17 ^d ±0.33	0 ^x
70	73.24 ^a ±0.83	18.96 ^b ±0.68
100	70.51 ^b ±0.58	18.18 ^c ±0.76
150	61.33 ^c ±0.14	26.09 ^a ±0.23
200	21.55 ^r ±0.72	0 ^x
300	32.91 ^y ±0.72	0 ^x
500	30.39 ^y ±0.86	0 ^x
700	20.37 ^s ±1.94	0 ^x

Mean values within each column which do not have the same superscript letter are significantly different ($p < 0.05$)

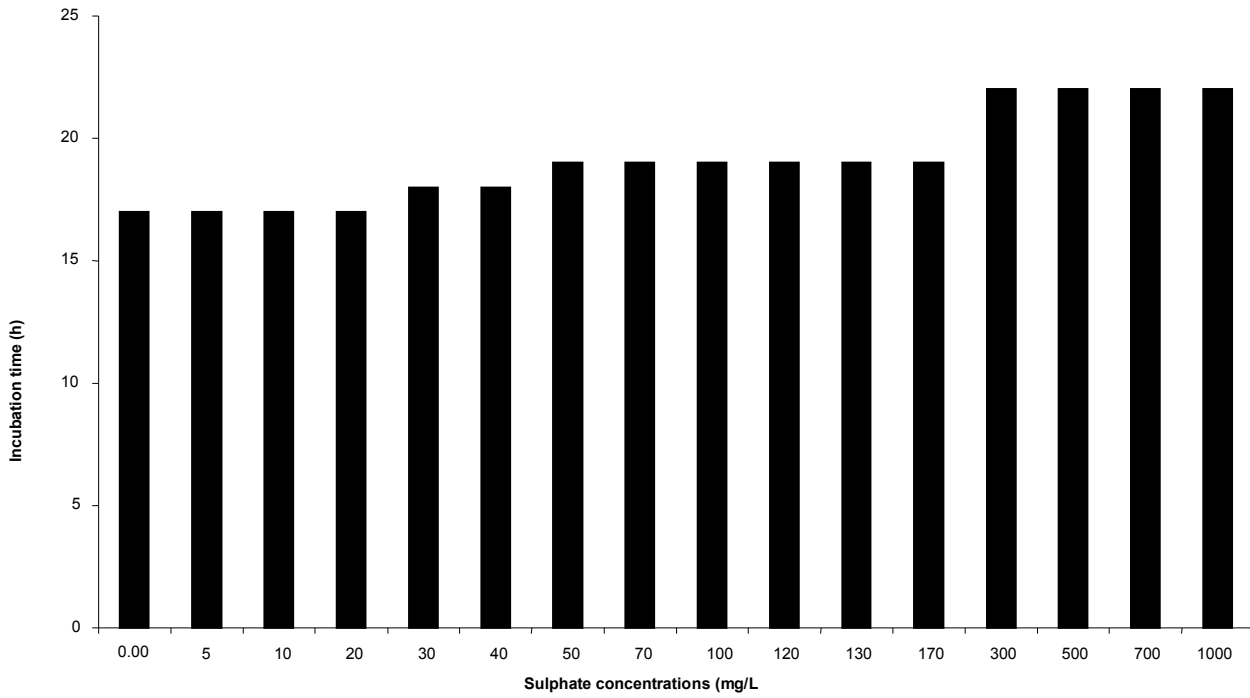


Figure 3: Incubation time to hatching of *Clarias gariepinus* eggs exposed to different sulphate concentrations

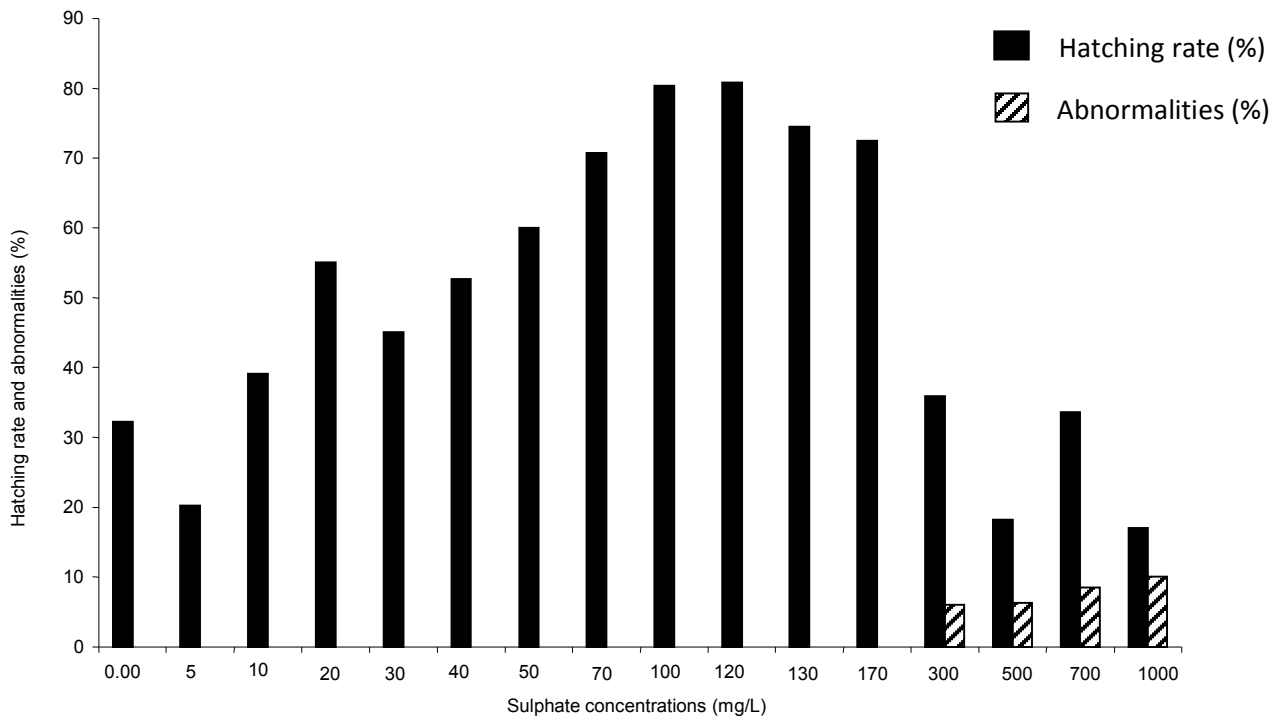


Figure 4: Hatching rate and percentage abnormalities of *Clarias gariepinus* eggs exposed to different sulphate concentrations

Table 3: Survival (mean \pm SD) of *Clarias gariepinus* eggs and larvae exposed to different sulphate concentrations

Sulphate concentrations (mg/L)	Egg period			Hatching period		Yolk sac period		
	Initial number of eggs	Survivors to hatching period	Egg survival (%)	Survivors to end of hatching period	Survival from end of egg period (%)	Survivors to end of yolk sac period	Survival from end of hatching period (%)	Survival from end of egg period (%)
0.00*	124	40	32.26 \pm 0.98	35	87.50 \pm 1.21			
5*	163	33	20.25 \pm 1.39	16	48.48 \pm 0.91			
10*	92	36	39.13 \pm 1.23	23	63.89 \pm 0.50			
20*	100	55	55.00 \pm 0.06	53	96.36 \pm 0.21			
30*	82	37	45.12 \pm 1.25	36	97.30 \pm 0.61			
40*	93	49	52.69 \pm 0.74	45	91.84 \pm 0.57			
50	95	57	60.00 \pm 0.09	53	92.98 \pm 0.31	5	9.43 \pm 0.72	8.77 \pm 0.61
70	89	63	70.79 \pm 0.58	63	100.00 \pm 0.00	5	7.94 \pm 1.23	7.94 \pm 0.51
100	112	90	80.36 \pm 0.88	86	95.56 \pm 0.72	57	66.28 \pm 1.50	63.33 \pm 1.09
120	89	72	80.90 \pm 0.28	68	94.44 \pm 1.27	23	33.82 \pm 0.91	31.94 \pm 0.14
130	94	70	74.47 \pm 0.75	70	100.00 \pm 0.00	4	5.71 \pm 0.77	5.71 \pm 0.51
170*	98	71	72.45 \pm 0.78	71	100.00 \pm 0.00			
300*	92	33	35.87 \pm 0.20	25	75.76 \pm 0.42			
500*	88	16	18.18 \pm 2.89	13	81.25 \pm 0.47			
700*	140	47	33.57 \pm 0.76	41	87.23 \pm 0.38			
1000*	118	20	16.95 \pm 0.50	17	85.00 \pm 0.29			

*All yolk sac larvae at these concentrations died before the end of yolk sac period

Table 4: Mean (\pm SD) comparison for *Clarias gariepinus* egg hatchability and larval survival at different sulphate concentrations

Sulphate concentrations (mg/L)	Hatchability (%)	Larval survival (%)
0	32.26 \pm 0.98	0 ^x
5	20.25 ^p \pm 1.39	0 ^x
10	39.13 ^v \pm 1.23	0 ^x
20	55.00 ^z \pm 0.06	0 ^x
30	45.12 ^z \pm 1.25	0 ^x
40	52.69 ^y \pm 0.74	0 ^x
50	60.00 ^c \pm 0.09	8.77 ^c \pm 0.61
70	70.79 ^d \pm 0.58	7.94 ^c \pm 0.51
100	80.36 ^a \pm 0.88	63.33 ^a \pm 1.09
120	80.90 ^a \pm 0.28	31.94 ^b \pm 0.14
130	74.47 ^b \pm 0.75	5.71 ^d \pm 0.51
170	72.45 ^c \pm 0.78	0 ^x
300	35.87 ^f \pm 0.20	0 ^x
500	18.18 ⁿ \pm 2.89	0 ^x
700	33.57 ^s \pm 0.76	0 ^x
1000	16.95 ^m \pm 0.50	0 ^x

Mean values within each column which do not have the same superscript letter are significantly different ($p < 0.05$)

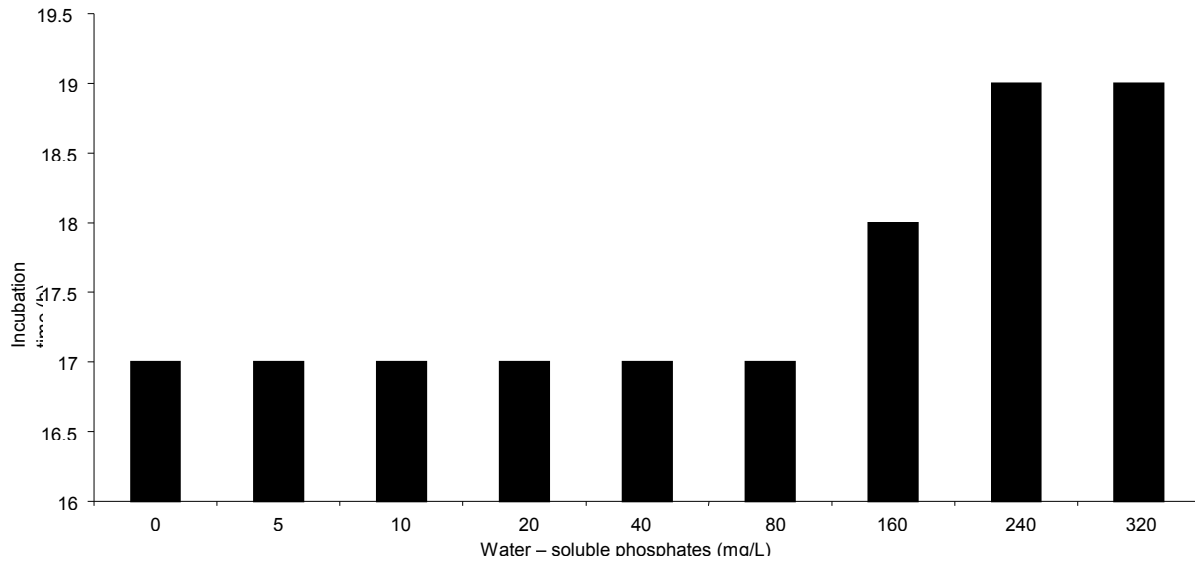


Figure 5: Incubation time to hatching of *Clarias gariepinus* eggs exposed to different levels of water soluble phosphate

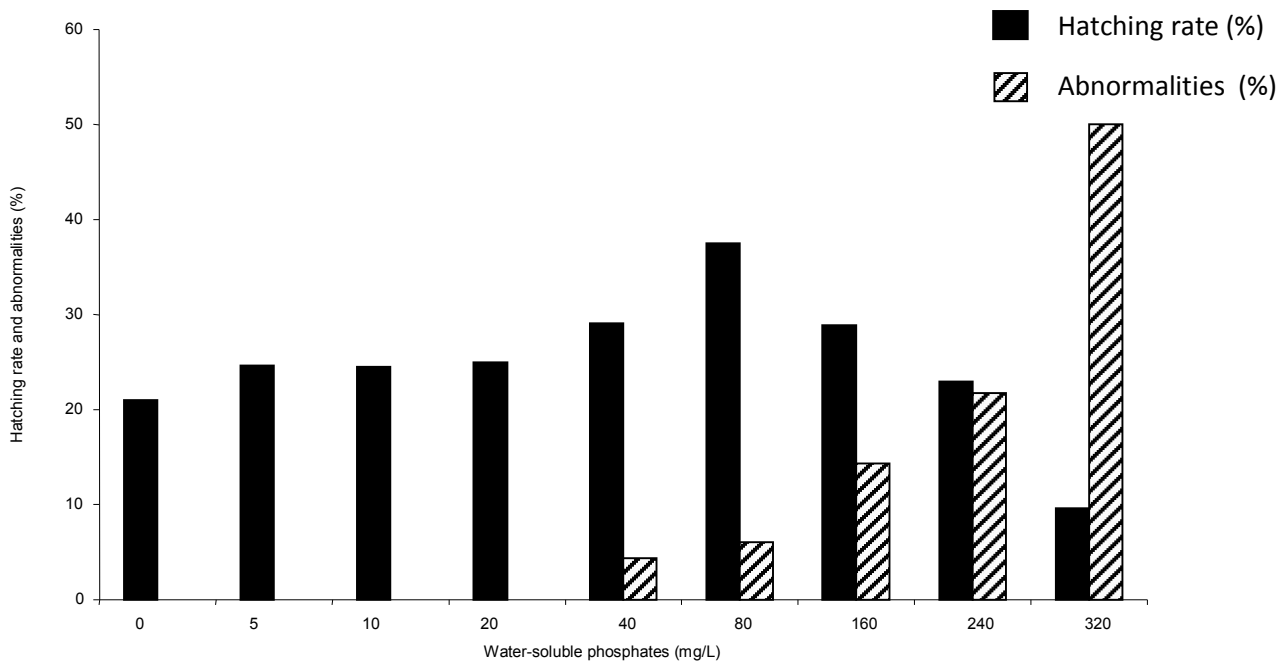


Figure 6: Hatching rate and percentage abnormalities of *Clarias gariepinus* eggs exposed to different levels of water-soluble phosphate

Table 5: Survival (mean \pm SD) of *Clarias gariepinus* eggs and larvae exposed to different water- soluble phosphate

Water - soluble phosphate concentration (mg/L)	Egg period			Hatching period		Yolk sac period		
	Initial number of eggs	Survivors to hatching period	Egg survival (%)	Survivors to end of hatching period	Survival from end of egg period (%)	Survivors to end of yolk sac period	Survival from end of hatching period (%)	Survival from end of egg period (%)
0	81	17	20.99 \pm 1.06	13	76.47 \pm 1.02	4	30.76 \pm 0.61	23.55 \pm 0.64
5	65	16	24.62 \pm 0.54	13	81.25 \pm 1.10	5	38.46 \pm 0.91	31.25 \pm 0.81
10	102	25	24.51 \pm 0.14	20	80.00 \pm 0.20	10	50.00 \pm 0.13	40.00 \pm 0.37
20	92	23	25.00 \pm 0.10	23	100.00 \pm 0.00	12	52.17 \pm 0.24	52.17 \pm 0.47
40	79	23	29.11 \pm 1.29	17	73.91 \pm 0.70	3	17.64 \pm 0.36	13.04 \pm 0.18
80	88	33	37.50 \pm 0.92	29	87.88 \pm 0.17	3	10.34 \pm 0.78	9.09 \pm 0.20
160* ¹	97	28	28.87 \pm 0.23	21	75.00 \pm 0.28			
240* ¹	100	23	23.0 \pm 0.07	10	43.48 \pm 0.49			
320* ²	104	10	9.62 \pm 0.54					
500	68	0						

No eggs hatched at 500mg/L

*¹ = All yolk sac larvae at these concentrations died before the end of yolk sac period

*² = All yolk sac larvae at this concentration died before the end of hatching period

Table 6: Mean (\pm SD) comparison for *Clarias gariepinus* egg hatchability and larval survival at different levels of water- soluble phosphate

Water-soluble phosphates (mg/L)	Hatchability (%)	Larval survival (%)
0	20.99 ^c \pm 1.06	23.55 ^d \pm 0.64
5	24.62 ^c \pm 0.54	31.25 ^c \pm 0.81
10	24.51 ^c \pm 0.14	40.00 ^b \pm 0.37
20	25.00 ^c \pm 0.10	52.17 ^a \pm 0.47
40	29.11 ^b \pm 1.29	13.04 ^e \pm 0.18
80	37.50 ^a \pm 0.92	9.09 ^x \pm 0.20
160	28.87 ^b \pm 0.23	0 ^y
240	23.00 ^d \pm 0.07	0 ^y
320	9.62 ^x \pm 0.54	0 ^y

Mean values within each column which do not have the same superscript letter are significantly different ($p < 0.05$)

In conclusion, favourable and unfavourable nitrate, sulphate and phosphate levels for the embryonic development and survival of *Clarias gariepinus* were observed. The data suggest that the optimal normal hatching and larval survival of *Clarias gariepinus* may be expected if the concentration of nitrate is within the range of 70-150mg/L while that of sulphate is about 100mg/L and water-soluble phosphate is within 5-20mg/L during artificial propagation in the hatchery.

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Adjustment Problem Of Male And Female Students At Plus Two Level

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ABSTRACT: The present study was conducted to assess the adjustment problem of male and female adolescent student at plus two level, the random technique was used to select the sample from various educational higher secondary institutions Kashmir. The total number of adolescent was 400 out of which 200 were boys and 200 were girls. The D.N. Srivastava and Govind Tiwari adjustment inventory was used for the collection of data. Statistical method –mean, S.D, t test was applied to analyze the data. The result revealed that there is no significant difference between male and female adolescents on different dimensions of adjustment.

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Key words: adjustment problems, male adolescents, female adolescents

INTRODUCTION

Adjustment is a process of reducing strains and coping with the circumstances in any situation, we adjust when we cannot change the conditions to suit our needs or demands. Adjustment therefore, occurs in various conditions and situations like family, emotional, social and workplace.

The relationship which is established among the biological heritage or organism, the environment, and the personality is adjustment. The term adjustment refers to a harmonious relationship between the persons and the environment. The degree of harmony depends upon two things i) certain potentialities within a person, ii) characteristic of the environment. A person is said to be adjusted when he is reasonably happy, efficient and has a degree of social feeling. In simple words, adjustment is an all-inclusive team meaning relationship between an individual and his environment through which his needs are satisfied in accordance with social demands. Life may be looked as long series of adjustment in which the individual is constantly adjusting himself to the demands of external environment as well as both needs of his physiological and mental constitution. The adjustment that he makes are not always healthy, sound or effective from the point of view of his life long welfare, but they are made as they seem at the moment to satisfy some his needs. Thus the process by which the individual maintains a level of psychological and physiological balance between his needs and the circumstances that influence the satisfaction may be termed as adjustment. The adjustment thus means that characteristic way in

which individual perceives reacts to and satisfied the major needs of his life.

Need and importance

Since adjustment has a profound effect on the overall behavior of an individual whether boy or girl, The present study will focus on the home, educational, social, emotional dimensions of adjustment of boys and girls at plus two level. The findings can be used as inputs for deriving intervention, strategies so that boys and girls at plus two levels are better adjusted to their environment.

OBJECTIVES OF THE STUDY

- 1) To compare boys and girls of plus two level on 'home dimension'.
- 2) To compare boys and girls of plus two level on 'social dimension'.
- 3) To compare boys and girls of plus two level on 'emotional dimension'.
- 4) To compare boys and girls of plus two level on 'educational' dimension'.
- 5) To compare boys and girls of plus two level on total dimension of adjustment.

HYPOTHESIS

- 1) There would be significant mean difference between boys and girls of plus two level on 'home' adjustment.
- 2) There would be significant mean difference between boys and girls of plus two level on 'social' adjustment.
- 3) There would be significant mean difference between boys and girls of plus two level on 'educational' adjustment.

- 4) There would be significant mean difference between boys and girls of plus two level on 'emotional' adjustment.
- 5) There would be significant mean difference between boys and girls of plus two level in aggregate.

Operational definition of terms and variables Adjustment

For the purpose of present investigation adjustment is operationally defined as the scores that investigator derived by the administration of D.N Srivastava and Govinda Tiwari Adjustment inventory, which has four dimensions related to home, social, educational and emotional.

SAMPLE

The sample was drawn from the different higher secondary institutions of Kashmir. The present

study was conducted upon 400 plus two level students. Among these 200 students were boys and 200 were girls. For the selection of the sample normal random procedure was adopted. The age range of the subjects was from 17 to 18 years.

DATA GATHERING TOOL:-

D.N srivastava and Govinda Tiwari Adjustment inventory was used to gather the data. This inventory provides four measures of adjustment viz home, social emotional and educational. This inventory consisted of 80 questions in terms of 'yes' or 'No'.

STATISTICAL ANALYSIS:-

The data was subjected to 't' test and for establishing the adjustment problems of students the collected information was properly arranged into the following tables.

Table 1.0: Showing the significance of mean difference between the boys and girls at plus two level on 'Home' dimension of adjustment.

Group	N	Mean	S.D	t. value	Level of significance
Boys	200	12.67	2.87	0.025	Not significant
Girls	200	12.66	2.83		

Table -1.1 Showing the significance of mean difference between the boys and girls at plus two level on 'social' dimension of adjustment.

Group	N	Mean	S.D	t. value	Level of significance
Boys	200	12.59	2.98	1.90	Not significant
Girls	200	11.86	2.43		

Table -1.2. Showing the significance of mean difference between the boys and girls at plus two level on 'emotional' dimension of adjustment.

Group	N	Mean	S.D	t. value	Level of significance
Boys	200	13.3	3.38	1.17	Not significant
Girls	200	12.78	2.84		

Table -1.3. Showing the significance of mean difference between the boys and girls at plus two level on educational dimension of adjustment.

Group	N	Mean	S.D	t. value	Level of significance
Boys	200	13.45	2.97	0.26	Not significant
Girls	200	13.55	3.36		

Table -1.4. Showing the significance of mean difference between the boys and girls at plus two level on 'total' dimension of adjustment.

Group	N	Mean	S.D	t. value	Level of significance
Boys	200	52.01	9.63	0.86	Not significant
Girls	200	50.85	9.40		

Discussion and interpretation

The perusal of table 1.0 shows the significance of mean difference between boys and girls of plus two level on 'Home' dimension of adjustment. Since the calculated 't' value (0.025) is less than tabulated value at 0.01 and 0.05 level of significance. So the above table reveals that there is no significant difference between boys and girls of Plus two level on 'home' dimension. So the hypothesis no. 1 stands rejected.

The perusal of table 1.1 shows the significance of mean difference between boys and girls of plus two levels on 'Social' dimension of adjustment. Since the calculated 't' value (1.90) is less than tabulated value at 0.01 and 0.05 level of significance. So the above table reveals that there is no difference between boys and girls of plus two level on social dimension. So the hypothesis no. 2 stands rejected.

The perusal of table 1.2 shows the significance of mean difference between boys and girls of plus two level on 'emotional' dimension of adjustment. Since the calculated 't' value (1.17) is less than tabulated (t) value at 0.05 and 0.01 level of significance. Therefore the above table reveals that there is no significant difference between boys and girls of plus-two level on emotional dimension of adjustment. So the hypothesis no. 3 stands rejected.

The perusal of table 1.3 shows the significance of mean difference between boys and girls of plus two level on 'emotional' dimension of adjustment. Since the calculated value (0.26) is less than tabulated (t) value at 0.05 and 0.01 level of significance. Therefore the above table reveals that there is no significant difference between boys and girls of plus-two level on educational dimension of adjustment. So the hypothesis no. 4 stands rejected.

The perusal of table 1.4 shows the significance of mean difference between boys and girls of plus two level on 'total' dimension of adjustment. Since the calculated value (0.86) is less than tabulated (t) value at 0.01 and 0.05 level of significance. Therefore the above table reveals that there is no significant difference between boys and girls of plus-two level on total dimension of adjustment. So the hypothesis no. 5 stands rejected.

Conclusion

Various conclusion have been drawn from the inferences which emanated from the intensive investigation of the present study, these are listed as under:

- 1) No significant difference was found between boys and girls of plus two level on 'home' dimension.
- 2) No significant difference was found between boys and girls of plus two level on 'social' dimension.
- 3) No significant difference was found between boys and girls of plus two level on 'emotional' dimension.
- 4) No significant difference was found between boys and girls of plus two level on 'educational' dimension.
- 5) No significant difference was found between boys and girls of plus two level on 'dimension' dimension.

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Modernization of Male & Female Higher Secondary School Students - A Comparative Study

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Abstract: Modernization is understood as a process which indicates the adoption of modern ways of life and values. It is a process which changed the society from primarily agricultural to industrial economy. It is an attempt on the part of people particularly those who are custom - bound, to adopt themselves to the present time conditions, styles and ways in general. It indicates a change in people's preferences, ideas, values, speaking styles etc. The present study examined the modernization of male and female higher secondary school students. The sample of the study consisted 60 higher secondary school students i.e. 30 male and 30 female students. Modernization of students was measured using R.S Singh's Modernization Scale (RSSMS). Results indicated that male higher secondary school students have significantly higher mean scores in terms of modernization. Males have more freedom in marriage, politics and employment than females.

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Keywords: Socio religious, Marriage, Position of woman, Education

Introduction

In the last decades there have been sweeping changes due to modernization that has affected every country in the world. Modernization is a process by which historically evolved institutions are adapted to the rapidly changing functions that reflect the unprecedented increase in man's knowledge, permitting control over his environment that accompanied the scientific revolution. Modernization is a comprehensive concept aimed at capturing, describing and evaluating profound qualitative and quantitative change in society. It describes the transition of a society from medieval to modern culture. It stands for progress beyond tradition. It is a process of movement from traditional and quasi-traditional to certain desired type of technology and the resultant changes in the social structure, value orientations, motivations, achievements and aspirations. It means a value change, significant institutional modifications and improvement of standards of performance and

achievement. It involves the substitution of old images and forms with new ones.

Modernization is not a synonym of westernization, which loosely may mean uncritical imitation of the social ways and values prevailing in a western country. Modernization is for discriminate selection between what is worthy and what is unsuitable in a particular situation. Modernization can be described as the process of development in almost every aspect of human life i.e. scientific, technological, economic, environmental, educational and social fields.

Modernization has two major aspects, firstly there is a system of thought and values with reference to which an individual directs or orients his activities and secondly, a system of institutions through which he carries out his activities. Both the aspects influence the behavior of an individual with respect to his self- esteem and social system.

Need and Importance

It is a well known fact that we are in the era of modernization. The process of modernization has a great impact on individual and society. Modernization includes reason and rationalism, secularism, high aspiration and achievement orientation, over-all transformation of attitudes, norms and values, an open society and mobile person. Modernization is the building of an “open society” in which individual talent, enterprise and training can find places in the society appropriate to their achievement. The process of modernization involves appropriate change in the social system to meet the rising expectation of the people. Modernization entails social change which leads to progress in many fields.

Due to modernization old social and psychological elements are transformed and new values of human conduct are setup. With the acceleration in the speed of social change the status of individuals and families undergo change.

Realizing the great importance of modernization in the society and the role which the young generation is supposed to play in strengthening social order the present study was undertaken.

Objectives of the Study

The following objectives have been formulated for the present study.

- 1) To study modernization of male and female higher secondary school students.
- 2) To compare male and female higher secondary school students on ‘socio – religious’ dimension of modernization.
- 3) To compare male and female higher secondary school students on ‘marriage’ dimension of modernization.
- 4) To compare male and female higher secondary school students on ‘position of woman’ dimension of modernization.
- 5) To compare male and female higher secondary school students on ‘education’ dimension of modernization.

- 6) To compare male and female higher secondary school students on ‘over-all’ dimensions of modernization.

Hypothesis

The following hypothesis have been formulated:-

- 1) There is a significant difference between male and female higher secondary school students on ‘socio- religious’ dimension of modernization.
- 2) There is a significant difference between male and female higher secondary school students on ‘marriage’ dimension of modernization.
- 3) There is a significant difference between male and female higher secondary school students on ‘position of woman’ dimension of modernization.
- 4) There is a significant difference between male and female higher secondary school students on ‘education’ dimension of modernization.
- 5) There is a significant difference between male and female higher secondary school students on ‘over-all’ dimension of modernization.

Method and Procedure

Sample

30 male and 30 female higher secondary school students were taken as sample for the present study. The sample was taken from 11th and 12th class students of district Kupwara (J&K). In order to select the sample of students from various higher secondary schools random sampling technique was adopted.

Procedure

The data was collected with the help of R.S Singh’s Modernization Scale (RSSMS). The scale was administered to the sample subjects in the respective institutions. The investigator visited various higher secondary institutions in order to collect the data for the present study. The scoring was strictly done as per the manual of the test.

Statistical Treatment

The data was analyzed by applying “t” test for testing the difference between male and female higher secondary school students on various dimension of modernization.

Analysis and Interpretation of Data:-

The data collected through the administration of R.S Singh’s Modernization Scale (RSSMS) was statistically analyzed by applying “t” test. The analysis and interpretation of data have been arranged in a tabular form in the following manner.

Table 1.0: Mean comparison of male and female higher secondary school students on socio-religious dimension of modernization. (No = 30 in each group)

Group	Mean	SD	‘t’ value	Level of significance
Male	24.40	4.49	0.27	Insignificant
Female	23.40	3.61		

Table 1.0 shows the mean comparison of male and female higher secondary school students on socio-religious dimension of modernization. The table reveals that male and female higher secondary school students do not differ significantly on socio-religious dimension of modernization. The table further reveals that

both the groups are similar on socio-religious dimension of modernization. Therefore, hypothesis numbers one, which read as “Male and female higher secondary school students differ significantly on socio religious dimension of modernization” stands rejected.

Table 2.0: Mean comparison of male and female higher secondary school students on ‘Marriage’ dimension of modernization. (N=30in each group)

Group	Mean	SD	‘t’ value	Level of significance
Male	24.80	1.16	2.80	Significant at 0.01 level
Female	23.40	2.60		

Table 2.0 indicates the mean comparison of male and female higher secondary school students on ‘Marriage’ dimension of modernization. The table reveals that male and female higher secondary school students differ significantly at 0.01 level on ‘Marriage’ dimension of modernization. The

table further reveals that male higher secondary school students have better freedom in marriage than female higher secondary school students. Therefore, hypothesis number two, which reads as “Male and female higher secondary school students differ significantly on ‘Marriage’ dimension of modernization” stands accepted.

Table 3.0: Mean comparison of male and female higher secondary school students on ‘Position of Women’ dimension of modernization. (N = 30 in each Group)

Group	Mean	SD	‘t’ Value	Level of Significance
Male	32.80	2.92	10.57	Significant at 0.01 level
Female	25.40	2.57		

Table 3.0 mentions the mean comparison of male and female higher secondary school students on ‘Position of

women’ of dimension of modernization. The table reveals that male and female higher secondary school students differ significantly at

0.01 level on position of woman dimension of modernization .It is evident from the table that the female higher secondary students are not given equal freedom in status and employment as are given to male higher secondary school

students. Therefore, hypothesis number three, which reads as “Male and female higher secondary school students differ significantly on position of women dimension of modernization” stands accepted.

Table 4.0: Mean comparison of male and female higher secondary school students on ‘Education’ dimension of modernization. (N=30 in each group)

Group	Mean	SD	‘t’ Value	Level of Significance
Male	25.60	4.22	0.76	Insignificant
Female	26.40	3.92		

Table 4.0 depicts the mean comparison of male and female higher secondary school students on ‘Education’ dimension of modernization. The table reveals that male and female higher secondary school students do not differ significantly on the scores obtained on ‘Education’ dimension of modernization. The

table further indicates that both the groups have freedom in terms of imparting education. Therefore, hypothesis number four, which reads as “Male and female higher secondary school students differ significantly on ‘Education’ dimension of modernization” stands rejected.

Table 5.0: Mean comparison of male and female higher secondary school students on “over–all” scores of modernization. (N=30 in each group)

Group	Mean	SD	‘t’ Value	Level of Significance
Male	107.60	3.55	2.83	significant at 0.01 level
Female	103.20	5.84		

Table 5.0 mentions the mean comparison of male and female higher secondary school students on ‘over–all’ dimension of modernization. The table reveals that male and female higher secondary school students differ significantly at 0.01 level on the over-all scores of modernization. The table further indicates that male higher secondary school students have better freedom in socio-religious and marriage dimension of modernization than female higher secondary school student. Therefore, hypothesis number five, which reads as “Male and female higher secondary school students differ significantly on “over-all” dimension of modernization” stands accepted.

Conclusions

On the basis of statistical analysis and interpretation of data the following conclusions have been drawn.

1. The male and female higher secondary students have similar socio-religious freedom.
2. The male have more freedom in marriage than female.
3. The females are not given equal status in politics and employment as are given to males.
4. The male and female have equal freedom in imparting education.
5. On the basis of over-all scores of modernization male higher secondary school students have better freedom than female higher secondary school students.

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Adjustment of Science and Social Science Higher Secondary School Teachers - A Comparative Study

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Abstract: Adjustment implies the process by which a person changes his behavior to achieve a harmonious relationship between himself and his environment. The adjustment of the teacher in his/her profession involves not only a continuous effort to understand children better, but also constant self appraisal, in which the teacher carefully scrutinizes method of increasing his own learning. A teacher who matures professionally is not only better able to diagnose and meet his own needs, but also sets a worthwhile example of growth and learning for the students with whom he works. The present study has been designed in order to compare the adjustment of science and social science higher secondary school teachers. Sample includes 100 higher secondary school teachers i.e. 50 science and 50 social science teachers. For obtaining the data Bell's Adjustment Inventory was used. The findings of the study showed that the social science teachers have more adjustment problems than science teachers.

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Key words: Home adjustment, health adjustment, social adjustment, emotional adjustment, occupational adjustment.

Introduction

Adjustment is the process by which a living organism maintains a balance between its needs and the circumstances that influence the satisfaction of these needs. The process of adjustment has two main elements: One the need of the living organism and two, the conditions or circumstances that influence these needs. These needs can be bio-genic, originating in society, personal or communal, or arising from any other conceivable source. On the other hand, the circumstances influencing these needs also can either be inside the individual or outside him. Factors that influence these needs are his physical and mental states, capacity, attitudes, interests etc.

Life may be looked as a long series of adjustment in which the individual is constantly adjusting himself to the demands of external environment as well as both needs of his physiological and mental constitutions. The adjustment that he makes are not always healthy, sound or effective from the point of view of his life long welfare, but they are made as they seem at the moment to satisfy some of the needs. Thus the process by which the

individual maintains a level of psychological and physiological balance between his needs and the circumstances that influence the satisfaction may be termed as adjustment.

Adjustment is that variety of behavior which includes visual exploration, grasping, crawling walking, attention and perception, language and thought, curiosity and manipulation of the environment. It is a part of the process by means of which a person learns to interact effectively with the environment and develops competence to change or control the environment for his own needs.

Adjustment processes concerning human being have hand in glove relationship with human nature. It is adjustment which is responsible for the organization of behavior to life situations at home, at school and at work. We are deeply influenced by adjustment whether it is good or bad. Besides what is in our culture may be bad in another culture. But throughout the world it has been the constant attempt of man to adjust him with the changing circumstances. However, the concept of adjustment has attracted the attention of psychologist. They agree that a well adjusted

person is very much in need because he is the one whose needs and satisfaction of life, are integrated with the sense of social feelings and acceptance of social responsibility.

In fact, adjustment has much in common in meaning and usage with the terms like theoretical, economic, aesthetic, social, political and religious values implied in several departments of human activity. Against their common usage, the two terms are more technically used in psychology and their socio-cultural disciplines and more substantial relationship between the two are empirically sought.

Progress in learning to make adjustments to actual situations involve dealing directly with one's own problems. The six year old has to make his own childish adjustments today, so that ten years hence he will be better able to make other more or less related adjustments peculiar to adolescence.

The adjustment thus, is the characteristic way in which an individual perceives, reacts to and satisfies the major needs of his life or solves the main problems of his life. The improvement of the teacher's own socio-emotional adjustment is an essential aspect of preparation for helping learners in their personal adjustment problems.

Needs and importance

The individual's adjustment can best be assessed by his achievements, the satisfaction he derives from the pattern of his life and the effect his adjustment has on his personality. The success with which the individual adjusts to the problems of life has an effect on his self-concept. The more successfully he adjusts the more favorable his self-concept will be.

The present study is an endeavor to study the adjustment problems of the teachers that stand in their way and also to make out the basic cause which have been operative in the creation of these tendencies in them. The various investigations and researches conducted by the psychologists and educationists clearly indicate that teachers are confronted with adjustment problems. The different factors which influence the quality of education and its contribution to national development, the quality, competence, personality and character of teachers are undoubtedly the most significant. Nothing is more important than securing a sufficient supply

of high quality recruits to the teaching profession, providing them with the best possible professional preparation and creating satisfactory conditions of work in which they can be fully effective. The problems of personality adjustment being a burning problem at present needs immediate attention.

Since adjustment has a profound effect on the over-all behaviors of an individual (whether male or female) it was decided to study the adjustment problems of the science and social science higher secondary school teachers. Personality adjustment of a teacher is the reflection of his inner and outer character.

Objectives of the study

The following objectives have been formulated for the present study:

1. To study the adjustment of science and social science higher secondary school teachers.
2. To compare science and social science higher secondary school teachers on home adjustment.
3. To compare science and social science higher secondary school teachers on health adjustment.
4. To compare science and social science higher secondary school teachers on social adjustment.
5. To compare science and social science higher secondary school teachers on emotional adjustment.
6. To compare science and social science higher secondary school teachers on occupational adjustment.

Hypothesis

The following hypothesis have been formulated for the present study.

1. Science and social science higher secondary school teachers differ significantly on home adjustment.
2. Science and social science higher secondary school teachers differ significantly on health adjustment.
3. Science and social science higher secondary school teachers differ significantly on social adjustment.
4. Science and social science higher secondary school teachers differ significantly on emotional adjustment.

5. Science and social science higher secondary school teachers differ significantly on occupational adjustment.
6. Science and social science higher secondary school teachers differ significantly on over-all adjustment.

Methods and Procedure

Sample

The present study was conducted upon 100 higher secondary school teachers (50 science and 50 social science streams). The sample was taken randomly from various higher secondary institutions in district Srinagar.

Procedure

The data was collected with the help of Bell's Adjustment Inventory (Adult form). The Inventory was administered to the sample subjects in the respective institutions. The investigator visited various higher secondary

institutions in order to collect the data for the present study. The scoring was strictly done as per the manual of the test.

Statistical Treatment

The data collected through the administration of Bell's Adjustment Inventory (Adult form) was statistically analyzed by applying "t" test for testing the difference between science and social science higher secondary school teachers on various dimensions of adjustment.

Analysis and interpretation

The data collected through the administration of Bell's Adjustment Inventory (Adult form) was statistically analyzed by applying "t" test. The analysis and interpretation of data have been arranged in a tabular form in the following manner.

Table 1.0: Mean comparison of science and social science higher secondary school teachers on home adjustment. (N= 50 in each group)

Group	Mean	SD	"t" value	Level of Significance
Science Teacher	7.00	1.35	0.19	Insignificant
Social Science Teacher	6.95	1.27		

Table 1.0 shows the mean comparison of science and social science teachers on home adjustment. The table reveals that science and social science teachers do not differ significantly on home adjustment. The table further reveals that both the groups are similar on home

adjustment. Therefore, hypothesis number one, which reads as "Science and social science higher secondary school teachers differ significantly on home adjustment" stands rejected.

Table 2.0: Mean comparison of science and social science higher secondary school teachers on health adjustment. (N= 50 in each group)

Group	Mean	SD	"t" value	Level of Significance
Science Teacher	7.00	1.42	3.67	Significant at 0.01 level
Social Science Teacher	8.20	1.84		

Table 2.0 depicts the mean comparison of science and social science higher secondary school teachers on health adjustment. The table indicates that science and social science higher secondary school teachers differ significantly at 0.01 level on health adjustment. The table further indicates that social science teachers

have more problems related to health than science teachers. Therefore, hypothesis number two, which reads as "Science and social science higher secondary school teachers differ significantly on health adjustment" stands accepted.

Table 3.0: Mean comparison of science and social science higher secondary school teachers on social adjustment. (N=50 in each group)

Group	Mean	SD	“t” value	Level of significance
Science Teacher	8.70	1.78	8.69	Significant at 0.01 level
Social Science Teacher	12.10	2.13		

Table 3.0 mentions mean comparison of science and social science higher secondary school teachers on social adjustment. It is clear from the table that science and social science higher secondary school teachers differ significantly at 0.01 level on social adjustment. The table further reveals that social science

teachers have more social problems than science teachers. Therefore, hypothesis number three, which reads as “Science and social science higher secondary school teachers differ significantly on social adjustment” stands accepted.

Table 4.0: Mean comparison of science and social science higher secondary school teachers on emotional adjustment. (N = 50 in each group)

Group	Mean	SD	“t” value	Level of significance
Science Teacher	10.15	2.13	4.30	Significant at 0.01 level
Social Science Teacher	11.9	1.96		

Table 4.0 indicates the mean comparison of science and social science teachers on emotional adjustment. The table reveals that science and social science higher secondary school teachers differ significantly at 0.01 level on emotional adjustment. It further

indicates that social science teachers have more emotional problems than science teachers. Therefore, hypothesis number four, which reads as “Science and social science higher secondary school teachers differ significantly on emotional adjustment” stands accepted.

Table 5.0: Mean comparison of science and social science teachers on occupational adjustment. (N= 50 in each group)

Group	Mean	SD	“t” value	Level of significance
Science Teacher	5.50	1.01	8.07	Significant at 0.01 level
Social Science Teacher	7.30	1.23		

Table 5.0 shows the mean comparison of science and social science teachers on occupational adjustment. The table reveals that science and social science teachers differ significantly at 0.01 level on occupational adjustment. The table further reveals that social

science teachers have more occupational problems than science teachers. Therefore, hypothesis number five, which reads as “Science and social science higher secondary school teachers differ significantly on occupational adjustment” stands accepted.

Table 6.0: Mean comparison of science and social science teachers on over-all adjustment. (N= 50 in each group)

Group	Mean	SD	“t” value	Level of significance
Science Teacher	39.35	5.46	9.92	Significant at 0.01 level
Social Science Teacher	45.25	6.49		

Table 6.0 depicts mean comparison of science and social science teachers on over-all adjustment. It is clear from the table, that both the groups differ significantly at 0.01 level. It

further indicates that social science teachers have more over-all problems as compared to social science teachers. Therefore, hypothesis number six, which reads as “Science and social

science higher secondary school teachers differ significantly on over-all scores of adjustment” stands accepted.

Conclusion

On the basis of the statistical analysis and interpretation of data the following conclusions have been drawn:

1. The higher secondary school science and social science teachers have similar home adjustment.
2. The science teachers have better health adjustment than social science teachers.
3. The science teachers have better social adjustment and find it easy to make friendly contact with other persons on social occasions in comparison with social science teachers.
4. The science teachers have better emotional adjustment than social science teachers.
5. The social science teachers have more adjustment problems while science teachers have adequate opportunities to express their own ideas in their present job.

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The Relationship between Job Satisfaction and Remuneration in Pakistan: Higher Education Institutes Perspectives

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Abstract: Empirical research has identified the various factors which affect the employees regarding their job satisfaction from the intrinsic and extrinsic aspects but limited work is done on the knowledge workers in this regard in the developing countries like Pakistan. A university teacher imparts training at the highest level in knowledge category however, factors influencing his/her satisfaction levels are not little known. An attempt has been made to relate the impact of job satisfaction with regard to benefits and salary of a university faculty member of Pakistan based on higher education universities. The result shows that there is a positive relationship exists between job satisfaction and pay of knowledge workers. This research is an attempt to undertake and analyze all those important aspects that improve the satisfaction level of teachers in the universities and promote learning culture. Pay is one of the most important and basic determinant of the job satisfaction of university teachers in Pakistan.

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Key words: Job Satisfaction; Compensations; Pay Performance; Rewards; Working Environment; Organizational HR Practices; Pakistan.

1. Introduction

In countries like Pakistan, the class involved in transferring and sharing of knowledge are called teachers. In both public and private sectors, teachers are employed through contractual contracts and in government sector on permanent basis. The induction process is well worked out and candidates have to go through different stages of tests and interviews, then accordingly selected candidates are offered packages depending on the qualification and experience. Higher Education Commission (HEC) has helped in improving the standards of education for the colleges and university faculties in terms of higher salaries depending upon the universities profile whom they completed their final degree but this does not apply same for domestic universities faculties. Therefore, grievances against the job satisfaction exist in the faculty members in these prestigious institutions. In numerous studies of social sciences, salary impact on the workers' characteristics and job satisfaction has been found, so an attempt is made to gauge the impact and relationship between these two human resource variables.

Two-Factor theory of Herzberg is an interesting theory that highlights both academic and realistic implications of job satisfaction. It states that dissatisfied workers are more concerned about "conditions that surround the job" such as prevailing working environment, job security, pay, quality of supervision, called as hygiene factors (Herzberg et al., 1959, p.113). If employees are satisfied with their job, organization

output and efficiency will improve and turnover of employees will decrease.

Salary, reward or remuneration is defined as the compensation in lieu of the services rendered by the employee. It is always compared in relation to the timings on periodic basis. Pay or salary is an acknowledgement and regarded as reward to motivate and improve the workers behavior towards the goals set by the employer (Oshagbemi, 2000). Although there are many social factors important for enhancing the efficacy but salary impact is most potent and effective. The pleasure and satisfaction one derives from pay is important for life, as dissatisfaction leads to decreased interest in work and motivation. The objective of this study is to around the well debated question in the academia i.e., whether pay satisfaction positively influence employment, enthusiasm and routine, and it further lead to decrease in turnovers in academics. The current study seeks the answer in higher education institutes of Pakistan. The study is divided in to following sections i.e., after introduction which is discussed in Section 1 above. Section 2 shows the review of literature. Data and methodological framework is shown in Section 3. Results are discussed in Section 4. Final section concludes the study.

2. Literature Review

Human resource and rewards are well debated issues in academia arena. However, this debate is ignored in higher education institutes perspectives. Frye (2004) studied the link between salary and job

satisfaction and found a constructive relationship between them. Experience reveals that pay strategies have a positive impact on the performance (Ichniowski et al., 1997). Tasema & Soeters (2006) established a positive relationship between compensation practices and job satisfaction. The studies on employee's job satisfaction started almost a hundred years ago. In 1911, Taylor worked on employee's job duties (Taylor, 1911) and after seven years. Edward Thorndike worked on examining the association between job satisfaction and work and in 1918 he has published his work in the *Journal of Applied Psychology*. These studies brought out influencing job satisfaction factors. Studies on Job satisfaction continued to evolve and findings brought out humanistic and financial benefits. The fact is when employee is satisfied; he/she cares more about quality and organization (Bravendam Research Incorporated, 2002).

Majority of social scientists considered salary as an important factor which may influence on job satisfaction. Pay satisfaction variable is associated with outcomes of the organization significant in nature. Empirical evidence exists regarding the dissatisfaction of employees regarding pay which ultimately lead to decreased performance, motivation & job satisfaction and increased turnover, absenteeism and other problems related to pay e.g. lawsuits etc. (Huber & Crandall, 1994; Gerhart & Milkovich, 1990; Milkovich & Newman, 2002; Cable & Judge, 1994; Nisar et al., 2012; Huselid, 1995).

While Werther & Davis (1993) has explored that Job satisfaction depends upon the matching of rewards with the expectations of employees from the employer and other factors like desires, wishes and needs of the employees. Tasnim (2006) has conducted research in Bangladesh to find out the factors which affect the job satisfaction of female teachers and found that status and low salary greatly affected the female teachers in performing their duties. Okerlund et al., (1995) found that direct benefit of job is the Salary and an important motivating factor. If salary is not up to the expectations of the employees and less attractive then it can greatly affect the teachers regardless of gender. Relationship between the fringe benefits, salaries of employees and job satisfaction is found positive and strong. Schlechty and Vance (1983) suggested that the main reasons for the most academicians for quitting jobs are curtailed salary scales and lesser salaries of employees.

An essential purpose of job is to earn sufficient salary to sustain a good life. It is very natural that a handsome salary brings satisfaction and teachers have consensus on it. According to a Bangladeshi study (Tasnim, 2006), lower salary cannot help in bringing job satisfaction as it is not consistent with socio-economic conditions. Salary should be sufficient to cope up with the social standing and culture and cover the living cost.

If salary can not meet the living cost then teacher has to look for other earnings and would not be able to focus on job. Bennell (2004) analyzed teachers regarding status, work and pay and found that they are dissatisfied about their low status, pay and work. These arguments and findings from the literature review strengthen the assumption about close and positive association of University teachers with their job satisfaction.

As quality education in universities is deemed important for the growth of individuals on the one hand and development of the society on the other. Increase in economic reward is considered as one of the important tools to motivate the employee in any organization. Pakistani government has taken initiatives to enhance the quality of education in both private and public sector universities through Higher Education Commission. Various economic incentives (best teacher award, publication incentives, tenure track system, research grants) have been introduced by the Higher Education Commission for enhancing the education standards but still a huge proportion of university teachers are not highly qualified and working under old basic pay scale system. The pertinent question arises whether university teachers working under basic pay scale are satisfied with their pays or not? Satisfaction or dissatisfaction with the level of pay affect their overall satisfaction with job and influence their performance towards quality of education. The teachers less satisfied with their salaries are considered to be dissatisfied with their jobs in that they may teach in private educational institutions to raise their earnings at the cost of the quality of the education. In order to examine the satisfaction level of teachers regarding their pay, a study was held in University of the Punjab (Nisar et al., 2012). The aim of the study was to explore the relationship between job satisfaction and pay satisfaction of university teachers. A sample of 200 respondents, consisting of male and female, contractual and permanent was collected for this research work. The results showed that 47 percent were having medium level of pay satisfaction, followed by 35 percent that were having low level of pay satisfaction and only 18 percent were having high pay satisfaction.

In another research conducted in the Universities of Rawalpindi and Islamabad region in this regard (Bilal, 2012). Study focused on evaluation of the impact of compensation and other conditions related to workplace on the teaching staff of the university in context with their job satisfaction. The results indicate strong interrelation between salary and job satisfaction among teachers. Nguyen et al. (2003) found that relationship between pay satisfaction and Job satisfaction studies have tested that job satisfaction very much depends on the income. The workers are very much concerned about the payment schemes of the firms and guide their interests accordingly (Heywood and Wei, 2006).

Both human resource development and rewards are an important issue in academia arena, therefore, this study examines the relationship between Job Satisfaction and Remuneration on Higher Education Institutes of Pakistan.

3. Analysis and Discussion

In Pakistan University teaching is one of the most important aspects of knowledge sharing and imparting quality education. University teachers are hired on both contractual basis as well as permanent basis. Both motivation and job satisfaction are very important for the teaching faculty in discharging their duties and delivering knowledge in University environment besides other working conditions. Pay, Incentives, Compensation and other reward structures of the universities play an important role in satisfying the university teachers as well as motivating them to work efficiently. The working conditions affect both the male and female teachers regardless of their genders. Pay is one of the major and regular sources of earning for most of the university teachers in fulfilling their needs thus describing a direct, significant relationship with the job satisfaction.

Higher salaries result in high motivation for the university teachers and lower salary packages becomes de-motivating factors for the faculty members. Job satisfaction of the university teachers relies on their pay packages and other intrinsic and extrinsic reward strategies and structures of the Pakistani Universities. If employees especially University teachers are not satisfied with their pay then it would be a great cause of de-motivation, decreased performance, increased turnover absenteeism. Dissatisfied employees of the university would add problems for the universities and may indulge in litigation and lawsuits besides creating a dissatisfied environment for the rest of their colleagues.

Some of the findings are mentioned below:

1. In Pakistan, University teachers have a significant and positive relationship with the reward structure and Pay in context with their job satisfaction.

2. Pakistan is an emerging economy where social, economic, legal and political factors have severely impacted the working environment and lives of employees of the organizations. To sustain and fulfill a normal life, a better salary package for the teachers of the universities is imperative and essential.

3. Extrinsic Rewards are very important in improving and increasing the satisfaction level of the teachers of both genders at university level faculty in Pakistan.

4. Female and male faculty members have different variables of job satisfaction. The factors which count in the satisfaction of male faculty members are the rewards which are extrinsic in nature, commitment with organization and factor of equity and fair play. Whereas,

female faculty staff although give equal preference to extrinsic rewards but relationship among the staff, diversity embracement also affects the job satisfaction. It is found from the results however that teachers have extrinsic rewards as common indicators for job satisfaction in universities at Pakistan regardless of their gender.

5. HEC (Higher Education Commission) Pakistan has played an important role in offering lucrative pay packages to the university faculty in the form of Tenure track system, best teacher award, publication incentives, research grants etc. thus contributing magnanimously in enhancing and improving the job satisfaction level of the teachers of the Pakistani Universities.

6. Universities must take keen interest in devising the pay strategies for their teachers and give due consideration to the Pay Packages at par with HEC as it is one of the major satisfier for their faculty in performing their job effectively.

4. Conclusion

A major association exists between the pay of university teachers and their job satisfaction in Pakistan. The social needs if not fulfilled definitely hamper the efficiency and performance of the teachers, not satisfied with pay structure. The findings of the study clearly reflect that In Pakistani universities, the job satisfaction of teachers is very closely related to their pay satisfaction. Universities must give due consideration to these aspects while designing the compensation and reward strategies for its teachers. Universities should devise and offer attractive and lucrative pay packages to its teachers at par with HEC (Higher Education Commission) of Pakistan.

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Brief review on socioeconomic impacts and control challenges of Human African and Animal Trypanosomiasis in South Sudan

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Abstract: Human and animal African trypanosomiasis had been reported in South Sudan since 1909. Socio-economic impacts and control challenges of human and animal African trypanosomiasis in South Sudan were reviewed to elucidate episode of HAT and AAT impeding production and productivity. Foci of both tsetse transmitted diseases are still active in South Sudan. This is due to epidemic outbreaks from active foci in neighboring countries as a result of widespread distribution of the vectors and political upheavals, social instability and civil disturbance. Sleeping sickness caused the local population living in the sleeping sickness-endemic areas to lose their cattle; contributed to poverty in those foci. The infected individuals are mentally hampered. Challenges to control programmes leading to inadequate knowledge of the disease symptoms and signs, transmission dynamic and treatment at the individual level; massive population movements; lack of funds by stakeholders, role players and partners in controlling the disease. The risk of infection is increased by agricultural developments which increased human-fly contact. Regular active surveillance including active case detection and treatment is the backbone for the strategy of sleeping sickness control.

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Keywords: South Sudan; Socio-economic impacts; control challenges; Human and Animal African Trypanosomiasis.

Tsetse transmitted human African trypanosomiasis (HAT), or sleeping sickness caused by *Trypanosoma brucei gambiense* is responsible for the chronic form of HAT in West and Central Africa where the main vectors are *Glossina species* of the *palpalis* group (Hoare, 1972). A full description of sleeping-sickness in the Sudan /South Sudan has been given by (Moris, 1961 ;Bloss,1969).

The only form of the disease present is that due to *T.b. gambiense* and this has been confined to a comparatively narrow belt of the country along the southern border of the then Equatoria Province, adjacent to Uganda, the Congo, and the Central African Republic.

At the present, , tsetse flies occur in the extreme South Sudan, along the Nile-Congo watershed, involving the upper parts of the tributaries of the Nile, both *G. palpalis* and *G. morsitans* are prevalent and cattle are absent. Other tsetse-fly species are present in localized areas but are of less importance. The situation is complicated by the activities of tabanids acting as mechanical transmitters of animal trypanosomes in the grazing areas outside the tsetse-fly belt. A small pocket of *G. morsitans* in the Nubian mountains has now been eliminated. The interrelation of the present tsetse-fly distribution and the prevalence of mechanical transmission in the southern grazing areas and the prevalence of *T. evansi* in camels have been well shown (Buxton ,1955) .

The present paper reviews the distribution of Sleeping sickness, the socio-economic impacts of the disease, factors that led to the failure of HAT and AAT and control Programmes in South Sudan.

At the beginning of the last century, sleeping sickness was perceived by the colonial powers as the most important public health problem in Africa. Huge epidemics devastated large areas of the continent. In the then Sudan cases of the disease were identified in Raga, Yei, Kajokeji, Nimule ,Tambura and Yambio since 1909, 1910, 1914, 1915, 1918 and 1924, respectively. However, all the aforementioned foci are still active and all epidemic outbreaks in those regions were attributed to the presence of active foci in neighboring countries, particularly those where tribal settlements straddled the borders; widespread distribution of the vectors; and political upheavals, instability and civil disturbance (Duku ,1979).

In 1946 Yambio became the centre of the new Zande Development Scheme (ZDS), this resulted in a massive movement of people to settle in high density in Yambio where numerous *Glossina palpalis* infested streams existed. As no control of this fly attempted, the contact between the densely settled population and the fly became easier, provided ideal conditions under which the epidemic arose (Morris, 1960). The administrative changes in 1954-55 which led to the revolt in Southern Sudan had caused the breakdown of

the well-established sleeping-sickness inspection and control.

The Yambio outbreak then arose with alarming suddenness and in contrast to a previous slow increase, reaching 871 cases in 1957. In the 1960s, the prevalence of sleeping sickness was successfully reduced in all endemic countries to less than 0.1%, through historic campaigns by the former colonial powers. Soon after independence, however, national governments were either lacking in resources or had diverted resources to other pressing health problems. Breakdown of specialized mobile teams and health facilities in several countries, as a consequence of war and civil strife or change in health policy, resulted in dramatic resurgence of African trypanosomiasis, the distribution of which corresponds closely with that of major conflicts in sub-Saharan Africa.

However, some control measures were made possible through external assistance from WHO and the Government of the Kingdom of Belgium between 1974 and 1978, which led to availability of information on the disease epidemiology (Scientific working group Report, 2001).

After a resurgence of the disease in the late 1970s in the then provinces of Western and Eastern Equatoria, a bilateral Belgian Sudanese trypanosomiasis treatment and control programme was implemented. This effort brought the disease under relatively good control within a few years. However, the trypanosomiasis programme collapsed in 1990 during the civil war. In 1997, it became evident that sleeping sickness was staging a comeback. After the American International Medical Corps (IMC) observed a progressive increase in passively detected cases in Tambura County, South Sudan, a population-based prevalence survey documented epidemic levels of trypanosomiasis in the south-western part of the county bordering Central African Republic (CAR) and Democratic Republic of the Congo-DRC (Moore *et al.*, 1999). Consequently, 19.4% of the population was seroreactive to Card Agglutination Test for Trypanosomiasis (CATT) (Magnus *et al.*, 1978) and 13% of the population had confirmed infection based on a single parasitological examination.

In 1998, the most active focus of trypanosomiasis identified in Western Equatoria was Ibba, in Maridi County, with a confirmed infection prevalence of 29%. Other areas with epidemic disease were Kajo Keji (5.1%) and several sites including Ezo, 13.6%; Source Yubu, 6.4%; Mupoi, 5.4%. In late 1999, 20 months after a cycle of Active Case Detection (ACD) had been conducted in Tambura County, repeat screening in several areas showed that the prevalence of confirmed infection had declined dramatically. Despite an influx of new infections among Sudanese

refugees repatriated from DRC, trypanosomiasis prevalence decreased in Ezo from 13.6 to 3.1% and in Source Yubu from 6.4 to 1.6%. The current resurgence of trypanosomiasis is not confined to Western Equatoria or to South Sudan. Epidemic levels of the disease are also present in adjacent areas of CAR and DRC. Bazigbiri, a village in CAR approximately 75 km from the South Sudan border, was nearly too depopulated by sleeping sickness in 1995 (J. Jannin, personal communication).

The close link between agriculture and (HAT) is well illustrated by events in the then Sudan. The start of the Yambio outbreak in 1946 coincided with this town becoming the centre of the new Zande Development Scheme (ZDS), in which a formerly scattered population was settled at a fairly high density in country intersected by numerous *G. palpalis*-infested streams. No control of this fly was attempted as it was considered impracticable. The resulting situation, of a heavy population in intimate contact with the vector, provided ideal conditions under which the epidemic then arose.

The effect on livestock not only reduces the availability of meat and dairy produce, but most particularly denies the use of cattle and horses for transport and traction. For agricultural communities, this means that only small areas can be tilled by hand, leaving the communities vulnerable to food shortages, starvation, and famine. Studies conducted by Govereh (1999) had indicated that if draught animals were available, a family currently dependent on manual labour alone could increase its income from agricultural work by 45% per unit of land, and 143% per unit of labour (FAO, 2000). Steelman (1976) and FAO (1994) estimated that for the whole of Africa, overall agricultural losses attributable to trypanosomiasis would total more than US\$ 4 billion annually which is in line with Budd (1999), who estimated that agricultural benefits accruing to tsetse elimination could reach US\$ 4.5 billion per annum.

The Yambio incident is but one among a number of instances elsewhere in Africa in which agricultural developments, without regard to the risks arising from increased contact with *tsetse*, have provoked epidemics of *T. gambiense* (Morris, 1960). Conversely, agricultural development, properly handled, can be the most successful and economic method of reclaiming land from tsetse fly. The first step must be an attack upon the vector species to the point of their elimination. When *G. palpalis* is the vector, as in the Sudan, the terrain it occupies is usually the most fertile and well watered. Consequently the land gained from the fly can be fully developed, for agriculture, livestock, and often fishery. A dual purpose is thus served: justifying the expense of tsetse-fly eradication, and stabilizing the

control. A stable form of control obviates the need for maintenance, which often in the long run proves even more costly than the initial reclamation. Since tsetse fly eradication removes at once the danger of HAT and AAT, a follow-up with full agricultural development, including mixed farming, is possible, and the eventual benefits to the economy as well as to the health of the country are immense.

Livestock trypanosomosis is an important constraint to livestock productivity in sub-Saharan Africa (Swallow, 1998). It has adverse effects on rural development over vast areas (Holmes, 1997). Unfortunately, the pattern of contact between haematophagous insects, such as tsetse flies, and their hosts is extremely heterogenous and non-random (Kelly, 2001). As a result, some host species are challenged substantially more than others and may contribute more to parasite transmission (Woolhouse *et al.*, 1997).

Animal trypanosomiasis is of tremendous importance to the then Sudan; not only does it affect the distribution of cattle, but it has also strongly affected the distribution and even the habits of the main tribes (Lewis, 1949). In the then Bahr el Ghazal and Equatoria Provinces, the disease is so severe that cattle are almost completely absent in the areas occupied by *G. morsitans*. Trypanosomiasis sets such a limit to the raising of stock as to give rise to serious protein deficiency in the diet of many of the people (Tohill, 1948). It is on the fringe of these fly-belts that animal trypanosomiasis chiefly flourishes, largely in the herds of cattle driven from the fly-free open grass plains into the fly-infested savannah woodland for dry-season grazing. Infected cattle (also game, which are important reservoirs) carry trypanosomiasis back with them into the wet-season grazing areas, where tabanids are so numerous as to set up widespread epizootics, transmission being entirely mechanical. These outbreaks reach such severity that, in 1946-47, one-and-a-half million cattle were affected in an area of over 100 000 square miles (260 000 km²). Most herds were infected, many losing more than half their beasts. At one time the death-rate exceeded 10 000 cattle in a month.

In South Sudan, the main sleeping sickness outbreaks are along the Congo-Nile watershed brings forestry interests under consideration. One of the most important functions of a forest being protection of the soil and prevention of run-off on such catchment areas. Hence, tsetse control method by bush-clearing is not desirable under this circumstance. It seems that, a chemoprophylaxis or the removal of tsetse fly by spraying with insecticides or trapping may be preferable (Morris, 1962).

Control of sleeping sickness relies on detection of the parasite and effective treatment of the patient.

Routine diagnosis of the disease is based on direct visualization of the parasite in blood, lymph node aspirates and cerebrospinal fluids (CSF) using a microscope (Van Meirvenne, 1999). This method has limited sensitivity due to fluctuating parasitaemia. In efforts to improve detection of trypanosomes, a number of diagnostic methods have been developed, including the mini-anion exchange centrifugation technique (AECT) (Lumsden *et al.*, 1979), polymerase chain reaction (PCR) (Welburn *et al.*, 2001; Gibson *et al.*, 2002; Radwanska *et al.*, 2002; Jamonneau *et al.*, 2003) and recently, a dipstick test has been evaluated (Deborggraeve *et al.*, 2006). Despite these advances, diagnosis of HAT remains unsatisfactory. The PCR-based tests have good sensitivity. However, the need for precision instruments and elaborate visualization methods are obstacles to their wide application in clinical settings in Africa. Consequently, diagnosis of HAT involves a combination of parameters, such as origin of the patient, symptoms, demonstration of parasites by microscopy, or detection of specific antibodies using the Card Agglutination Test for Trypanosomiasis (Magnus *et al.*, 1978). The paucity of definitive tests means that some patients go undetected and therefore become potential sources of infection to other people.

Significant resurgence of the disease has occurred in recent years in South Sudan and new foci of the disease have emerged. The persistence and resurgence of sleeping sickness is attributable to a number of factors which constitutes challenges for control. Means for regular surveillance are often inadequate, while at individual and family levels, there may be inadequate knowledge of disease symptoms, transmission dynamics and treatment. Population movement due to seasonal migration and refugees, may increase human-fly contact and hinder regular medical surveillance of the population at risk.

Regular medical surveillance of the population in the endemic areas, involving case detection and periodic population screening and treatment, and tsetse fly control, where applicable, is the backbone of the strategy for control of sleeping sickness (WHO, 1998). With available tools, control is a continuing effort rather than eradication.

Ministries of health, research organizations and services often lack or do not have adequate economic resources for sleeping sickness control programme due to competing health priorities. Recruitment of medium-level personnel is inhibited by lack of incentives and care prospects. Ministries may lack funds for the purchase of diagnostic tests and drugs.

Central governments often accord sleeping sickness a low priority, until it assumes epidemic proportion.

However, historically, social upheaval has been a contributing factor in outbreaks of trypanosomiasis. Trypanosomiasis control activities are particularly vulnerable to collapse in settings of civil strife. Furthermore, social disruption often leads to population movements and altered relationships of humans with tsetse habitat. The situation in South Sudan suggests that the civil war was associated with a collapse of the public health infrastructure, resulting in this epidemic of trypanosomiasis.

Never-the-less, obtaining adequate resources to maintain active surveillance in *T. b. gambiense*-endemic areas and to reestablish abandoned control programmes will remain a challenge. The current cost of implementing these programmes is insignificant compared with the future cost of delayed interventions to contain this expanding epidemic.

This review shades light on the evidence for inequities in trypanosomiasis infection status, epidemiologically relevant living conditions, and access to health care in the studied population.

The resurgence and persistence of the disease in South Sudan might have been attributed to the fact that the South is bordered by countries with still active sleeping sickness foci and especially in the presences of the disease vectors that are moving between the South and these countries. The situation was worsened by the lack of adequate funds by the Ministry of Health to control the disease and the fact that the Central Government gave no priority to Sleeping Sickness Control Programme in its list of emergency and urgency.

These findings make emphases on the need for more equitable and efficient trypanosomiasis control interventions, which may contribute to poverty alleviation. No or little progress has been made in research investigating into the role of socioeconomic factors and the broader socioeconomic environment in the transmission and spread of trypanosomiasis in South Sudan and highlights several additional areas that might benefit from such studies:

- I. Continuous monitoring of the Tsetse fly in the endemic areas is necessary to determine its population dynamic and factors favoring and disfavoring its growth.
- II. Public awareness of the population at risk on the symptoms and some important clinical signs of the disease.
- III. Periodical examination of the natives for the presence of the parasites in their blood.
- IV. There is a need for capacity building for research and control of Human HAT through strengthening laboratory diagnostic capacities and research centers, training scientists and encouraging networking.

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An Investigation on Auditing History

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Abstract: Audit history have including topics that its place in accounting had very limited and had deficit attention or neglecting. Even in this era, especially in recent decades that significant progress in all aspects of audited occurred it is also clearly visible. So far shouts comprehensive is not available about details emerging thoughts on various subjects and describe the technical aspects of this view. This article is investigated the part of the history of this science, that intertwined with the history of human civilization.

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Keywords: Audit history; accounting; deficit attention; science, human civilization

Introduction

Auditors have been around for a long time. As long as there has been civilization, there has been a need for some type of record-keeping to apply answerability. In fact, it was the need to keep discs of possession of quantities of commodities that led to the growth of writing and arithmetic. The first number representation system and the first written words were modernized as symbols to keep track of ware either taken in as taxations or used in trade(1).

It was centuries later that literature and arithmetic evolved on an individual basis, way far from this primary responsibility application. As an example, the primary proto-Greek written script, Linear B, was basically developed for keeping records of business transactions and palace inventories in urban center Greece in 1400–1300 B.C. It absolutely was solely in 800–700 B.C. that an additional evolved orthography was accustomed record a number of the earliest works of Western literature, the epic poem and also the Odyssey. By then in Greece writing had evolved to the purpose of recording outstanding deeds and social events and not simply industrial transactions. Similarly, accounting and measure evolved into additional abstract arithmetic. This pattern of the gradual evolution of writing had been seen in several even earlier civilizations, beginning with the Sumerians (3000 B.C.), the Egyptians (2500 B.C.), the primary river civilization (2500 B.C.) and also the begin of the Xia sept in China (2300 B.C.).

Auditing attended the event of accounting, and therefore the initial recorded auditors were the spies of King Darius of ancient Persia (522 to 486 B.C.)(2). These auditors acted as “the King’s ears” checking on the behaviour of provincial satraps. The word auditor comes from the Latin word “to hear” as a result of in times of yore auditors listened to the oral reports of accountable officers (stewards) to house owners or those having authority, and confirmed the accuracy of the reports. Over the centuries this role of auditors as verifiers of official reports evolved to incorporate that of substantiating written records. By 1500 A.D. bookkeeping had evolved to the purpose of being documented by Luca Pacioli of Italia within the initial illustrious book on accounting. Pacioli conjointly counseled that the accounting records be verified by auditors. By the first nineteenth century auditors acting as freelance outside consultants were oftentimes called upon to research and report on business failures or to settle business disputes(1,2).

Independence may be a key characteristic of the auditor that we are going to discuss in some detail throughout this book. For currently consider it as conditions necessary to get associate objective appraisal of the topic matter under consideration. If the auditor showed any bias in his or her investigation, or even if there was just the suspicion of bias, the effectiveness of the auditor’s report would be greatly reduced.

Modern auditing began in 1844 once British Parliament passed the Joint Stock Companies Act, that for the primary time needed that company administrators report back to shareholders via associate audited finances, the record. In 1844 the auditor was required to be neither associate comptroller nor freelance, however in 1900 a brand new corporations Act was passed that needed associate freelance auditor.

The first public accountants' organization was the Society of Accountants in Edinburgh, organized in 1854, and European nation and England became the leaders in establishing the fashionable accounting profession. As a results of British lead, the primary North yankee association of accountants, later to become the Institute of hired Accountants of Ontario, was organized in 1879 in Toronto. The Quebec Order became the primary lawfully incorporated accounting association in North America in 1880. The Canadian Institute of hired Accountants (CICA) began beneath federal incorporation laws in 1902, and also the Certified General Accountants Association of North American country was incorporated by associate Act of Parliament in 1913(3).

Following British precedents, the primary legislation requiring audits in Canada was the Ontario companies Act of 1907. This was followed by the Federal Corporation Act of 1917. till 1930 Canadian follow followed Brits model, specializing in the procedures that were followed to method a group action (transaction oriented); these procedures mostly relied on internal proof.

After the 1929 stock exchange crash and also the economic crisis of the Thirties, Canadian apply was more and more influenced by developments within the us. U.S. apply had evolved since the late nineteenth century towards a method of assembling proof on assets and liabilities or what's oftentimes cited as a record audit. As a results of in depth dishonest money coverage that contributed to the stock exchange crash of 1929 and also the world depression of the Thirties, the U.S. passed legislation in 1933 and 1934 that greatly influenced auditing round the world. The U.S. Securities Acts of 1933 and 1934 created the Securities and Exchange Commission (SEC), that regulated the main stock exchanges in the us. firms want to trade shares on the big apple exchange or the yankee exchange were needed to issue audited financial gain statements additionally as balance

sheets. additionally, attributable to the sooner issues with dishonest money reports of the Nineteen Twenties, the stress switched to fairness of presentation of those money statements, and also the auditor's role was to verify the fairness of presentation(3).

In 1941, as a results of expertise within the McKesson and Robbin's fraud case (discussed in Chapter 5), the SEC counseled references to "generally accepted audit standards (GAAS)" within the auditor's report and mandated additional in depth reliance on external proof.

This created a necessity to raised outline audit standards and objectives. This method was begun in 1948 by the american Institute of Certified Public Accountants (AICPA).(3)

Auditing History in Iran

Auditing did not spring to life in Iran as a result of changes in the country's economy. Neither the development of limited companies nor the functioning of capital market created the need for auditing. Instead, the idea of auditing first came to light in the Income Tax Law of 1949. The idea of controlling revenues and expenditures was the result of a constitutional Revolution in Iran. The Certified Public Accountants Association was established according to the Direct Tax Law in 1963. The Center of Iranian Official Accountants was established according to the Direct Tax Law in 1966. Moreover, many other laws and regulations have been found which are related to auditing functions and institutions such as the Tehran Stock Exchange Law that requires companies registered on the Tehran Stock Exchange (TSE) to be audited. According to the Cooperative Companies Law, auditing is required for Cooperatives too. The Iranian Expert Accountants Association was registered in 1974. This association is still operating and publishes the Monthly Journal of Accounting (4,5).

With auditing being required by a number of laws, several of the largest foreign audit firms chose the Iranian Official Accountants as their partners, established branches in Iran, and took the responsibility for auditing large companies. The presence of these firms led to a progressive flow in the accounting profession and education in Iran.

A bill, ratified by the Revolutionary Council after the Islamic revolution in Iran in 1979, confiscated

many enterprises or placed them under direct governmental supervision. To audit and perform statutory examination of these enterprises, three audit firms were established in the public sector: Nationalized Industries and Plan Organization Audit Firm (1980), Mostazafan Foundation Audit Firm (1981), Shahed Audit Firm (1983).

In 1983, an act ratified by the Iranian national parliament merged these three audit firms with the Audit Company (established in 1971 to audit government corporations) to establish the Audit Organization. The Audit Organization's by-laws were approved by Parliament in 1987 when the Organization was established as a legal entity with financial independence. It is affiliated with the Ministry of Economic Affairs and Finance and replaces the original audit firms and pursues the activities legislated in the Organization's Act and by-laws(5).

Conclusion

Iran, a nation of more than 69 million people, is situated in west Asia, in a region commonly referred to as the Middle East. Geographically, Iran's surface area is 1,648,195 km. Iran is a

country with rich resources of oil and gas and other natural reserves. Documents of ancient Iran

show that in 550 B.C. (Achaemenid era), all records of public revenues and costs were kept soundly and with remarkable accuracy. In this paper we reviewed origin, growth and development of auditing in Iran. During the last two decades, Iran's Audit Organization has taken various measures to harmonize the Iranian Accounting profession with global practices.

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A mini review on electronic commerce in IRAN

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ABSTRACT: Electronic commerce usually called e-commerce is really shopping for and commerce of product and services (Wikipedia, 2008) like on-line stock and bond transactions, the downloading and commerce of “soft merchandise” (software, documents, graphics, music, etc.), business-to-business transactions and different styles of looking over the web or different electronic networks. this text covers the present e-commerce standing in Persia, its benefits and drawbacks and ments in Persia’s banking industry needed to expand e-commerce in Iran. It conjointly covers the mental efforts that has to be done to assist e-commerce prosper in Iran.

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Key Words: Electronic commerce, Iran

INTRODUCTION

E-commerce is apace reworking the means accounting functions ar performed. Distinct as they're from typical industrial activities, electronic transactions have expose new challenges to the accounting profession. Besides, additional and additional accountants nowadays ar mistreatment data technology, be it in a job or within the observe of the profession. it's helped the fraternity of accountants to enhance the service levels and type of services to the shoppers.

Electronic commerce normally called e-commerce is truly shopping for and mercantilism of product and servic-es (Wikipedia,2008) like on-line stock and bond transactions, the downloading and mercantilism of “soft mer-chandise” (software, documents, graphics, music, etc.), business-to-business transactions and alternative kinds of looking over the net or alternative electronic networks. it's the paperless exchange of business data mistreatment electronic information interchange (EDI), e-mail, electronic bulletin boards, fax transmissions, and electronic funds transfer. It refers to web looking as an entire (businesstown, 2008). Talking regarding the thought of e-commerce we are able to say that it's all regarding mistreatment the net to try and do business higher and quicker. it's regarding giving customers controlled access to the pc systems of a corporation and property individuals serve themselves. it's regarding committing the corporate to a significant on-line effort and group action the online web site of that company with the guts of its business (businesstown, 2008). Asian country as a developing county is active some e-commerce connected activities. this text is regarding the exist-ing practices in Asian country with regard to shopping for and

mercantilism on-line. It covers the subsequent subjects:

1. Advantages and drawbacks of e-commerce
2. limitations and limits of e-commerce in Iran
3. Iran’s banking industry that supports on-line payments
4. What quite businesses will go online?
5. wherever is Persia in international e-commerce competition?
6. What opportunities will e-commerce give for Iranian business people?

LITERATURE REVIEW

E-commerce is changing into in style among the organizations these days across the globe. several surveys are created to estimate the expansion of e-commerce in varied countries.

Carr (1985) conducted a study of twenty- four organizations in U.K. The study is predicated on the responses of 344 certified accountants out of communication questionnaires to 1192 certified accountants. The study was conducted to seek out the modification that data technology is transfer to the suggests that by that organizations set up, develop and structure their additional ancient processing systems. The survey advised that the profit which could arise by giving technological support to accountants are going to be principally within the sort of time saving and improved work quality. The technology can facilitate the businessperson to hold out the observe of accounting additional effectively instead of modification the character of accounting.

PRTM, Washington, conducted Associate in Nursing e-business survey in 1999 for sales and promoting management. The survey participants enclosed executives from a crosswise of industries.

The survey found that for sixty six per cent corporations, client service was the most e-business goal. eighty five per cent of the businesses surveyed regarded e-business strategy as necessary to their promoting and sales success. seventy nine per cent expected their e-business contacts with customers via the net to make loyalty on condition that supported by different media and private interaction.

According to Webmergers.com (2001), 210 web corporations went out of the business within the year 2000. Of these, regarding sixty per cent shut look within the half-moon of the year. In December alone, around forty start-ups within the U.S. logged off permanently, cost accounting investors \$ one.5 billion, forty six dotcoms stop working in Gregorian calendar month, 2000. Nearly 15,000 folks lost their jobs thanks to the autumn out. seventy five per cent of the dotcoms that went out of business were within the B2C sector. fifty five per cent were e-commerce corporations and around thirty per cent were content providing corporations. Around thirty per cent of the shut downs came about in CA, whereas the Japanese coast of the United States of America accounted for nearly twenty per cent of the overall. regarding eleven per cent were Western European.

Pricewaterhouse Coopers (2001) conducted a study of seventy eight giant producing companies within the us. It found that solely forty per cent of enormous corporations might receive orders on-line and solely twenty eight per cent might settle for payments on-line. These corporations, however, believed that the portion of their revenue from e-commerce would jump from but five per cent to a minimum of twenty per cent by 2003.

Data from Forrester analysis, Cowles and Simba data indicates that shopper disbursement on line was solely \$ 240 million in 1994. However, it multiplied to \$ 993.4 million in 1996 and was expected to achieve \$ vi.9 billion by 2000. Of this, it absolutely was projected that thirty two per cent of the resources would be spent on pc merchandise, twenty four per cent on travel, nineteen per cent on recreation, ten per cent on getting gifts and flowers, and five per cent on shopping for attire.

Jupiter (2001) suggests that in 2005, eighty per cent of B2B transactions are going to be e-commerce transactions, accounting for a few United States of America \$ vi.3 trillion. Beantown Consulting cluster (2001) comes an increase from thirteen per cent of inter-company gross purchases (US \$ four.8 TRILLION) in 2004. whereas the figures from these 2 sources take issue, it's clear that B2B irresistibly dominates e-commerce. In fact, business analysts argue that shortly business can drop the "e" from e-commerce, as a result of group action are going to be undertaken no different approach.

A study by Cisco Systems INC. found that the net economy contributed quite \$300 billion in U.S. revenue and it absolutely was chargeable for one.2 million jobs. the yank cluster, Beantown forecasted the degree of transactions to extend from \$ 138 billion in 1999 to quite \$541 billion in 2003, a compound rate of growth of forty one per cent over 5 years.

The Thomas Register and Visa, USA conducted a survey of 3,000 getting executives operating in producing, government, construction and engineering industries. They disclosed that regarding twenty five per cent of the executives purchased between \$1,000 and \$10,000 price of products per month via the net. Moreover, eight per cent of the executives purchased quite \$10,000 price of products per month over information superhighway.

Another survey was conducted collectively by Wielson Media analysis, O'Reilly and Associates, and Georgia technical school. to see the demographics of the net user. They found that the standard user of the net had a median age within the middle 30's, with a median financial gain between \$ fifty,000 and \$60,000 and customarily had a university degree. what is more, the proportion of the feminine user multiplied chop-chop. They conjointly reportable that electronic business-to-business (B2B) market was a hundred times above the web shopper market.

According to International Technology Firm, Gartner, the amount of web users in Asia can reach 188 million by the top of 2004. this could imply Associate in Nursinging virtually five-fold increase over a five-year amount. The report expressed that China, Japan, peninsula and Bharat would be the most countries transfer sizable amount of individuals on-line. Of the expected 188 million, around ten million would be from Bharat, whereas regarding fifty one million (27 per cent) are going to be from China.

At the country level, projections for us e-commerce sales place it within the initial place, with the best sales within the world throughout the amount 2000-2004. web commerce within the us is anticipated to quantity to US\$ 488.7 billion and US\$ three.2 trillion in a pair of 2000 and 2004 severally, followed by Japan wherever electronic transactions square measure expected to extend from US\$ thirty one.9 billion in 2000 to US\$ 880.3 billion in 2004. Germany's e-commerce sales, that square measure expected to earn it third place, can quantity to US\$20.6 billion and US\$386.5 billion in 2000 and 2004, severally. These figures indicate that the 3 commerce giants square measure reaching to conduct additional and additional of their business electronically. The 2004 e-commerce sales as a share of total sales square measure expected to achieve thirteen.3 per cent within the us, 8.4 per cent in Japan and vi.5 per cent in FRG. This trend can most likely drive the remainder of the globe into

increasing their e-commerce activities. Business can most likely contend with different businesses that also are e-business, and businesses that square measure outside the electronic chain would possibly most likely be left aside. These figures ought to compel developing countries to undertake serious preparations for effective engagements in e-commerce. According to Forrester analysis INC., on-line retail sales can grow from \$172 billion in 2005 to \$329 billion in 2010. E-commerce can represent thirteen per cent of total United States of America retail sales in 2010.

Advantages of e-commerce

The following list is that the range of benefits that may be achieved victimisation e-commerce

1. Business will be conducted all day daily (marcbowles, 2008).
2. As all (or most) of the communications and fund transfers ar done electronically, the general speed of doing business is high (marcbowles, 2008).
3. victimisation e-commerce, corporations have access to world market places and do business with each different company or individual WHO is connected to the net (marcbowles, 2008).
4. There ar variant opportunities to search out the initial makers over the net and buy product and services cheaper or with higher quality and support (marcbowles, 2008).
5. because it is declared before, e-commerce is somehow client self-serviced and a part of the task will be done by clients (is spoken as customer outsourcing) (marcbowles, 2008).
6. As e-commerce unremarkably done via net, application that is employed within the web site of an organization or different applications will be developed with efficiency. And additionally computers have the power to speak through net freelance of their platform and operational systems (marcbowles, 2008).
7. there's a list flexibility and on-line change is quick (isos, 2008)
8. As selling and advertising expenses reduces, there's a higher probability in competency with larger corporations (isos, 2008).
9. Business relationships with dealers and suppliers ar additional economical (isos, 2008).
10. Payment systems and fund transferring systems ar encrypted and secured (isos, 2008).

Disadvantages of e-commerce

There also are some disadvantages in e-commerce which might be listed as follow:

1. Delivery of physical product desires time and you can not one thing them as before long as you buy it (marcbowles, 2008).

2. There ar continuously some levels of uncertainty. the client can't be one hundred certain that the vendor is legiti-mate and he/she can receive the merchandise that he/she is purchased (marcbowles, 2008).
3. cargo of perishable product isn't a simple job (marcbowles, 2008).
4. By selecting to shop for one thing through net we have a tendency to can't be certain concerning the standard and if the nice is what we actually need (marcbowles, 2008).
5. Returning of the products isn't continuously satisfactory once it involves refund, come back postage fees, re-quired time, etc problems (marcbowles, 2008).
6. Potential frauds in identity, personal data and payment data (marcbowles, 2008).
7. Feedback concerning however individuals react to product and repair offerings additionally tends to be of very little use, victimisation net primarily based sales (marcbowles, 2008).
8. terribly tiny or terribly massive transactions can't be done on-line as unremarkably these transactions ar done employing a mastercard (marcbowles, 2008).
9. bit orders tend to possess terribly high cargo costs that aren't appropriate for people (marcbowles, 2008).

Limitations and bounds of e-commerce in Asian nation

It has been a few years that e-commerce has came to Asian nation. tho' the speed of e-shopping is increasing there ar still some limitations and issues to be resolved. "Trust" is one in all the most issues that e-commerce is facing. Iranian folks don't trust suppliers whom they can not see or talked to. it's troublesome for them to pay cash on-line and stay up for delivery rather than planning to a store and find the products as before long as they pay the money. alternative problems that should be thought of ar as follow:

1. on-line payment and fund transfers aren't on the market for many of the folks that use debit cards of most of the Iranian banks expect for Parsian Bank and rain tree Bank.
2. Suppliers/ sellers aren't sure by folks as they are doing not give satisfactory info regarding themselves.
3. Lack of acceptable legal framework (Abbasi, Alireza, 2007).
4. Security
5. Low web affiliation speed and high costs of connecting to the net. though new ISPs (in-ternet service providers) ar being introduced daily and broad band connections like ADSL with up to two Mb/sec speed ar on the market in recent years, still there ar ample those that solely have access to low speed web affiliation at high costs that makes the electronically transactions vulnerable.

6. Absence of technical information among traders and businessmen (The National Report on E-commerce in Asian nation, 2004).

Iran's banking industry and E-Banking developments

In order to support e-commerce Iran's banking industry has been developed and currently offers totally different services like automated teller machine machines (ATMs), type Message causation (SMS) services, debit cards, credit cards, on-line payment systems (available by Parsain Bank and zaman Bank mostly), purpose of sell (POS) machines, Bulletin Board system (BBS), machine-driven phone banking, bill payment systems, etc (Abbasi, Alireza, 2007). All governmental and most of non-governmental banks are members of Shetab network in Islamic Republic of Iran|Persia|Asian country|Asian nation}|Persia|Asian country|Asian nation} providing the antecedently mentioned services for costumers of different banks in Iran however in my opinion these services are remote from a true e-banking in Iran. so as to realize a fascinating e-banking the subsequent needs should be considered:

1. Payment gateways should be used at Iranian banks (Abbasi, Alireza, 2007).
2. International credit cards should be offered by these banks (Abbasi, Alireza, 2007).
3. exchange machine-driven system should be developed (Abbasi, Alireza, 2007).

E-banking is one in every of the most important steps that should be taken so as to develop e-commerce in Islamic Republic of Iran.

What reasonably businesses will go browsing in Asian nation

As a matter reality each business will go browsing. no matter is said to product and services are often listed via net. a number of services that area unit presently offered on-line are:

- net banking that is that the service of Iranian banks that has access to customer's account via the web site of the bank.
- Bus, Train and ticket purchases.
- edifice reservation
- Utility bill payments
- News services
- Book ordering
- Advertising
- E-government
- E-learning
- Virtual libraries
- Domain registration and internet hosting services
- on-line product sales (mostly for laptop hardware)

- traveller services

Where is Asian country in international e-commerce competition?

The value of North America's transactions amounted to \$3.5 trillion in 2004 (Abbasi, Alireza, 2007). Asia-Pacific, with \$1.6 trillion and Western Europe, with \$1.5 trillion area unit severally second and third within the re-gion. geographic area with \$81.8 billion and different regions with \$65.6 billion stand at fourth and fifth within the re-gion. the worth of e-commerce in Asian country was presupposed to reach to twelve.8 billion in 2006 (The National Report on E-commerce in Asian country, 2004). in keeping with the ministry of commerce – country written report (2005), e-payment equipments that area unit offered through Iranian banks area unit as follow:

	Cards	ATM	POS	POS in branches
Total	13,511,529	4,458	68,532	11,268

These statistics are grownup drastically nowadays (2008) however it's still removed from the international e-commerce statistics.

What opportunities will e-commerce offer for Iranian business people?

Iranian business individuals will get pleasure from the varied blessings of e-commerce just in case the wants of web searching and e-commerce are totally provided. they will have access to International market places, gain the flexibility to contend with giant foreign firms, scale back prices, have higher advertising and promo-tional facilities at lower costs and face huge style of customers.

Conclusion

E-commerce is spreading throughout the globe at high speed and considering its blessings and wide selection of opportunities that it offers, it's extremely needed that Iranian government puts therefore should effort proving the idea and developing the technologies like ICT, e-banking, e-government, e-insurance, etc. so as to assist it grow quicker. there's nice potential in Iran's market to form use of benefits of e-commerce and it's already begun however firm foundation is needed to assist it proceed.

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Site selection of relief and rescue bases by GIS (case study: Shirvan city)

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Abstract: Death, injury, famines and ...are natural disaster typically which occur in short time and we see this unexpected events. The rescuers are ready for reusing the people that need help. It is necessary for urban planners to select best sites for relief and rescue bases. The research method is descriptive-analytic the main aim is site selection for the bases based on scientific indexes, the software which is used for analyzing is Arc GIS AS a result it was prepared a map based on Boolean logic. The map shows the best sites for establishing the bases.

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Key words: rescue and relief rescue bases, site selection, GIS, Shirvan city

Introduction

There is no severe place from natural disaster on the earth but natural disasters are increasing because of population increasing. The natural situation of Iran with dense population points are the most important factors for this vulnerability, Shirvan city have been located on earth quack ring like other cities of Iran also there are two flooding rivers around the city. So site selection for secure and rescue bases is very useful.

There are some researches about reducing of natural disaster vulnerability like the following research.

-Ares arch show that road secure and relief bases can improve the emergency bases activities (Atapour, 2005)

- based on a study by the name of what have to know road rescuers, show some new ways for improving the role of road rescuers.(Abdekhodavandi and etal , 2008)

-Also one of the researches has proposed some solutions to reduce damages due earthquake. In Tehran city. (Ramezanzade , 2001)

-a study represents some urbanism indexes to decreasing damages due earthquake. (Ahmadi, 1997).

Method

The research in this study is analytic-descriptive necessary data is gathered from some articles , books, aerial photographs , maps and data banks of some organization like municipality of Shirvan and red cross. The software have used for data analyzing is Arc GIS and model for mapping is Boolean logic

State of problem

Nowadays site selection is one of the most important factors which can reduce some disasters. Relief and rescue bases are the center which can reduce the rate of death while an event is occurs or

even after the disaster events. So it is necessary to pay attention to site selection for these basements.

It seems it hasn't been regarded to distance between stations, old part. Of the city, clinic and sanitation centers, passages network, ground radiant, to site selection rescue and relief bases in Shirvan city.

Discussion

Site selection is one of the most important factors for more competencies of the bases because if it be ignored may be waste much time therefore manage people may be lose their lifetimes.

Some of indexes are criterion which is important to site select one of the bases is: distant, between the bases and sanitation centers, clinics, as station, passages network, parks and so on.

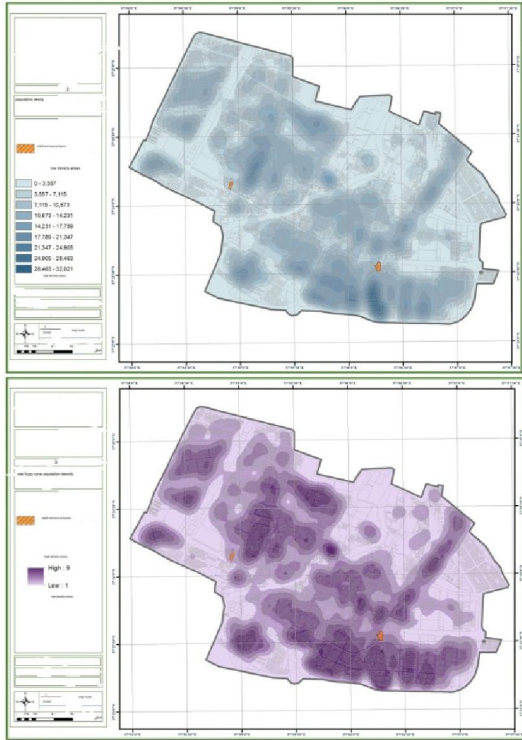
Situation of the relief and secure bases

There are two relief and secure bases in Shirvan city the base number one was located in the west of the city and the base number two is located on the east-south of the city

-distance between the bases and population centers in Shirvan city

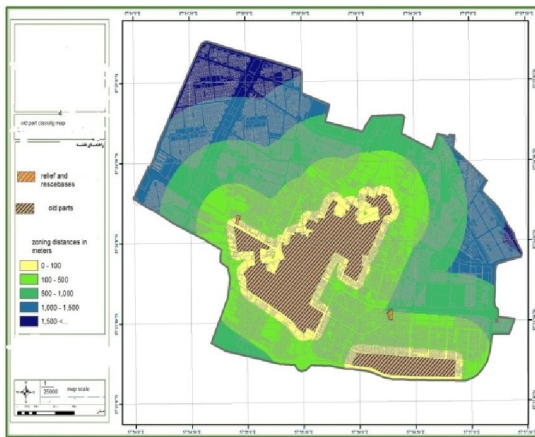
The relief and rescue bases aren't compatible with population centers (map-1) and populous places are located in the area with low values (map- 2)

Map1-distance between the bases and old parts of the Shirvan city.



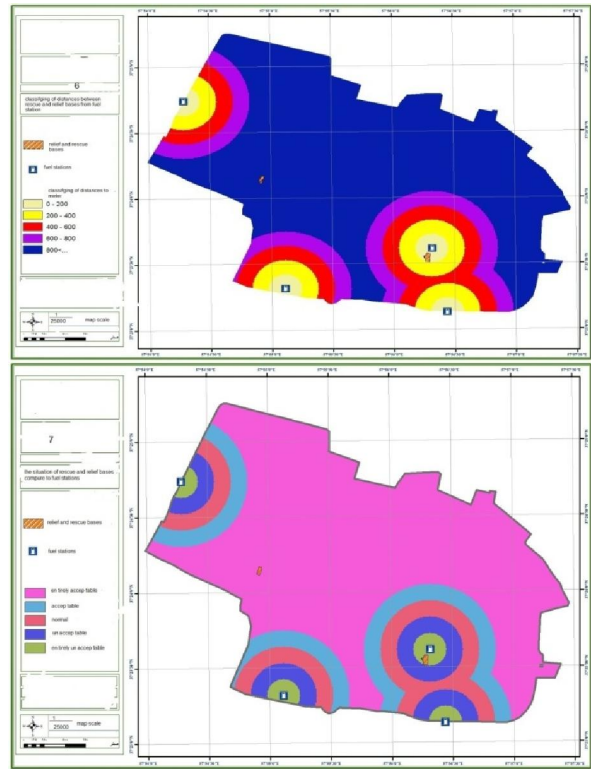
Map 2- populous places are located in the area

The old parts of Shirvan city located in center of city (map – 3) as it has been shown in that map the base which has been located in the west part of the city is suitable to help and rescue the settlers and the distance between old part of the city which is more vulnerable than new part of Shirvan city is 100 meters also the second base which is situated in the east south of the city is snit able to rescue and relief the settlers because the distance between the second base and old part of the city is 500 meters.



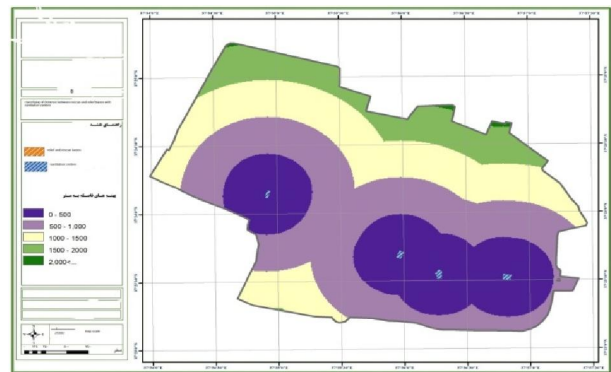
Map 3-old parts of Shirvan city located in center of city

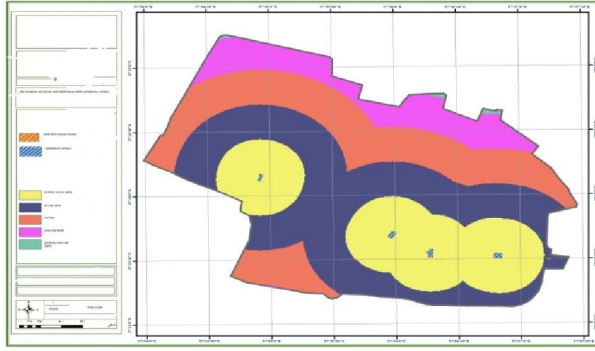
The distance between relief and rescue bases and fuel station the base which has been located in the waste of the city isn't accept shows the different with different values.



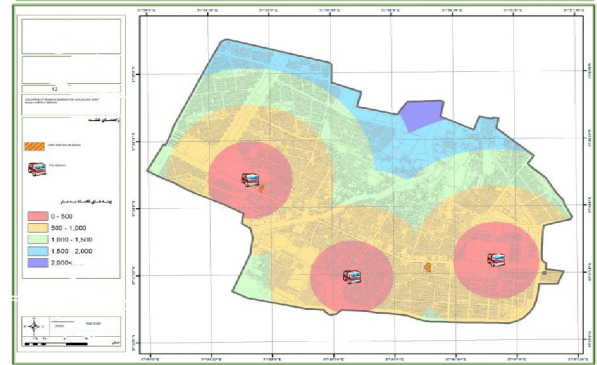
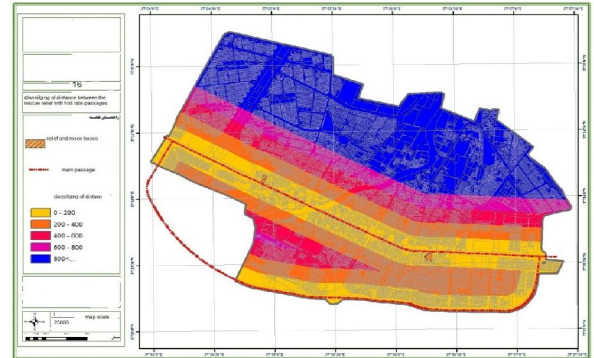
Map 4 and 5 -the distance between sanitation centers.

There are four sanitation centers the in the city. The distance between both bases and the nearest sanitation system is 500 meters. This distance is acceptable to render service to inured people. (Map-6) as it has been shown on the map-7 the distances between both of the bases are situated of in the area with high values



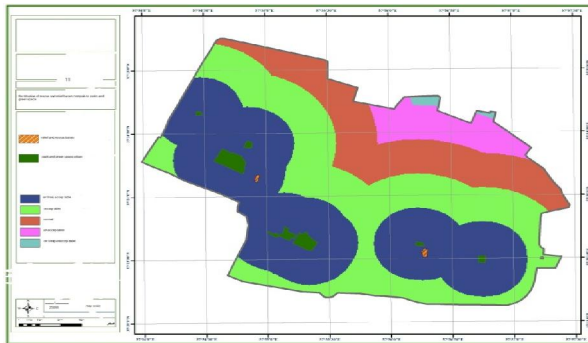


Map 6 and 7 - The distance between the bases and parks and urban green lands.

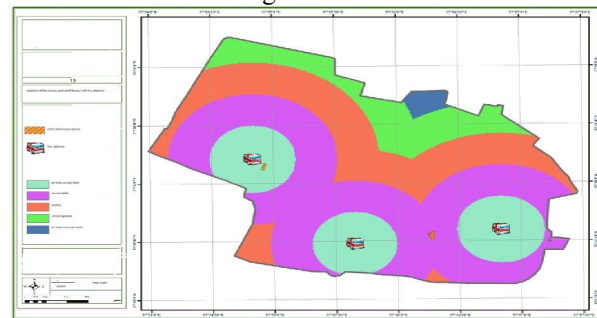


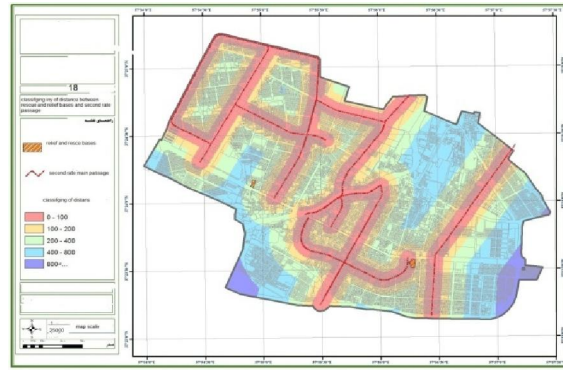
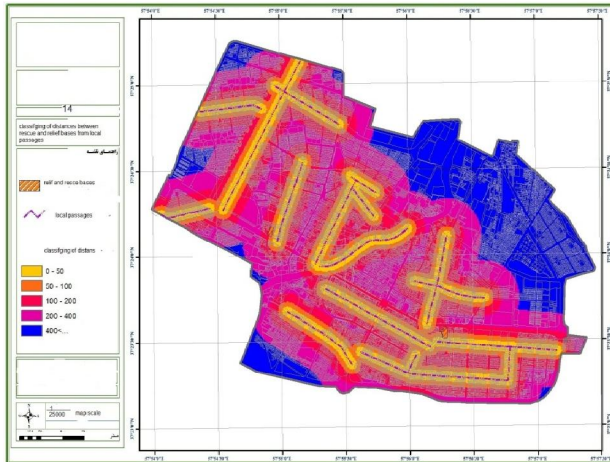
As map -8 (above) has shown both the bases are situated 500 meter further than urban green lands and base on the map 9 both of the bases has high values.

As it shown in the map 10 (above) the distance between the both bases and local passages network is 50 meter and based on map 11 both of the bases are located in an area with high value.



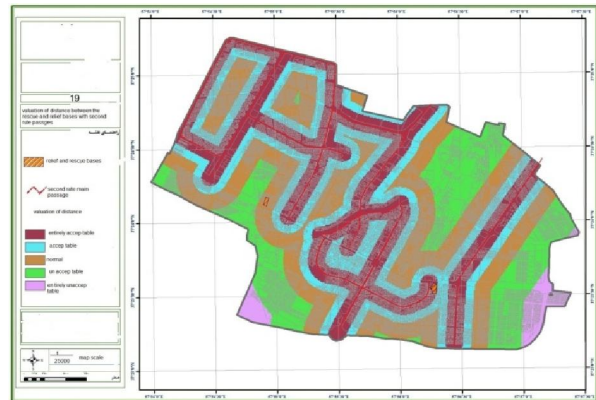
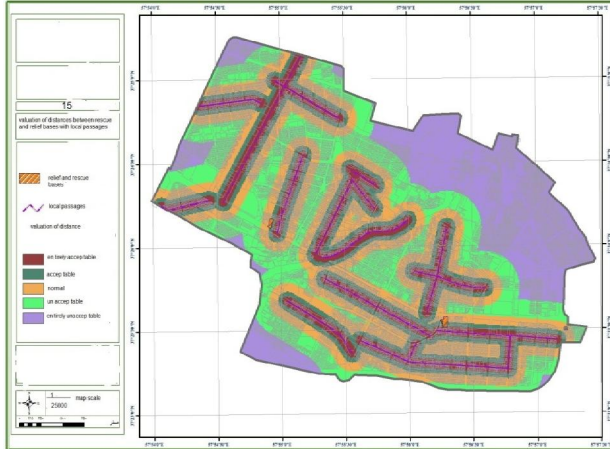
Map 9- distribution of the bases based on passages network





Based on map 15 (above) the west base is located in an area with the best condition and the east south base is located in an unfavorable area.

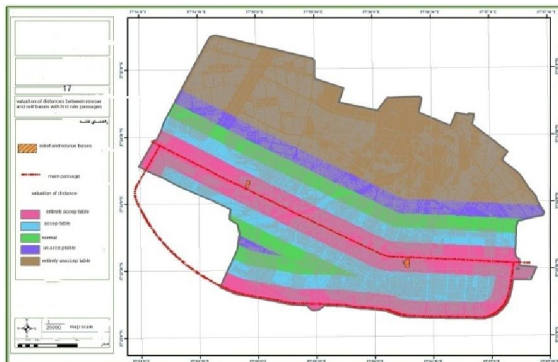
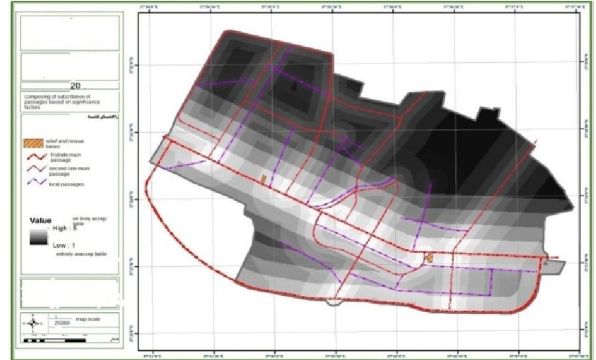
Based on map 16 (above) both of the bases are located in an area with high value from access view point.



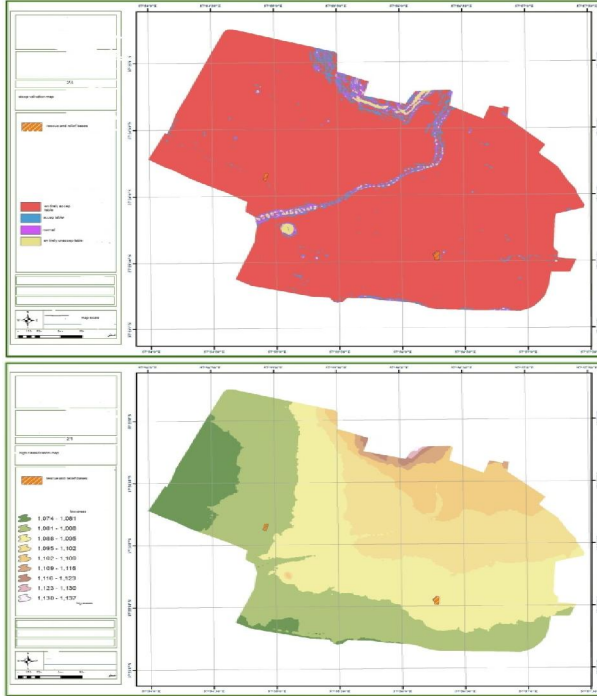
Map 12 to 14. Refer to text

Map 12 shows the both of the bases are situated 200 meter farther from the number 2 passage network and map 13 shows that both bases are located in an area with high value.

Map 14 shows (above) the west base is located 400 meter from the number 2 passages network while the east south base is located 100 meter far from number 2 passages network.

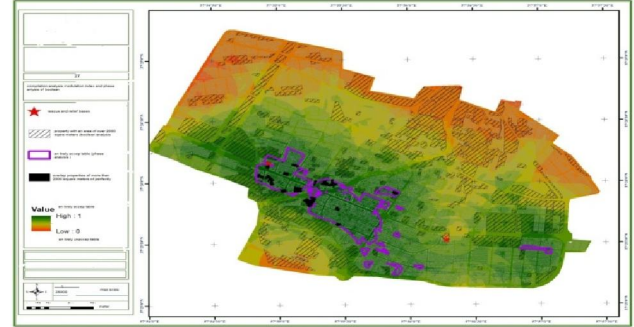


The map 17 show (above) that the bases have been located on an area with low latitude therefore in this point they have favorable conditions and base on map 18 the situation of these bases are favorable.



Map 19 and 20(above) show the situation of the bases from altitude point.

Based on map 21 which have been obtained by using of all of the maps which used. Before it is found that the best areas to establish the bases are the area with 5 value and the areas with low value aren't suitable for this site selection (Map 21)



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12/23/2012

用作者的新黑洞理论推导出精密结构常数 $1/\alpha = F_n/F_e = hC/(2\pi e^2)$, L_n 和 $1/\alpha$ 的物理意义

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“他山之石，可以攻玉”

【内容摘要】。通过将 1 个氢原子作为模型和对比，可求出氢原子上正电子对壳上负电子的电磁力 F_e 与原子核质量与壳上电子质量的引力 F_g 之比，即 $F_e/F_g = L_n = 2.27 \times 10^{39} =$ 狄拉克大数，这是因为静电力和引力都同时作用在电子和原子核上，而有着同一个距离 R 。迄今为止，物理学家们尚未找到强核力 F_n 的准确公式和数值。作者用求 L_n 的类似的方法，取某一个特殊的微黑洞 $M_{b0} = 0.71 \times 10^{14} \text{g}$ 作为模型，其内部粒子全部夸克化，于是 2 邻近核子（夸克）之间的强核力 F_n 与正负电子之间电磁力 F_e 共同作用在相同的夸克之上，由此可用对比和推论求得 F_n/F_e 之比，得出公式 $F_n/F_e = 1/\alpha = 137.036 =$ 精密结构常数。下面是费曼论精细结构常数（Fine-structure constant）的一段话。

---- Richard Feynman: It has been a mystery ever since it was discovered more than fifty years ago, and all good theoretical physicists put this number up on their wall and worry about it... It's one of the greatest damn mysteries of physics: a magic number that comes to us with no understanding by man. You might say the "hand of God" wrote that number, and "we don't know how He pushed his pencil."

[张洞生：用作者的新黑洞理论推导出精密结构常数 $1/\alpha = F_n/F_e = hC/(2\pi e^2)$, L_n 和 $1/\alpha$ 的物理意义，

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【关键词】。精密结构常数 $F_n/F_e = 1/\alpha = hC/(2\pi e^2) = 137.036$ ；精密结构常数 $1/\alpha$ 的物理意义；狄拉克大数， $F_e/F_g L_n = 10^{39}$ ；宇宙微黑洞 $M_{b0} = 0.71 \times 10^{14} \text{g}$ ；

【1】。精密结构常数 $1/\alpha$ 可定义为 $1/\alpha = hC/(2\pi e^2) = 137.036$ ，并可得出：

$$1/\alpha = hC/(2\pi e^2) = 137.036 = F_n/F_e \quad (1a)$$

在上面(1a)中，普朗克常数 $h = 6.626 \times 10^{-27} \text{g} \cdot \text{cm}^2/\text{s}$ ；光速 $C = 2.998 \times 10^{10} \text{cm/s}$ ；电子电量 $e = 4.80325 \times 10^{-10} \text{esu} = 1.6022 \times 10^{-19} \text{C}$ （库伦）；于是， $1/\alpha = hC/(2\pi e^2) = 6.626 \times 10^{-27} \times 2.998 \times 10^{10} / [2(4.80325 \times 10^{-10})^2] = 137.0368 \approx 137.036$ 。

下面，让我们来逐步推导出(1a)式即可。

作者在下面就是要利用一个特定的微黑洞 $M_{b0} = 0.71 \times 10^{14} \text{g}$ 的内部是纯粹夸克的性质，求出夸克之间的作用力（核力） F_n 与静电力 F_e 之比， $F_n/F_e = 1/\alpha = 137.036$ 。

注意：本文中所用的 F_n , F_e , F_g 只是为求其核力，静电力，引力之比而用，他们并不是真正的核力，静电力，引力。而宇宙中真正的基本力应该是核力 F_n ，静电力 F_e ，引力 F_g ：

$$F_n = F_n/R^2, F_e = F_e/R^2, F_g = F_g/R^2 \quad (a)$$

R 是产生作用力的 2 粒子之间的距离

【2】。用一个氢原子作模型求出 $F_e/F_g = L_n = 2.27 \times 10^{39} =$ 狄拉克大数

首先来回顾一下拉克的大数 L_n 是怎样来的。按照拉克的‘大数假设’的观念，求电磁力 F_e 与万有引力 F_g 之比 F_e/F_g 。以氢原子作为模型，质子质量 $m_p = 1.6727 \times 10^{-24} \text{g}$ ，电子质量 $m_e = 9.1096 \times 10^{-28} \text{g}$ ，电子电量 $e^+ = e^- = 1.602 \times 10^{-19} \text{C}$ ， R 是正负电子之间的距离，万有引力常数 $G = 6.6726 \times 10^{-8} \text{cm}^3/\text{s}^2 \cdot \text{g}$ ，实验测定的比例常数 $k = 9.0 \times 10^9 \text{N} \cdot \text{m}^2/\text{C}^2$ 。由于 F_e 与 F_g 的 R 相同，

$$F_g = Gm_p m_e / r^2 = 6.6726 \times 10^{-8} \times 1.6727 \times 10^{-24} \times 9.1096 \times 10^{-28} / R^2 = 101.67 \times 10^{-60} / R^2 \quad (2a)$$

$$F_e = ke^2/r^2 = 9.0 \times 10^9 \text{N} \cdot \text{m}^2/\text{C}^2 \times (1.6022 \times 10^{-19} \text{C})^2 / R^2$$

$$= 9.0 \times 10^9 \times 10^5 \times 10^4 \times (1.6022 \times 10^{-19} \text{C})^2 / R^2 = 23.10 \times 10^{-20} / R^2 \quad (2b)$$

$$F_e/F_g = L_n = 23.10 \times 10^{-20} / 101.67 \times 10^{-60} = 2.27 \times 10^{39} \quad (2c)$$

(2c) 式表明，在同时带电和引力的一些粒子的距离都为 R 时，无量纲常数 $L_n = F_e/F_g = ke^2/Gm_p m_e = 2.27 \times 10^{39}$ 表示电磁力 F_e 与万有引力 F_g 之比。

【3】。对黑洞普遍适用的几个基本公式

下面(3a) 是著名的霍金黑洞的温度公式，

$$T_b M_b = (C^3/4G) \times (h/2\pi k) \approx 10^{27} \text{gk} \quad (3a)$$

M_b —黑洞的总质能量； R_b —黑洞的视界半径， T_b —黑洞的视界半径 R_b 上的温度， m_{ss} —黑洞在视界半径 R_b 上的霍金辐射的相当质量， κ —波尔兹曼常数 $= 1.38 \times 10^{-16} \text{g} \cdot \text{cm}^2/\text{s}^2 \cdot \text{k}$ ，下面是霍金黑洞的温度公式， $T_b M_b = (C^3/4G) \times (h/2\pi k) \approx 10^{27} \text{gk} \quad (1)$

(1a) M_b —黑洞的总质能量； R_b —黑洞的视界半径， T_b —黑洞的视界半径 R_b 上的温度， m_{ss} —黑洞在视界半径 R_b 上的霍金辐射的相当质量， m_{ss} 既然是量子辐射，在视界半径 R_b 上的 m_{ss} ，按引

m_{ss} 既然是在视界半径 R_b 上的量子辐射 m_{ss} ，按质能转换为辐射能的阈温公式，

$$m_{ss} = \kappa T_b / C^2 \quad (1)(2) \quad (3b)$$

根据史瓦西对广义相对论方程的特殊解，

$$GM_b / R_b = C^2/2 \quad (1)(2) \quad (3c)$$

作者用 (1a) 和 (1b)，很容易推导出下式，

$$m_{ss} M_b = hC/8\pi G = 1.187 \times 10^{-10} \text{g}^2 \quad (3d)$$

【4】。宇宙微黑洞 $M_{b0} = 0.71 \times 10^{14} \text{g}$ 的特性

按照著名的霍金黑洞理论的熵公式(4a)，任何一个恒星在塌缩过程中，熵总是增加而信息量总是减少的。假设 S_b —恒星塌缩前的熵， S_a —塌缩后的熵， M_0 —太阳质量 $= 2 \times 10^{33} \text{g}$ 。

$$S_a/S_b \approx 10^{18} M_b/M_0 \quad (4a)$$

Jacob Bekinstein指出, 在理想条件下, $S_a = S_b$, 就是说, 熵在恒星塌缩的前后不变。这样, 就从(4a)式得出一个黑洞 $M_{bs} \approx 2 \times 10^{15} \text{g}$ 。它被称为宇宙的原初小黑洞 $= M_{bs}$, ^{[1][2]}其密度 $\rho_{bs} \approx 1.8 \times 10^{52} \text{g/cm}^3$ 。

但为了下面的计算方便, 取一个特殊的微黑洞 $M_{bo} = 0.71 \times 10^{14} \text{g}$ 作为计算的模型。

由前面的(3a), (3b), (3c), (3d)式, 在 $M_{bo} = 0.71 \times 10^{14} \text{g}$ 的情况下, 得出其视界半径 $R_{bo} = 1.05 \times 10^{-14} \text{cm}$; 视界半径上的温度 $T_{bo} = 1.09 \times 10^{13} \text{K}$; 视界半径上的霍金辐射的相当质量 $m_{sso} = m_p = 1.67 \times 10^{-24} \text{g} =$ 质子质量; 黑洞里平均密度 $\rho_{bo} = 2.57 \times 10^{56} \text{g/cm}^3$; 该黑洞内总质子数 n_p ,

$$n_p = 0.71 \times 10^{14} / 1.67 \times 10^{-24} = 0.425 \times 10^{38} \quad (4b)$$

从 Bekinstein 对恒星塌缩的前后熵不变的解释可以得出有非常重要意义的结论。

Bekinstein 对霍金公式 (4a)只作了一个简单的数学处理, 使其能够和谐地成立。但是没有给出其中的恰当的物理意义。作者认为, (4a) 应该用于解释恒星塌缩过程中有重要意义的物理含意。

首先, (4a) 表明黑洞在密度 $< \rho_{bs} = 1.8 \times 10^{52} \text{g/cm}^3$ 的恒星在塌缩过程中是不等熵的。这表示质子作为粒子, 在其密度 $< 1.8 \times 10^{52} \text{g/cm}^3$ 的情况下, 能够保持质子的结构没有被破坏而分解为夸克, 所以质子才有热运动和熵的改变。但质子仍然由 3 夸克 uud 组成。其次, 既然密度从大于 $1.8 \times 10^{52} \text{g/cm}^3$ 到 10^{93}g/cm^3 的改变过程中, 不管是膨胀还是收缩, 熵不会改变, 证明这就是理想过程。因此, 质子必须解体而不再作为粒子, 质子在此过程中只能变为夸克。换言之, 夸克就是没有热运动和摩擦可在 $> 1.8 \times 10^{52} \text{g/cm}^3 \sim 10^{93} \text{g/cm}^3$ 之间作理想过程的转变。质子此时可能增加其能量成为超子。

重要的结论: 由于微黑洞 $M_{bo} = 0.71 \times 10^{14} \text{g}$ 的平均密度 $\rho_{bo} = 2.57 \times 10^{56} \text{g/cm}^3$ 大于 $\rho_{bs} \approx 1.8 \times 10^{52} \text{g/cm}^3$ 。因此, 黑洞已是理想状态, 其内部的 $n_p = 0.425 \times 10^{38}$ 个质子都是非粒子状态的夸克。

由于近代物理学对夸克模型的结构和运动状态的认识并不完全清楚, 下面只对夸克模与本文有关方面简短的描述一下: ^[5] 1*. 根据近代粒子物理学和量子色动力学 (QCD) 理论认为, 夸克都是被囚禁在粒子 (质子或重子) 内部, 不存在单独的夸克。2*. 一个质子由 3 个夸克 uud 组成, 3 夸克之间的强核力将他们捆绑在一起。但每个夸克有自己的一种固有的颜色, 3 个夸克各有红 R 绿 G 蓝 B 3 种颜色, 3 种颜色共同构成白色, 才能共同存在组成一个质子, 这就是‘夸克囚禁’现象, 是泡利不相容定律的表现, ‘色’是夸克强作用‘核力’的根源。3 夸克之间既有排斥力, 也有吸引力使 3 者能保持一定的距离, 以维持 3 者的稳定平衡, 永不分离。3*. 2 个上夸克 uu 各带有 $2/3e^+$, 而 1 个下夸克带有 $1/3e^-$,

以维持质子内电力的平衡 (8a), 每个夸克上都同时具有强核力 F_n 和电力 F_e , 而 2 种力的作用距离 R 是同一的。这就使得求 F_n/F_e 变得简易可行。

【5】。求核力, 即夸克之间的作用力 F_n 与一对正负电子之间的静电力 F_e 之比, 即 F_n/F_e 。

上面已经论证了微黑洞 $M_{bo} = 0.71 \times 10^{14} \text{g}$ 是全部由夸克化的质子组成的。其霍金辐射粒子 Jacob Bekinstein 指出, $1.67 \times 10^{-24} \text{g} = m_p =$ 质子质量, 由 (3d) 式, $m_{ss} M_b = hC/8\pi G$, 黑洞内夸克之间的强核力为 F_n , 令,

$$F_n = hC/2\pi \quad (5a)$$

由 (3d) 变换就得到

$$4GM_{bo}m_{sso} = F_n = hC/2\pi \quad (5b)$$

$$\text{或为 } F_n/R^2 = 4GM_{bo}m_{sso}/R^2 = hC/2\pi R^2,$$

$$F_n = F_n/R^2 = GM_{bo}m_{sso}/R^2 \quad (5c)$$

由于黑洞内 e^+ 和 e^- 的静电力 $F_e = e^2/R^2$,

$$F_n/F_e = hC/2\pi e^2 = 137.036 = 1/\alpha \quad (5d)$$

$$\therefore (5d) \equiv (1a) \quad (5e)$$

而 $F_n/F_g = F_n/F_e \times F_e/F_g = 1/\alpha \times L_n = L_n/\alpha$

$$= 2.27 \times 10^{39} \times 137.036 = 3.11 \times 10^{41} \quad (5f)$$

上面 (5d), (5e), (5f) 3 式就是证明的结果和结论。下面再作进一步的论证。

1*. 必须指出, (5b) 式只有在黑洞的情况下才成立, 在非黑洞时, $4GM_{bo}m_{sso} \neq$ 常数。其次, $F_n = hC/2\pi$ 对不同的黑洞都成立, 但不同黑洞有不同的 R, 所以 $F_n = F_n/R^2$ 对不同的黑洞是不相同的。

2*. 验证 (5b) 式 $4GM_{bo}m_{sso} = F_n = hC/2\pi$, 先变为 $4GM_{bo}m_{sso}/F_e = F_n/F_e = hC/2\pi e^2$,

$$\text{于是 } 4GM_{bo}m_{sso}/F_e = 4 \times 6.67 \times 10^{-8} \times 0.71 \times 10^{14} \times 1.67 \times 10^{-24} / 23.1 \times 10^{-20} = 137 = F_n/F_e \quad (5g)$$

$$F_n/F_e = hC/2\pi e^2 = 1/\alpha = 137$$

上面无论从公式推导, 还是从数值计算上都证实了 (5d) \equiv (1a) 的正确性。

现代核物理学中, 仅仅大概地估计出 $F_n/F_e \approx 10^2$ 。更没有认识到和找出精密结构常数 $1/\alpha$ 的物理意义就是 F_n/F_e 。作者现在最先用类比法推导出了 (5d) \equiv (1a)。

3*. 由前面的(a)式, 可知在这 $M_{bo} = 0.71 \times 10^{14} \text{g}$ 的黑洞内, 真正的核力 F_n , 静电力 F_e , 如果 2 夸克之间引力 F_g 照常存在, 它们分别为:

$$F_n = F_n/R^2 = hC/2\pi R^2 = 3.17 \times 10^{-17}/R^2$$

$$F_e = F_e/R^2 = e^2/R^2 = 2.31 \times 10^{-19}/R^2$$

$$F_g = F_n/F_e \times F_e/F_g = L_n/\alpha$$

在这里, R 应是 2 个邻近的夸克之间的距离。

前面已经得出微黑洞 M_{bo} 的视界半径 $R_{bo} = 1.05 \times 10^{-14} \text{cm}$, $n_p = 0.425 \times 10^{38}$, 因此,

$$n_p R^3 = R_{bo}^3, \quad R = 3 \times 10^{-27} \text{cm}$$

4*. 强力 F_n 有多强?

如上所述, 使 $R^2 \approx 9 \times 10^{-54} \text{cm}$, 则 $F_n = hC/2\pi R^2 = 6.626 \times 10^{-27} \times 2.998 \times 10^{10} / (2\pi \times 9 \times 10^{-54}) = 0.3515 \times 10^{37} \text{dyne}$ 。而电磁力 $F_e = e^2/R^2 = 23.1 \times 10^{-20} / 9 \times 10^{-54} = 2.567$

$\times 10^{34}$ dyne. 于是, $F_n/F_e = 136.92 \approx 137.036 = 1/\alpha$

5*, 令 F_{Mm} 是黑洞 M_{bo} 对 m_{sso} 引力, 于是,

$$F_{Mm} = 4GM_{bo}m_{sso}/R_{bo}^2 = 4 \times 6.67 \times 10^{-8} \times 0.71 \times 10^{14} \times 1.67 \times 10^{-24} / (1.05 \times 10^{-14})^2 = 3.17 \times 10^{-17} / (1.05 \times 10^{-14})^2 = 2.88 \times 10^{11} \text{ dyne} \quad (5h)$$

必须对 $F_{Mm} = 4GM_{bo}m_{sso}/R_{bo}^2$ 作重点的解释. 在牛顿力学中, M_{bo} 是质量集中在其中心的集中力, 所以是 $F_{Mm} = GM_{bo}m_{sso}/R_{bo}^2$. 然而, 在黑洞里来源于广义相对论 (3c) 的 M_{bo} 的质量是分布在整个黑洞的空间的, 所以 $F_{Mm} = 4GM_{bo}m_{sso}/R_{bo}^2$. 这说明分散的质量的引力大于集中质量对同一粒子的引力.

6*, 一个有趣的推论

从公式(5b), $4GM_{bo}m_{sso} = F_n = hC/2\pi$,

$$\therefore 4GM_{bo}m_{sso}/R_{bo}^2 = (hC/2\pi)/R_{bo}^2, \text{ 于是,} \\ (4GM_{bo}m_{sso}/R_{bo}^2)/(hC/2\pi) = R_{bo}^2/R_{bo}^2$$

再从(5c) 和 (5h).

$$\therefore F_{Mm}/F_n = R_{bo}^2/R_{bo}^2 \quad (5i)$$

再从公式 (5g), $R_{bo}^2/R_{bo}^2 = n_p^{2/3}$

$$\therefore F_n/F_{Mm} = R_{bo}^2/R_{bo}^2 = n_p^{2/3} \quad (5j)$$

公式(5j) 意外地使核强力 F_n 与 黑洞 M_{bo} 对其霍金辐射 m_{sso} 的引力联系起来。

从黑洞理论可知,^[1] 一旦 M_{bo} 由于发射 m_{sso} 而减小时, 其下一个 m_{sso} 则跟着增大。而且, R_{bo}^2 的减小 $> R^2$ 的减小. 随着 M_{bo} 的减少下去, 最后就会到达一个极限情况, 即 $M_{bo} = m_{sso}$ 。此时, 按照 (3d),

$$M_{bo} = m_{sso} = 10^{-5} \text{ g, 而(5j) 式会变成,}$$

$$F_n = F_{Mm}, R_{bo}^2 = R^2, n_p = 1$$

按照黑洞理论,^[1] $M_{bo} = m_{sso} = 10^{-5} \text{ g}$ 会在普朗克领域爆炸成为高能 γ -rays 后消失。

【6】。进一步的分析和结论

1*。由前面的【4】节可知, 因微黑洞 $M_{bo} = 0.71 \times 10^{14} \text{ g}$ 的密度已经 $\approx 10^{56} \text{ g/cm}^3$, 其内部完全为 n_p 个质子分裂成的夸克组成。又由于(5d) \equiv (1a), 可见, 精密结构常数 $1/\alpha$ 就是夸克之间的核强力 F_n 与同距离上的正负电子对的静电力 F_e 之比, 即 F_n/F_e , 与 $F_e/F_g = L_n$ 完全类似。显然, F_n 与 F_e 有共同的距离 R , 而作用在相同的夸克上, 故(5d)式, $1/\alpha = F_n/F_e =$ 精密结构常数的结论应该是合理的。

2*。由于首先证实了微黑洞 M_{bo} 内部的质子全部夸克化后, F_n 与 F_e 才会作用在相同的粒子上, 有共同的 R , 才能简易地作出有普适性的对比。

3*。正如 $F_e/F_g = 2.27 \times 10^{39} = L_n$, 可类似的得出了 $F_n/F_e = 137 = 1/\alpha$ 。既然 L_n 可认为是 F_n 与 F_e 的耦合系数。那么, α 就可以看成是原子核内强核力 F_n 与电磁力 F_e 的耦合系数。

4*。既然 L_n 作为一个特定的无量纲常数在宇宙中有普遍的意义。那么, α 作为一个特定的无量纲常数, 也应该有普遍的意义。

5*。然而, 由于强力 F_n 至今还未被科学家们清楚地认知和得出正确的计算公式, 要在不久的将来认识到 $F_n/F_e = hC/2\pi e^2 = 137.036 = 1/\alpha$ (5d) 式是一个准确的等式还是困难的, 因为很难在未来短期内制造出新的仪器观测到夸克的内部结构和运动方式。

6*。本文推导出 $1/\alpha = F_n/F_e = hC/(2\pi e^2)$ 后, 同时也验证了作者新黑洞理论和公式的正确性。

====全文完====

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The Fine-structure Constant, $1/\alpha = F_n/F_e = hC/(2\pi e^2)$, Has Just Firstly Derived
With Author's New Black-hole Concepts and Formulas

Zhang Dongsheng 张洞生 zhangds12@hotmail.com; zds@outlook.com; 2/5/2013.

【Abstract】。With the hydrogen atom as a model and contrast, a proper ratio F_e/F_g between the electromagnetic force F_e and the gravitational force F_g could be established as a famous Dirac large number $L_n = F_e/F_g \approx 10^{39}$. Drawing the same mathematical and physical analogy, a special mini black hole of $M_{bo} = 0.71 \times 10^{14} \text{ g}$ can be a better choice as a model, in which all quarks decomposed from protons must have the electrical force F_e and the strong nuclear force F_n . Thus, the proper ratio F_n/F_e between F_n and F_e was correctly established and proved that, F_n/F_e should just be the fine-structure constant, and $F_n/F_e = 1/\alpha = hC/(2\pi e^2) = 137.036$.

[张洞生: 用作者的新黑洞理论推导出精密结构常数 $1/\alpha = F_n/F_e = hC/(2\pi e^2)$, L_n 和 $1/\alpha$ 的物理意义,

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2/2/2013

统一基本粒子系和原子系弦学之桥 ——现代实用量子弦学发轫 (1)

叶眺新

Recommended by 王德奎, y-tx@163.com

摘要: 对于氢原子谱线的波长数据, 我们用从原子系量子数轨道圆弦图和正切基角 $\theta = 45^\circ$ 出发的数据处理方法, 合乎逻辑地导出了 2013 年的巴尔末公式。这种肯定, 能否扩容到基本粒子系, 即有物质族数目的类似“巴尔末公式”的新量子数质量谱公式吗? 我们已经整整奋斗和等待了半个世纪。

[叶眺新. 统一基本粒子系和原子系弦学之桥——现代实用量子弦学发轫 (1) *Academ Arena* 2013;5(2):64-77] (ISSN 1553-992X). <http://www.sciencepub.net/academia>. 14

关键词: 巴尔末公式 光谱 超弦 量子数质量

弦论、弦学、弦图, 是超弦或超弦理论和圈量子引力理论等理论的统一的简称, 是人类目前在数理科学中取得的最大发现。它的基本表叙是纯旋量表叙, 简称三旋; 它解决质量起源是两种弦图。穿越历史时空, 让哥白尼、玻尔、威滕等三位分属于太阳系、原子系、基本粒子系模型创新的领军人物, 在今天走到一起来考虑未来三系统一的虚拟生存的弦论框架、模具像什么? 也许和大家一样回答的是卢瑟福-玻尔行星原子核式量子数轨道圆弦图。这是自 1884 年巴尔末发现氢原子可见光波段的光谱并给出的经验公式以后, 为 20 世纪初普朗克、庞加莱、爱因斯坦等科学大师们开创量子引力理论的辉煌统一大厦, 奠定的第一块基石。但基本粒子系还有一张巴拿马运河船闸-马蹄形链式量子数轨道弦图, 是人们不知道的。它也是在发轫中的实用量子弦学。

一、巴尔末公式和新量子数质量谱公式等价性证明

什么是卢瑟福-玻尔行星原子核式量子数轨道圆弦图 (简称“核式弦图”) ? 它跟巴尔末多项式 $m^2 / (m^2 - n^2)$ 的意义是什么? 巴尔末公式是:

$$\lambda = b[m^2 / (m^2 - n^2)]$$

(1)

式中 λ 是光谱的波长。m 和 n 为正整数序数, m 为跃迁前的能级, $m \geq 2$; n 为跃迁后的能级, 且 $n \geq 1$ 。b 是一个常量, 称为巴尔末常量, 通过实验确定 $b = 364.56$ 纳米。

在 1854 年巴耳末给出氢的可见光谱波长之前, 没有人能预测氢谱线的波长。巴耳末之后里德伯又花了近 4 年时间, 将他的经验公式扩充为里德伯公式。巴耳末-里德伯原始的公式在 1888 年提出, 在 1980 年完成。而巴耳末公式 $\lambda = b[m^2 / (m^2 - n^2)]$

的形式, 2012 年才出现在重庆出版集团重庆出版社出版的由包新周等先生翻译的[英]曼吉特·库马尔的《量子理论》一书中。但它的说明仅限于 1913 年玻尔提出的玻尔原子量子数弦图模型, 以说明为何巴尔末公式能够解释氢原子的谱线。这是不够的。

玻尔的弦图假设是: 原子中电子的绕核运动时, 只能在符合一定量子化条件的轨道弦上运转, 这些轨道弦上运动着的电子既不能辐射能量, 也不能吸收能量, 这时称电子处于稳定状态, 其余的则称激发态。但玻尔的弦图从来没有说明过波粒二象性, 为什么? 因为玻尔轨道弦的波动和波长, 是真正像正弦曲线水波式的驻波运动。直到 2013 年 2 月 3 日, 才真正出现说明微观轨道圆弦驻波运动的莫比乌斯齿轮视频。

请看北师大特聘的海归计算机专家蒋迅先生博客作的“莫比乌斯齿轮”动画视频, 这是第一次出现在蒋迅的博文《【数学都知道】2013 年 2 月 3 日》中的视频。这种莫比乌斯齿轮, 不同于另外那种被莫比乌斯带齿轮环抱的若干小齿轮的莫比乌斯齿轮动画视频, 它是在环形轨道, 沿圆环的切线与圆面的垂直面方向, 和圆面自身的平面方向两个系列, 由互套并咬合的环圈齿轮组装成的传动。这个我们多年等待的难得的视频, 它解决了玻尔驻波运动量子化条件的轨道弦, 既连续又间断的波粒二象性图像难题。

蒋迅莫比乌斯齿轮的自旋、自转、转动中主要的线旋, 是属于我们对类圈体的三旋的定义。所谓三旋, 请看广东省计算机专家邱嘉文先生博客为我们做出的三旋动画视频: 面旋指类圈体绕垂直于圈面的中心轴线旋转; 体旋指类圈体绕圈面内的任一轴线旋转; 线旋指类圈体绕体内环圈中心线的旋转。莫比乌斯齿轮的每列小齿轮不仅能实现稳定轨

道弦的条件, 是电子的轨道角动量 L 只能等于 $h/2$ 的整数倍, 而且还能体现弦论定义的弦振动基本特征, 是自旋的定义。

这样电子在轨道弦不辐射能量, 是因为它的能量已经在用于莫比乌斯齿轮的传动。而电子在原子核外轨道弦由一个定态跃迁到另一个定态时, 一定会放出或吸收辐射能, 也可以理解。即如果电子从能态 E_1 跃迁到 E_2 , 根据普朗克-爱因斯坦公式, 辐射能的频率为 $h\nu = E_2 - E_1$ 。式中, E_1 、 E_2 分别代表始态和终态的能量; ν 为电子的速度, h 为普朗克常数。若 <0 , 表示跃迁放出能量; 若 >0 , 表示跃迁时吸收辐射能。蒋迅莫比乌斯齿轮量子轨道圆弦图, 联系玻尔理论处理氢原子后来把光谱分成线系, 都是起源于巴尔末多项式 $m^2 / (m^2 - n^2)$ 的这个发现。

1、“勾股数”量子轨道圆弦图之谜

在历史上, 解释氢光谱的本质曾是物理学上的一个难题。

氢所发出的谱线是不连续的。巴尔末是瑞士科学家, 他发现的氢光谱波长规律的巴尔末公式 $\lambda_n = b[m^2 / (m^2 - n^2)]$, 当其中 $n=1$ 时, 表示的是跃迁到基态的谱线, 即莱曼系。莱曼系是物理学上氢原子的电子从主量子数 n 大于等于 2 跃迁至 $n=1$ 的一系列光谱线。当 $n=2, 3, 4$ 时, 称为巴尔末线系、帕邢线系、布拉克线系等, 依此类推。历史上第一条莱曼系的谱线是莱曼在 1906 年在研究被激发的氢原子气体紫外线光谱时发现的, 其余的谱线在 1906 年至 1914 年间陆续被发现。

1) 氢原子光是氢原子内的电子, 在不同能阶跃迁时所发射或吸收不同波长、能量的光子而得到的光谱。玻尔的原子量子数弦图, 能说明氢原子光谱为不连续的线光谱; 而且自无线电波、微波、红外光、可见光到紫外光区段, 都有可能有其谱线。可是要知道, 巴尔末给出的经验公式 $\lambda = b[m^2 / (m^2 - n^2)]$, 是在以 1905 年爱因斯坦发表用布朗运动统计的数学方法测量, 才证实原子的存在的划界之前。

即使在这之后, 人们才弄清氢原子是由一个质子及一个电子构成的最简单的原子; 但巴尔末多项式 $m^2 / (m^2 - n^2)$ 是在这之前, 基于人们早就发现氢原子光谱在可见区和近紫外区有好多条谱线, 构成的一个很有规律的系统的。理论和实验都证明氢原子谱线的间隔和强度是向短波方向递减, 因此光谱一直是了解物质结构理论的主要基础。

如研究其光谱, 可借由外界提供其能量, 使其电子跃至高能阶后, 在跳回低能阶的同时, 会放出能量等同两高低阶间能量差的光子。再以光栅、棱镜或干涉仪分析其光子能量、强度, 就可以得到其发射光谱。或以一已知能量、强度之光源, 照射氢原子, 则等同其能阶能量差的光子会被氢原子吸

收, 因而在该能量形成暗线。我们之所以认为, 2012 年重庆出版社出版的库马尔《量子理论》书中的巴耳末公式 $\lambda = b[m^2 / (m^2 - n^2)]$ 形式, 还没有完善, 还可以改进, 是我们认为 $[m^2 / (m^2 - n^2)]$ 把波长与序数 (m 、 n) 用多项式关联起来的表示, 实际 m^2 和 n^2 是属于“勾股数”, 道理是原子弦图中的量子数构成了直角三角形。

2) 什么叫勾股数? 如重庆药师张绍涛先生 2012 年出版的《勾股数》一书, 讲勾三股四弦五的勾股定理, 必须知道直角三角形两条边的长度才能求第三条; 问如果只知道一条边的长度, 能不能通过公式求出另外两条边的所有长度的所有组合呢? 张绍涛为此自创了新公式。巴尔末早就是瑞士的一个“张绍涛”。

因为如果把巴尔末公式中的 $[m^2 / (m^2 - n^2)]$, 看作一个张绍涛勾股数新公式, 那么我们就能够利用原子系玻尔量子数轨道圆弦图, 将序数正整数条件与圆周曲线拟合, 证明它是一座统一基本粒子系弦学与原子系弦学之桥。下面就是这种巴尔末公式和新量子数质量谱公式相互暗中等价性的证明。

3) 自然数本身就是一些自然量子数。如果量子数等价弦数, 那么把量子数性质上完全相同但质量 (或能量或波长) 数性质却不同的各种超对称粒子归在一处的一个根本特征, 就是勾股数; 它包含的是与同位素现象、放射性现象等价类似反映的, 从原子系到基本粒子系中量子数相同而质量 (或能量或波长) 数不同的, 由质子等粒子衰变产生的多粒子夸克等价的量子数的超对称现象。

但玻尔理论及其以后理论都没有看出这一特点。玻尔的原子量子数弦图, 能够看到的只是电子在氢原子的弦线能阶; 它们要将玻尔、里德伯和莱曼联结在一起, 就必需以巴耳末公式所描述的量子化, 以 m 对应于开始时的能阶, n 对应于结束时的能阶。

这只需要将 n 以 1 来取代。这就是巴耳末公式的莱曼系。因此, 每一条辐射弦的波长都对应于一种电子从主量子数弦大于 1 的能阶上跃迁至第一阶的能量。但正因为是这一点, 即只能是 $n \geq 1$, 而不能是 $n=0$, 这使反映勾股数所在的波长面只能固定在 45° 的投影面上。那么用勾股数来求它的一个直角三角形的对边长, 虽然这个直角三角形不是在玻尔轨道圆弦的半圆形内, 但还是可以设对边长在半圆外的切线上。即我们可以设所有系列的光谱线, 在半圆上的基角或所张的对角都是 $\theta = 45^\circ$ 。

由于 $\text{tg}45^\circ = 1$, 所以 $\text{tg}45^\circ$ 乘以巴尔末公式 $\lambda = b[m^2 / (m^2 - n^2)]$ 的两边, 其值不变。即与 $\lambda = b[m^2 / (m^2 - n^2)] \text{tg}45^\circ$ 形式的公式是等价的, 但的意义却大变。因为在一个直角三角形中, $(m^2 - n^2)$

$\text{tg}n45^\circ$ 是意味求切线上的那条直角边长。而这里又类似已经知道了一条斜边为 m ，一条直角边长为 n ；由于 45° 直角三角形的两条直角边长是相等的，所以 $(m^2 - n^2) = n^2$ ；代入 $\lambda = b[m^2 / (m^2 - n^2)] \text{tg}45^\circ$ 得：

$$\lambda = b[m^2 / (m^2 - n^2)] \text{tg} \theta = b[m^2 / (m^2 - n^2)] \text{tg}45^\circ = b(m^2 / n^2) \quad (1-2)$$

4) 但在实际标示中，是不能表示为 $b(m^2 / n^2)$ 的。因为会出现 $m^2 / 0^2 = b$ 这样的不合理的情况，失去巴耳末公式所描述的勾股数量子化的意义。这

一特点在夸克核式弦图中很明显，因为它们的 $n=0$ 。为了说明巴耳末公式 $\lambda = b[m^2 / (m^2 - n^2)]$ 本身不符合实际，我们先来验算一下。巴耳末最先发现，如果 n 被固定为 2，而把 m 定为 $m=3, 4, 5$ 或 6 的话，则他的公式得出的值几乎依次与已知的四条光谱线波长完全相配。

这是瑞典物理学家埃斯特伦发现并测量和分别取名为阿尔法、贝塔、伽马和德尔塔的四条线，它们分别为 656、486、434、410nm 的波长。检验证明符合得相当的好：

$$\text{阿尔法 } \lambda = 364.56[3^2 / (3^2 - 2^2)] = 656.21$$

$$\text{贝塔 } \lambda = 364.56[4^2 / (4^2 - 2^2)] = 486.10$$

$$\text{伽马 } \lambda = 364.56[5^2 / (5^2 - 2^2)] = 433.93$$

$$\text{德尔塔 } \lambda = 364.56[6^2 / (6^2 - 2^2)] = 410.13$$

2、物质族质量谱公式推证之迷

巴耳末公式 $\lambda = b[m^2 / (m^2 - n^2)]$ 求勾股数量子化的意义不同寻常。因为科学中很多实在的东西需要实际的测量才能准确知道，但巴耳末只用一个常量 $b=364.56$ 纳米，就能得出埃斯特伦测量出的阿尔法、贝塔、伽马和德尔塔的四条光谱线，这很了不起。例如门捷列夫通过对各种化学元素的原子量大小排序，搞出了化学元素周期表，但还不能少于元素的数目的常量，用一个数学公式测算出各个化学元素的原子量。对于氢原子谱线的波长数据，用从原子系量子数轨道圆弦图和正切基角 $\theta = 45^\circ$ 出发的数据处理方法出发，我们也能合乎逻辑地导出 $\lambda = fN^2 [m^2 / (m^2 - n^2)] \text{tg}n45^\circ$ 这样的巴耳末公式。上世纪 60 年代中期，我们已经知道质子、中子等核子的下一个层次是夸克，那么物质族的数目，是否也有类似巴耳末公式的物质族基本粒子质量谱计算公式呢？

对于有这种肯定，我们已经整整奋斗和等待了半个世纪。因为 1962 年我们上高中后，就已经知道巴耳末和里德伯以经验公式作为基础的原始公式，以及后来卢瑟福-玻尔的核式弦图的解释。这很容易联系我们早已发明的三旋量子数弦谱图，但由于众所周知的原因，我们只能千呼万唤求助于“山教”的基层劳作。直到 1996 年我们才在《大自然探索》杂志第 3 期发表了《物质族基本粒子质量谱计算公式》一文，以后又在 21 世纪初相继正式出版了《三旋理论初探》和《求衡论》两书，其中都献出有我们发现的类似“巴耳末公式”的粒子质量谱计算公式：

$$M = G \text{tg}N\theta + H \quad (2-1)$$

$$m_{\uparrow} = BH \cos \theta / (\cos \theta + 1) \quad (2-2)$$

$$m_{\downarrow} = B - m_{\uparrow} \text{ (或 } B = m_{\uparrow} + m_{\downarrow} \text{)} \quad (2-3)$$

$$B = K - Q \text{ (或 } K = Q + B \text{)} \quad (2-4)$$

那么以上我们的公式真的和巴耳末公式有相似之处吗？这里我们主要以 6 个夸克的粒子来说明， $M = G \text{tg}N\theta + H$ 能够对应巴耳末公式来求 6 个夸克和 6 个轻子的系列。

1) 这是如何推证的呢？首先说原子系的波长 λ 和基本粒子系质量 M 的比例等价对应关系。众所周知，波长 λ 是一种振动，而振动是一种能量，按玻尔-爱因斯坦质能公式，能量可以转变为质量，质量可以转变为能量，这在原子-基本粒子域是常事。

2) 为何要首选正切函数 $\text{tg}N\theta$ ？因为 6 个夸克的质量的实验测量值，在直角坐标第一象限 90° 的角度内，都能在正切函数表中找到相应的数字。当然这不是一种推证的方法，但它也提供了一个说明，物质族的基本粒子质量谱，类似材料断裂或撕裂的应力计算公式，即断裂或撕裂在微观有一种剪切应力，剪切断面有小于 90° 的角度。而 90° 的角度可以分成三代，设每组系列的 3 种夸克也像紫外、可见光和红外等氢原子谱线系列的各个波长数据，也是分成 m 和 n 的正整数量子序数来对应的。

由于基本粒子是由宇宙大爆炸生成，现在测的质量，不同于宇宙生成。 m 为跃迁前的能级，应 $m \geq 1$ ；那么 n 为跃迁后回到宇宙生成的能级，应 $n=0$ 。难题现转到问基本粒子系的夸克有多少种？可分多少代？每种夸克质量是多少？在上世纪90年代以前，我们能知道宇宙是由三种基本粒子组成，它们是“上”夸克 u 、“下”夸克 d 和电子构成；质子由两个 u 夸克和一个 d 夸克构成，而中子由两个 d 夸克和一个 u 夸克构成。由于夸克质量是用与质子质量的对比来计量的，且单个夸克又不能看见，所以当时估计约定， u 夸克和 d 夸克分别为一个质子质量约0.94Gev的1/3，即约为0.3Gev。

到1991年，我们查到G·Feldman和斯坦博格发表在《科学》杂志（《科学美国人》中文版）第6期中的文章《物质族的数目》，能提供的6种夸克质量数据是：上夸克 u 、粲夸克 c 、顶夸克 t 、下夸克 d 、奇夸克 s 和底夸克 b 等的质量，分别约为：约0.01Gev、约1.5Gev、约89Gev（未见到）、约0.01Gev、约0.15Gev和约5.5Gev等。

到1996年我们发表《物质族基本粒子质量谱计算公式》的论文前，我们尽自己的能力，当时能查到的各种资料的6种夸克质量的最理想数据是：上夸克 u 、粲夸克 c 、顶夸克 t 、下夸克 d 、奇夸克 s 和底夸克 b 等的质量，分别约为：约0.03Gev、约1.42Gev、约174Gev、约0.06Gev、约0.196Gev和约4.295Gev等。我们把 90° 的角度平分三等分，每份则为 30° ；但根据不确定性原理，我们不能把基角确定为 30° ，必须小于 30° 一点点，即基角约为 30° 。这样三倍于基角时，也就不会出现是 90° 这样的正切函数，是无穷大的这种不合理的现象。所以我们把6种夸克按质量大小的顺序，分别编号为三代两组的系列，只需求出两组夸克各自共同的基角 θ 、质量轨道模数 G 和质量模参数 H ；反过来6种夸克的质量，也就能算得出与实验对应提供的数据。

3) 其演算情况，根据高中数学的排列组合及两角和与倍角的三绝函数知识，6类夸克按合理的排列组合，是四种系列，共8组3个方程联立，才能计算求解，得出各组的 θ 、 G 和 H 。这四种系列的排列组合应是：

上夸克 u 、粲夸克 c 、顶夸克 t ；下夸克 d 、奇夸克 s 和底夸克 b
 上夸克 u 、奇夸克 s 、顶夸克 t ；下夸克 d 、粲夸克 c 和底夸克 b
 上夸克 u 、粲夸克 c 、底夸克 b ；下夸克 d 、奇夸克 s 和顶夸克 t
 上夸克 u 、奇夸克 s 、底夸克 b ；下夸克 d 、粲夸克 c 和顶夸克 t

以上四种系列共8组3个方程联立的排列组合作出后，因为基角 θ 倍数分代的编号是1、2、3，没有0，设符号为 N 。为了和巴尔末公式 λ 中的 m 和 n 符号一致，仍设定符号 m ，为8组3个方程联立求解中的夸克跃迁前的能级， $m \geq 1, 2, 3$ ；符号 n ，为夸克跃迁后的能级， $n=0$ 。约定和确定后， N 、 m 和 n 是已知的正整数。我们知道质量是一种静止的能量，现在要证明 $M=GtgN\theta+H$ 与 $\lambda=b[m^2/(m^2-n^2)]tg\theta=b[m^2/(m^2-n^2)]tg45^\circ=b(m^2/n^2)$ 式等价，即 $\lambda=M$ ，就要进一步说明为什么玻尔量子数轨道圆弦图的波长 λ 的振动，是和粒子的质量超对称等价成比例对应的？它们是：

A) 弦论合并量子力学与广义相对论后认为，普朗克尺度上的空间类似于格点或网格；格线之间的空间超越了物理的范围，粒子就只能从空间的一条“线”蹦到另一条。

B) 在极端的小尺度上，我们在宏观熟悉的空间和时间并不是突然失去了意义，而是较多地转变成其他更基本的概念，如振动或自旋，我们才能走得更远。

C) 有一些办法可检验弦论。但如说标准模型，它就回答不了为什么物质是由三代基本粒子组成？由哪些粒子组成？物质为什么有三代？等等。

D) 因为粒子性质只不过是标准模型的一部分输入参数。如果粒子性质不能确定下来，标准模型就无法运作。而在弦论中，粒子的性质是由弦的振动决定的。按质能公式 $E=mc^2$ ，质量和能量可以彼此转化；粒子的质量，正是弦的振动能量。无质量的光子和引力子则对应着弦可能有的最平静温和的振动模式。在弦论中，实际振动模式是指向自旋的；不同的自旋的振动模式之间，有一种完美的平衡。如希格斯场预言的粒子，是自旋为0的振动模式与实验上发现的性质符合。但相比中国新弦学，西方的弦论振动模式太多，且所有的振动中的质量都太过巨大。

E) 玻尔放弃电子可以在任何给定的距离上围绕核运转的观念，提出电子只能占据几个选定的轨道弦，也就是“稳定态”，而不是经典物理学所允许的所有可能的轨道弦，于是他把电子的轨道弦给量子化了。现在问，量子弦论为什么要出现在对撞机周围的某几个特定的衰变弦路？因为某些标准模型法则在对撞机里是无效的；把标准模型量子数给量子弦论化，对弦论振动基本模式的这种自旋，也就像普朗克想象的黑体辐射振荡器，对能的吸收和释放以量子弦论化可推算出对撞机的粒子衰变方程一样。

F) 直线运动的物体有动量, 这个动量是物体的质量乘以速度。而在圆周中运动的物体则有一种特性叫“角动量”, 在环形轨道弦中运动的电子角动量, 是电子的质量乘以它的速度再乘以其轨道弦的半径, 表示为 $L = m v r$ 。这对弦论或任何其他进行环形轨道弦运动的物体的角动量, 都没有做任何限定。玻尔知道, 由旋转的电子形成的环弦, 它的角动量只能是 $h/2\pi$, 或 $2(h/2\pi)$ 、 $2(h/2\pi)$ 、 $3(h/2\pi)$ 、 $4(h/2\pi)$ 等形式, 直到 $n(h/2\pi)$, 其中 n 是整数。其他那些非稳定态轨道弦则被禁止。

这就像站在梯子上的人只能站在梯级上, 而梯级之间没有任何其他地方可落脚一样。在原子内部的电子所能拥有的能量也是这种情形。反过来说, 希格斯海也像能量层级的弦梯。这架希格斯弦海原子能梯子的最低一个梯级为 $n=1$, 这时电子处于第一轨道弦, 这就是最低能量的量子弦态。对氢原子来说, 最低能量希格斯梯海能量层级态, 称为“基态”, 应该是 -13.6ev , 负号表示电子受到核希格斯海的束缚。如果电子占据着除 $n=1$ 以外的任何其他轨道弦, 那么这个原子就被称为处于“激发态”。这就是:

$$\lambda = M \quad (1-3-1)$$

$$\lambda = b[m^2/(m^2 - n^2)] = b[m^2/(m^2 - n^2)] \operatorname{tg} \theta = b[m^2/(m^2 - n^2)] \operatorname{tg} 45^\circ \quad (1-3-2)$$

$$\lambda = b[m^2/(m^2 - n^2)] = b[m^2/(m^2 - n^2)] \operatorname{tg} 45^\circ = M \quad (1-3-3)$$

5) 现在如果物质族基本粒子质量谱计算公式, 按基本粒子系质量 M 与原子系波长 λ 等价的巴尔末公式来计算, 即让质量谱带上量子数多项式 $[m^2/(m^2 - n^2)]$, 公式应为:

$$M = G \operatorname{tg} N \theta + H = \lambda = b[m^2/(m^2 - n^2)] \operatorname{tg} 45^\circ = G[m^2/(m^2 - n^2)] \operatorname{tg} N \theta + H \quad (1-3-4)$$

$$M = G[m^2/(m^2 - n^2)] \operatorname{tg} N \theta + H \quad (3)$$

$$3 \text{ 个方程联立组合是: } M_1 = G[m_1^2/(m_1^2 - n_1^2)] \operatorname{tg} N_1 \theta + H \quad (3-1)$$

$$M_2 = G[m_2^2/(m_2^2 - n_2^2)] \operatorname{tg} N_2 \theta + H \quad (3-2)$$

$$M_3 = G[m_3^2/(m_3^2 - n_3^2)] \operatorname{tg} N_3 \theta + H \quad (3-3)$$

以上 (3-1、2、3) 中, $m_1=1, m_2=2, m_3=3; n_1=0, n_2=0, n_3=0$, 所以它们具体为:

$$M_1 = G[1^2/(1^2 - 0^2)] \operatorname{tg} \theta + H \quad (3-4)$$

$$M_2 = G[2^2/(2^2 - 0^2)] \operatorname{tg} 2 \theta + H \quad (3-5)$$

$$M_3 = G[3^2/(3^2 - 0^2)] \operatorname{tg} 3 \theta + H \quad (3-6)$$

以上 3 式中的 $[1^2/(1^2 - 0^2)] = 1; [2^2/(2^2 - 0^2)] = 1; [3^2/(3^2 - 0^2)] = 1$, 都等于 1, 是一个值得探讨的有趣问题。其实它的道理是, 如果把核式弦图质量起源的表叙面, 硬要投影到巴尔末公式的波长的表叙面, 质量谱被作为波长谱的一个新系列, 那么它是量子数 n 的基态为 0 的特例, 在 $\operatorname{tg} 45^\circ$ 和 $\operatorname{tg} N_3 \theta$ 这两种正切函数同时存在的情况下是互不相容的。因为质量起源还有巴拿马运河船闸-马蹄形链式量子数轨道弦图 (简称“链式弦图”), 这在下节将解释, 这里到此为止, 但计算以上方程得出的是:

$$M_1 = G \operatorname{tg} \theta + H \quad (3-7)$$

$$M_2 = G \operatorname{tg} 2 \theta + H \quad (3-8)$$

$$M_3 = G \operatorname{tg} 3 \theta + H \quad (3-9)$$

可见以上 (3-7、8、9) 方程就是 (2-1) 方程 $M = G \operatorname{tg} N \theta + H$ 的具体计算形式。因为 (3-7、8、9) 方程是按基本粒子系质量 M 与原子系波长 λ 等价的巴尔末公式计算得来的, $M = G[m^2/(m^2 - n^2)] \operatorname{tg} N \theta$ 与巴尔末公式 $\lambda = b[m^2/(m^2 - n^2)] \operatorname{tg} \theta = b[m^2/(m^2 - n^2)] \operatorname{tg} 45^\circ$ 等价, 而 $\lambda = b[m^2/(m^2 - n^2)] \operatorname{tg} 45^\circ$ 又与巴尔末公式 $\lambda = b[m^2/(m^2 - n^2)]$ 等价, 得证 $M = G \operatorname{tg} N \theta + H$ 与巴尔末公式 $\lambda = b[m^2/(m^2 - n^2)]$ 等价。证毕。

二、希格斯海巴拿马运河船闸-马蹄形链式量子质量弦图

什么是希格斯海巴拿马运河船闸-马蹄形链式量子数轨道弦图? 巴尔末多项式说明链式弦图型的 $M = G \operatorname{tg} \theta_n = G \operatorname{tg} (\theta \pm \theta_n)$ 的意义是什么? 这是以下需要讨论的。

众所周知, 自然界存在一些基本常量。仅在标准模型中, 就有 28 个基本常量; 它们在物理公式中属于耦合常数, 是靠实验测得的。所以减少一个基本常量, 都是科学的重大进步。而巴尔末公式为我们提供的, 正是一种减少基本常量的方法和范例。因此如果仅说后来把所有光谱分成线系都是起源于巴尔末公式的发现, 但这种评价巴尔末公式对原子光谱理论和量子物理的发展影响, 还不够。

1、巴尔末公式常量 b 之谜

1) 在式 (1-3-1, 2, 3, 4) 中, 通过证明 $\lambda = M$, 虽得出巴尔末公式与核式弦图质量谱公式有等价性, 但在减少基本常量数方面后者没有可比性。例如, 两组夸克系列, 各组是 3 种夸克, 而质量谱公式各组仍然需要 3 个未知的公共因子: 即质量轨道模数 G 、质量轨道基角 θ 、质量模参数 H , 才计算得出来。质量谱公式减少基本常量数的方法, 是要通过整个方程组来实现的。即使如此, 质量谱计算公式减少基本常量数也还是

有限。但巴尔末公式的减少基本常量数的量却很大，可以说在氢原子系列只需一个基本常量。这很令人羡慕。那么在夸克系列是否也只需一个基本常量？质量量子数多项式 $[m^2/(m^2-n^2)]$ 对应核式弦图是一些轨道圆，那么链式弦图的量子数多项式是怎样一种结构？作为生命起源与宇宙起源对应，著名的生殖整数数列也可以是量子数吗？

2) 作为核式弦图的勾股数量子化传奇，巴尔末和后来者们也许没有想到只需一个基本常量的秘密。这不奇怪，和我们一样，巴尔末本身的人生和公式的提出就已经够曲折。巴尔末是一个女子学校的数学老师，只是在贝塞尔大学兼职。由于他对数字游戏有兴趣，在大学兼职期间，该校一位研究光谱的物理学教授哈根拜希，鼓励他去寻找氢原子光谱的规律。因为埃斯特伦等人在 1850 年代已对氢光谱可见光区波段的 4 条谱线有精确测定；通过观测恒星光谱又发现紫外波段的 10 条谱线，然而它们波长的规律尚不为人所知。巴尔末从寻找可见光波段 4 条谱线波长的公共因子和比例系数入手，否定了将谱线类比声音的思路。快满 60 岁时，巴尔末才受投影几何的启发，利用几何图形为这些谱线的波长，确定了一个公共因子 $b=364.56$ 纳米，写出了巴尔末公式。

巴尔末公式计算出的波长与埃斯特伦实际测量值符合得非常好，但埃斯特伦在 1874 年 59 岁已经去世。随后，巴尔末又继续推算出当时已发现的氢原子全部 14 条谱线的波长，结果也和实验值完全符合。1884 年 6 月 25 日，在贝塞尔自然科学协会的一次演讲中，巴尔末指出氢的光谱线的波长，可以由两个因数相乘而得到。同年又将其这个公式发表在当地一个刊物上，1885 年又刊载在《物理、化学纪要》杂志上。几年后，巴尔末又发表了有关氢光谱和锂光谱的各谱线频率之间的类似关系。

3) 前面我们验算过巴尔末的 $n=2$ 的四条可见区的氢原子光谱线。而巴尔末公式还表示过氢原子光谱的其他线系的波长值，我们还没有验算。根据核式弦图的勾股数量子化的秘密，我们在 (1-2) 式中推证得出所有的 $\lambda = b[m^2/(m^2-n^2)]\text{tg}\theta = b[m^2/(m^2-n^2)]\text{tg}45^\circ = b(m^2/n^2) = b(m/n)^2$ ，即只需一个基本常量，而不是巴尔末讲的需要基本常量“两个因数相乘而得到”。谁更准确呢？我们来检验。

由于氢原子光谱还存在于紫外域和红外域，如莱曼系 $n=1$ 、帕邢系 $n=3$ 、布喇开系 $n=4$ 、芬德系 $n=5$ 、汉弗莱系 $n=7\dots$ 。但我们是库马尔《量子理论》一书 83 页图 7 “能量层级，光谱线和量子跃迁”提供的定位在研究巴尔末公式。我们觉得，从原子系量子数轨道圆弦图和正切基角 $\theta = 45^\circ$ 出发，虽然巴尔末公式 $\lambda = b[m^2/(m^2-n^2)]$ 中的 m 和 n ，是人为约定的简单的整数，但实际计算这些可见光系的四条光谱线的常量，只需一个 $b=364.56$ 纳米。巴尔末实在厉害，是他减少了 3 个测量数。

但不仅如此，如果巴尔末公式是我们讲的 $\lambda = b[m^2/(m^2-n^2)]\text{tgn}\theta = b[m^2/(m^2-n^2)]\text{tgn}45^\circ = b(m^2/n^2)$ ，那么通过把公式中的 n 约定为 $n=1, 3, 4$ 和 5 ，而让 m 轮番取不同的数值，就像巴尔末把 n 定为 $n=2$ 来产生 4 条最初已知的光谱线那样，也还能用一个常量，预测出氢原子在红外及紫外区域中存在着其他系列的光谱线。

4) 例如，当 $n=3$ ； $m=4, 5$ 和 6 时，产生的红外线帕邢系列，我们的验算结果是：

$$m=4, \lambda = 364.56[4^2/(4^2-3^2)] = 833.28; \quad (1875, b=818.78)$$

$$m=5, \lambda = 364.56[5^2/(5^2-3^2)] = 569.63; \quad (1282, b=821.80)$$

$$m=6, \lambda = 364.56[6^2/(6^2-3^2)] = 486.10, \quad (1094, b=822.56)$$

红外线帕邢系列弦统计平均实际 $b = (821.80+821.80+822.56) \div 3 = 821.05$

5) 当 $n=1$ ； $m=2, 3, 4, 5$ 和 6 时，产生的紫外线莱曼系列，我们的验算结果是：

$$m=2, \lambda = 364.56[2^2/(2^2-1^2)] = 486.1; \quad (122, b=91.73;)$$

$$m=3, \lambda = 364.56[3^2/(3^2-1^2)] = 410; \quad (103, b=91.15;)$$

$$m=4, \lambda = 364.56[4^2/(4^2-1^2)] = 388.86; \quad (97, b=90.65;)$$

$$m=5, \lambda = 364.56[5^2/(5^2-1^2)] = 374.75; \quad (95, b=91.35;)$$

$$m=6, \lambda = 364.56[6^2/(6^2-1^2)] = 374.98; \quad (94, b=91.26;)$$

紫外线弦统计平均实际 $b = (91.73+91.15+90.65+91.35+91.26) \div 5 = 91.23$

6) 以上 λ 计算式后的括弧内的第 1 个数据，是库马尔《量子理论》书中图 7 提供的。据此，我们分别求出每条光谱线的实际 b 值，以代换按巴尔末可见光系 b 不变的 $b=364.56$ 纳米值。我们再分别将红外和紫外系列每条光谱线中的 b 值作统计平均，求出以上统一的 b 值，这样 8 条光谱线，分别只需 2 个实际的 b 值。可见光及红外和紫外系列共 12 条光谱线，分别只需 3 个实际的 b 值。

7) 其实由新巴尔末公式 $\lambda = b (m^2/n^2)$ 定位, 这 12 条光谱线, 只需 1 个实际的 b 值足够了。因为如果把可见光及红外和紫外系列的 3 个实际的 b 值, 按紫外: 可见光: 红外的 b 值大小顺序求比例, 其比值与它们之间的这个顺序编号 ($N=1, 2, 3$) 的平方相近。即: $91.23: 364.56: 821.05=1:4:9=1^2: 2^2: 3^2$ 。这是因原子系量子数轨道圆弦图属于一个 $\text{tgn}45^\circ$ 函数系列勾股数的道理。即如果把以上紫外、可见光和红外等光谱系列, 看成是一个 $\text{tgn}45^\circ$ 函数统一体的原子系量子数船闸链式弦图的 3 代或 3 座码头, 按编号大小顺序分别为 $N=1, 2, 3$, 那么巴尔末公式的基本常量 b 值可扩充为:

$$b = fN^2 \quad (4)$$

即在氢原子光谱系列中, 按紫外、可见光、红外的波长值大小顺序编号为 $N=1, 2, 3$ 的序列, 那么只需 1 个实际的基本常量值就足够了。我们设这个新巴尔末常量符号为 f , 来代替原先的符号 b , $f=91.23$ 纳米, 那么新的 2013 年型的巴尔末公式为:

$$\lambda = fN^2 [n^2/(n^2 - m^2)] \text{tgn}45^\circ = fN^2 (n^2/m^2) \quad (1-4-1)$$

$$\lambda = fN^2 (n^2/m^2) = fN^2 (n/m)^2 \quad (1-4-2)$$

8) 这里的 f 、 N 、 m 、 n 等四个数, 是一个“超对称体”, 或“超对称群体”结构数。“超对称”体有两类, 一类是空间从立方体到超立方体的扩倍; 另一类是自旋从基角 θ 到周期的旋转。如把 N 、 m 和 n 三个正整数量子数看成是长方体的三条边长, f 就是这个长方体的三条边长扩大的倍数, 那么可见光及红外和紫外系列的光谱, 就类似分属不同系列的一些“超对称”长方体。由此对应粒子的波长谱、质量谱、能量谱, 可说明质量在原子系的元素和其同位素的多元化, 在基本粒子系的粒子和其超伴子的超对称, 以及物质是由大爆炸宇宙统一起源来的。那么还有没有自旋超对称体呢?

2、核式弦图与链式弦图之争

从验算巴尔末公式, 使我们想到要再次验算物质族基本粒子质量谱计算公式。在 21 世纪前, 我们能查到 6 种夸克质量的最理想数据是: 上夸克 u 、粲夸克 c 、顶夸克 t 、下夸克 d 、奇夸克 s 和底夸克 b 等的质量分别为: 约 0.03Gev、约 1.42Gev、约 174Gev、约 0.06Gev、约 0.196Gev 和约 4.295Gev 等。用 (3-7、8、9) 方程组来计算以上 6 类夸克, 8 组 3 个方程联立求解 θ 、 G 和 H , 合理的排列组合是分四个系列。

计算十分繁难, 不是每个系列的两组排列组合都合理, 但最终得出的结果是: 上夸克 u 、粲夸克 c 和顶夸克 t 是一组, 与下夸克 d 、奇夸克 s 和底夸克 b 是另一组结合。由 $M_1 = G \text{tgn} \theta + H$ 、 $M_2 = G \text{tgn} 2\theta + H$ 、 $M_3 = G \text{tgn} 3\theta + H$ 等 3 个方程联立求解 θ 、 G 和 H , 由实验数据反求的结果, 第一组和第二组各自的 θ 、 G 和 H 等基本常量值和验算分别是:

第一组的上、粲、顶夸克为: $\theta = 29^\circ 52'$ 、 $G=1.22$ 、 $H=-0.671$

第二组的下、奇、底夸克为: $\theta = 29^\circ 27'$ 、 $G=0.124$ 、 $H=-0.01$

上夸克 u : $M_1 = G \text{tgn} \theta + H = 1.22 \times \text{tgn} 29^\circ 52' - 0.671 = 0.03 \text{Gev}$

粲夸克 c : $M_2 = G \text{tgn} 2\theta + H = 1.22 \times \text{tgn} 59^\circ 44' - 0.671 = 1.42 \text{Gev}$

顶夸克 t : $M_3 = G \text{tgn} 3\theta + H = 1.22 \times \text{tgn} 89^\circ 36' - 0.671 = 174 \text{Gev}$

下夸克 d : $M_1 = G \text{tgn} \theta + H = 0.124 \times \text{tgn} 29^\circ 27' - 0.01 = 0.06 \text{Gev}$

奇夸克 s : $M_2 = G \text{tgn} 2\theta + H = 0.124 \times \text{tgn} 58^\circ 54' - 0.01 = 0.196 \text{Gev}$

底夸克 b : $M_3 = G \text{tgn} 3\theta + H = 0.124 \times \text{tgn} 88^\circ 21' - 0.01 = 4.295 \text{Gev}$

1) 以上 6 个夸克需要 θ 、 G 和 H 两组 6 个基本常量, 一个没有少; 看来核式弦图质量谱公式起不到减少, 只勾股数边的分析作用。那么这个核式弦图是怎么回事呢?

作类似光谱线和量子跃迁的能级圆弦图, 作图的方法是: 用 X 轴和 Y 轴作平面直角坐标系, O 为坐标原点。设 $G=1$ 为半径作单位质量圆, $\angle n\theta$ 角的一边与圆交于 B 点, 过 B 点作质量圆的切线交于 X 轴的 C 点。再以 O 为圆心, OC 为半径作圆, 即为粒子对应的质量轨道。反之, 该轨道对应严格的质量轨道角, 它们各分成两组三代, 具有确定的值, 不能连续变化, 只能在确定值之间跳跃; 这种质量轨道角几乎三等分直角坐标系的第一象限角, 即与 30° 、 60° 、 90° 接近。与光谱线的勾股数相比, 这里 6 个夸克只有直角边 G , 设为单位圆一个常量可固定, 类似光谱线所属那个 $\text{tgn}45^\circ$ 函数。

另一条在切线上的直角边和它切割的弦长，是跑动的。只有已知的代数 N 量子数才起到一点作用。即是说这里的 N 、 m 和 n 等三个正整数量子数没有形成“超对称”长方体，要让它们起到减少基本常量作用，只有让它们进入自旋超对称体。这时质量轨道基角 θ 作为“稳定态”，处于最低能级，成为夸克轨道弦上运动“基态” θ 的始态或终态。而作为夸克质量运动定态 M 的始态和终态，它流落在正切函数表中的数值中，成为夸克轨道弦上运动的“激发态”或“非稳定态”。

事情正是这样，1996 年发表《物质族基本粒子质量谱计算公式》后的近 18 年中，我们希望 6 种夸克的实验测量值趋于一个较相同的稳定，但情况相反。例如我们搜集到三本专著：2008 年 4 月出版的[英]安德鲁·华生的《量子夸克》（下称华著）；2010 年 7 月出版的陈蜀乔的《引力场及量子场的真空动力学图像》（下称陈著）；2012 年 4 月出版的[美]布赖斯·格林的《宇宙的结构》（下称格著），提供的 6 种夸克，上夸克 u 、粲夸克 c 、顶夸克 t 、下夸克 d 、奇夸克 s 和底夸克 b 等的质量分别是：

华著为：约 0.004Gev、约 1.3Gev、约 174Gev、约 0.007Gev、约 0.135Gev 和约 4.2Gev 等（下称华生夸克质量）。陈著为：2~8Mev、1.3~1.7Gev、137Gev、5~15Mev、100~300Mev、和 4.7~5.7Gev 约 4.2Gev 等（下称陈蜀乔夸克质量）。格著为：0.0047Gev、1.6Gev、189Gev、0.0074Gev、0.16Gev 和 5.2Gev 等（下称格林夸克质量）。

我们采用 2012 年格林夸克质量数据为标准，运用前面讲的排列组合四种系列和以上（3-7、8、9）方程，分 8 组 3 个方程联立计算求解各组的 θ 、 G 和 H 。这 3 个方程 $M_1 = Gtg\theta + H$ 、 $M_2 = Gtg2\theta + H$ 、 $M_3 = Gtg3\theta + H$ 联立，但 8 组中 8 个夸克质量轨道连其基角 θ 也难得出合理的配对，更不说 G 和 H 了。其实这 18 年来我们没有停止过对质量谱计算公式的机制的研究。物质是宇宙的眼睛，研究微观粒子没有弦图，就没有科学。

2) 在这里要说明的是，最先我们认为时空撕裂产生质量，就分宇宙创生和一般的场相互作用力的两级撕裂。因为宇宙创生，真空撕裂总是以轨道能级出现。而在一般的场相互作用中，只起类似轨形面不平的摩擦撕裂效应；如果达不到宇宙创生级的能量，摩擦撕裂出的亚原子粒子，不再是时空撕裂宇宙创生的轨形组合。

后来我们从希格斯场公式的基础是希格斯海“度规格子”出发，把撕裂温和为“船闸”模型。希格斯海“度规格子”和类似长江三峡大坝的“船闸格子”或巴拿马运河的“船闸格子”是可以相通的。希格斯粒子类似希格斯海中的拖船、驳船或起重吊船、锚泊船。这样就出现了对称和超对称两类质量谱生存模具：对称型是长江三峡大坝船闸模具，船闸存在于长江中段；超对称型是巴拿马运河船闸模具，它类似运河两端进出有三座三级船闸，围起巴拿马地峡的热带雨水，形成一种高高的悬河，河道可以双向通行，让船只其中来来往往，好像一幅宇宙物质世界图景。

如果说巴拿马运河是人类在美洲大陆上的一次外科手术；对巴拿马而言，运河不是一条手术疤痕，而是它最清晰的面孔，那么宇宙大爆炸就是我们时空的一次自手术，物质质量谱对时空而言也不是自手术的疤痕，而是对人类认识宇宙最深沉的呼唤。

例如在标准模型，存在 28 个基本常量。这是一个非常大的数字。因为基本常量是一个出现在自然定律中而且无法被计算的量，只能通过实验来测定。所以一直有不少人试图减少基本常量的数目，但迄今为止没有取得任何成功。物质族基本粒子质量谱计算公式，就是为减少基本常量的数目而作的最深沉的呼唤回应。因为 28 个基本常量中包括有电子、 u 夸克和 d 夸克等稳定粒子的质量，和不稳定粒子由 w 和 z 玻色子， μ 和 τ 轻子、3 个中微子，4 个重夸克 s 、 c 、 b 、 t 等的质量以及携带的类似精细结构常数的自由参数、混合角和相位参量等，都要求人类给出。

质量谱计算公式 $M = GtgN\theta + H$ 运用“船闸”模型落差顺次模数、顺次基角、顺次参数等 14 个主要新参量来计算总共 61 种的夸克、轻子和规范玻色子的质量，虽然它们需要实验测量或设定，但这 14 个新参量的数目比 28 个基本常量中包括的稳定与不稳定夸克、轻子和规范玻色子的质量，以及它们携带的类似精细结构常数的自由参数、混合角和相位参量等的总数目少点，也就减少了 28 这个数字的总量。但是还比不赢巴尔末公式运用的勾股数，而像 1869 年俄国门捷列夫在编制化学元素周期表，得出元素原子量的大小有周期性的依赖规律一样，不是量子数的定量，只是定性。

关于运河两端进出有三座三级船闸的分代，日本小林诚和益川敏英基于卡比博的一次“分代”思想，也只是提出在强相互作用中存在三次“分代”的思想，但这也还不是我们的巴拿马运河船闸链式弦图类似巴尔末多项式勾股量子数 $(Nm)^2 / (m^2 - n^2)$ 的定量的意思，只是对此的一些定性的暗示。这里物质起源生成之难，难似过巴拿马船闸的受限。但坚持根据小林-益川理论和巴尔末多项式勾股数进行研究，分类排出物质族基本粒子质量谱量子数，也类似相应于巴拿马运河当局设计的那套复杂的规则。

3) 具体来说格林夸克质量给的6个夸克“船”，要过“船闸”，量子数分类弦图如果只留下一个基本常量，就只能是留给质量轨道基角 θ 。因为6个夸克的质量数据值，在正切函数表中都能查到，反求它们对应的质量轨道角度后，这是用通过实验确定 $\theta = ? \text{Gev}$ 的方法。有了基角 θ 常量，通过“自旋超对称体”的3个量子数平衡调节基角 θ 的倍数，就能得知6个格林夸克质量。这里要说是正切函数和起平衡调节作用的“超对称体”3个量子数的相互关系。实际不管是核式弦图还是链式弦图，都离不开它们，这是一种相辅相成的关系。在长方体或自旋周期的超对称体量子数确定的曲线，是轨道圆环；波长或质量轨道角度正切函数确定的曲线，只能是直线或半个抛物形曲线。这两种轨迹线路的交点，才是具体粒子的波长或粒子的质量的实际分布。

以格林夸克质量为例，为了通过实验确定 θ 值，我们要把通过正切函数表中查到的6个夸克质量值对应的正切函数的角度，因它们是分别以角的度数和分数表示的，为了便于计算，就需要统一换算为角度的分数值。例如，0.0047Gev上夸克 $u=15'$ ；0.0074Gev下夸克 $d=17'$ ；0.16Gev奇夸克 $s=545'$ ；5.2Gev底夸克 $b=4747'$ ；1.6Gev粲夸克 $c=3480'$ ；189Gev顶夸克 $t=5381'$ 。现在我们直接用它们的角度分数值表示6个夸克的质量值，用X轴和Y轴作平面直角坐标系的方法来表示格林夸克质量的超对称体的两种轨迹线路。X轴和Y轴都同用角度的分数值的 $1'$ 为单位“1”，这样作出整个 90° 内的正切函数确定的曲线，它是一条开口朝向Y轴正方向的半个抛物形曲线。再以格林夸克质量的6个自旋周期“超对称体”量子数平衡调节的质量值15、17、545、4747、3480、5381等，分别为半径，作质量轨道圆环弦线。

这时圆环弦线和正切函数半个抛物形曲线的交点，就是格林夸克质量的6个夸克在X轴和Y轴作平面直角坐标系中的具体位置。连接这6个点的轨迹，是一条带弯度的曲线，不是那种反映粒子波长勾股量子数的长立方体的对角线式的直线。但问题的难度却大大增加了，因为要重新设计不同于同心圆，而又能找到安排合理的量子数摆布的链式弦图，谈何容易？巴尔末公式的统一的 $\text{tgn}45^\circ$ 的量子数多项式是：

$$N^2 [m^2 / (m^2 - n^2)] \text{tgn}45^\circ = N^2 [m^2 / n^2] \text{tgn}45^\circ = N^2 [(m/n)^2] \text{tgn}45^\circ \quad (1-4-3)$$

其中量子数对应基态、稳定态、非稳定态、激发态、始态、终态的安排，在同心圆的弦图上都容易摆布；在众多光谱线系列也容易统一。但在链式弦图中却不相同。以格林夸克质量为例，要统一平衡调节质量值15、17、545、4747、3480、5381等的自旋周期“超对称体”量子数，不能用同心圆弦图，而以粒子费曼图和船闸巴拿马运河为蓝本，例如连接运河两端船闸的轨迹是直线；两端有船闸，是对称，也是超对称，也可能是超对称破缺，但超对称破缺的量子数如何表达？设计出的超对称破缺的“船闸链”式弦图，虽然可以有多种，但如果运河和两端船闸的实体一旦修好，这是不能变更的，可以变的只能是码头的编码编号，即可动的只能是量子数，那么这些量子数如何分类和布局呢？要破解格林夸克质量谱存在一个常量的秘密，离不开分解多项式。

4) 下面是我们对格林夸克质量谱正切函数角度值分拆的多项式，它是有规律的：

$$\text{上夸克 } u: 15 = 15 (1 \times 1) + 0 \approx 15 \times 6^0 \times (1 \times 1) + (1 \times 1)^2 = 16$$

$$\text{下夸克 } d: 17 = 15 (1 \times 1) + 2 \approx 15 \times 6^0 \times (1 \times 2) - (1 \times 2)^2 = 26$$

$$\text{奇夸克 } s: 545 = 545 (1 \times 1) + 0 \approx 15 \times 6^2 \times (1 \times 1) + (1 \times 2)^2 \approx 544$$

$$\text{粲夸克 } c: 3480 = 545 \times (3 \times 2) + 210 \approx 15 \times 6^2 \times (2 \times 3) + (4 \times 4)^2 \approx 3496$$

$$\text{底夸克 } b: 4747 = 545 \times (3 \times 3) - 158 \approx 15 \times 6^2 \times (3 \times 3) - (3 \times 4)^2 \approx 4716$$

$$\text{顶夸克 } t: 5382 = 545 \times (2 \times 5) - 477 \approx 15 \times 6^2 \times (2 \times 5) - (2 \times 2)^2 \approx 5384$$

3、向链式弦图进军

以上各式中后面的两对乘积多项式，是否有和巴耳末公式的量子数多项式相似的规律？我们按有规律相似的情况配对，这类航道归口及量子数有多种。以下就是对格林夸克质量谱中6个夸克质量值，分解成的含有量子数字的多项式：

$$(15-6-0-1-1-1-1) \text{ 上夸克 } u = 15 \times 6^0 \times (1 \times 1) + (1 \times 1)^2 \quad (4-1)$$

$$(15-6-0-1-2-1-2) \text{ 下夸克 } d = 15 \times 6^0 \times (1 \times 2) - (1 \times 2)^2 \quad (4-2)$$

$$(15-6-2-1-1-1-2) \text{ 奇夸克 } s = 15 \times 6^2 \times (1 \times 1) + (1 \times 2)^2 \quad (4-3)$$

$$(15-6-2-2-5-2-2) \text{ 顶夸克 } t = 15 \times 6^2 \times (2 \times 5) - (2 \times 2)^2 \quad (4-4)$$

$$(15-6-2-2-3-4-4) \text{ 粲夸克 } c = 15 \times 6^2 \times (2 \times 3) + (4 \times 4)^2 \quad (4-5)$$

$$(15-6-2-3-3-3-4) \text{ 底夸克 } b = 15 \times 6^2 \times (3 \times 3) - (3 \times 4)^2 \quad (4-6)$$

以上分拆的6个式中的数字，有很强的全息性。如上式前面括号内的那些量子数字，类比玻尔的量子能级理论，类比巴尔末公式中的常量 f 和量子数字 N 、 m 、 n 等四个数，马蹄形链式弦图中的常量和量子数字的意义是什么呢？首先“15”作为质量轨道圆弦基角 θ 这个共同的常量数角度分数，能确定下来，即 $\theta = 15'$ 。第二，“6”作为粒子夸克的共同数目类似一个繁殖系数，能确定下来。那么剩下的代表的量子数符号的什么意义呢？如含有的“0”，是否类似粒子质量谱的基态或终态？而且只有选择合理的马蹄形链式弦图，它们的位置才会恰当地出现在质量谱量子数多项式中；这类正整数数值链，自然界中有没有同它们类似的现象？这使我们想到著名的斐波那契生殖数列的组合排列。

1) 1228年意大利数学家斐波那契在修订的《算盘书》中增加了一道兔子繁殖问题：假如兔子生下后的第二个月便有生殖能力，且每对兔子每月恰好生一对小兔（一雌一雄）的话，那么今有一对小兔，按上面所说的情况繁殖，问一年后将有多少对兔子？即斐波那契从兔子繁殖问题中提出了一个数列：1、1、2、3、5、8……，从第三个数开始，每个数都是前两个数的和，继续推理下去仍是如此。

这一奇特的数列，也出现在其他很多地方，而称为斐波那契数列。斐波那契数列发人深省，这类问题的本质是有两类兔子：一类是能生殖的兔子，称为成年兔子。新生的兔子不能生殖；新生兔子一个月就长成成年兔子。求的是成年兔子与新生兔子的总和。每月新生兔对数等于上月成年兔对数。每月成年兔对数等于上个月成年兔对数与新生兔对数之和。斐波那契数列的性质其中有：相邻的斐波那契数之平方和(差)仍为斐波那契数；对连续的斐波那契数，首尾两项之积，与中间项平方之差为1等。

格林夸克质量对称破缺的巴拿马运河船闸-马蹄形链式弦图的摆布，和链式轨道弦图量子数多项式摆布的性质，就是以上6个格林夸克质量谱正切函数角度值分拆的多项式反映的性质。它们是否也类似斐波那契数列在其它地方的应用，如①花瓣数中的斐波那契数、②向日葵花盘内葵花子排列的螺线数？

向日葵花盘内，种子是按对数螺线排列的，有顺时针转和逆时针转的两组对数螺线。两组螺线的条数往往成相继的两个斐波那契数。1993年才给出的解释是：这是植物生长的动力学特性造成的；相邻器官原基之间的夹角是黄金角——137.50776度；这使种子的堆集效率达到最高。那么对应马蹄形链费曼图式的基态、稳定态、非稳定态、激发态、始态、终态等类似概念的量子数安排，通过此类大量弦图的分析会发现，存在微妙的“波浪”规律。众所周知，分析计算光谱线波长量子数多项式，是离不开弦图的；同样，要分析计算质量谱，求证合理的量子数多项式，也是离不开弦图。

2) 但符号编码的复杂性和数字计算的复杂性，还在于具体到每个夸克的计数时，因为在链式弦图的所在位置都不一样，需要确定唯一的链式弦图。我们给出的是不管蹄口左右向平行摆放，还是蹄口上下向竖直摆放，摆放形式不类似而又能合理的马蹄形链，整体如全息式“U”型的分形图示。以马蹄形磁铁蹄口向下摆放为例，是以三个大小不同的马蹄形磁铁蹄口向下的重叠摆放，但又稍有变化。

如将上夸克 u_{15} 和下夸克 d_{17} 构成的一个小马蹄形，称为1号马蹄形；蹄口向下摆放，作为整体“U”型的一边磁极。而作为马蹄形全息的再延伸，是将称为2号马蹄形的奇夸克 s_{545} 与顶夸克 t_{5381} 构成的一个最大的马蹄形，和称为3号马蹄形的粲夸克 c_{3480} 与底夸克 b_{4747} 组成的另一个次大的马蹄形，两者蹄口向下并重叠起来，再把它们各自下端一边的磁极，如奇夸克 s_{545} 和粲夸克 c_{3480} 联接到1号马蹄形的弯背处，作为整体“U”型另一边的磁极。整体“U”型另一边的磁极，是底夸克 b_{4747} 在内，顶夸克 t_{5381} 在外的平行摆放。所以属于整体“U”型，上夸克 u_{15} 、下夸克 d_{17} 、奇夸克 s_{545} 和粲夸克 c_{3480} 等是同为一极，设其大极量子数的编码符号为的 m ，这4个是同起 $m=1$ ；而底夸克 b_{4747} 和顶夸克 t_{5381} 作为大极的另一极，是同起 $m=2$ 。

其次，整体“U”型类似双航道，按质量大小从开端到终端，是分成三级码头层级，设其层级量子数的编码符号为的 n ，上夸克 u_{15} 和下夸克 d_{17} 属于开端层级，是同起 $n=1$ ；奇夸克 s_{545} 和粲夸克 c_{3480} 是同起联接到1号马蹄形的弯背处，属于中间层级，是同起 $n=2$ ；底夸克 b_{4747} 和顶夸克 t_{5381} 属于终端层级，是同起 $n=3$ 。而在这三个层级的各自两个夸克由于所属位置有内外之分，上夸克 u_{15} 、奇夸克 s_{545} 和顶夸克 t_{5381} 等，是同起属于在整体“U”型的外层，同起 $m=1$ ；下夸克 d_{17} 、粲夸克 c_{3480} 和底夸克 b_{4747} 等，是同起属于在整体“U”型的内层，同起 $m=2$ 。等等，可见一种夸克的量子数不是不变的，而且可以是相同或不相同。

另外为了便于量子数计量，还可以将此“U”型全息式分形图，变换为“X”型的直线交叉式简图。“X”的交叉点包含奇夸克 s_{545} 和粲夸克 c_{3480} ，其外的四端分别是上夸克 u_{15} 、下夸克 d_{17} 、底夸克 b_{4747} 、顶夸克 t_{5381} 组成。设这种不连接的端点，其量子数的编码符号为 n ，按质量大小它们分别 $n=1、2、3、4$ 。而将这4个端点和“X”中间的交点，归属极点或码头，设其量子数的编码符号为 m ，按质量大小和码头层

级，中间交点的奇夸克 s545 和粲夸克 c3480 的 m 同起 $m=3$ ；而前面那四端不连接的端点的 4 个夸克又分别为 $m=1、2、4、5$ 。可见在这里同一个夸克的量子数也不是不变的。

除此之外，马蹄形下端底联接到马蹄形的弯背处的，属于到站码。另外在弦图中，每个马蹄形除了本极的码号数字外，还有大小走向的来源问题；如有出现大于本极的码号数字的计量，就是本极的码号数字加上了来源那极的码号数字，所以作为单独的航道编号编码，这也是多项式中同一个夸克的量子数值变大的原因。

3) 这里再来说以上多项式指数中的 0 和 2，这类似两类兔子：新生的兔子不能生殖，类似指数“0”；能生殖的兔子类似指数“2”。1 号马蹄形是类似“新生的兔子”，0 在宇宙大爆炸时类似“有生于无”。从 2 号马蹄形和 3 号马蹄形开始，都类似“成年兔子”。我们把这种类似的生殖系数的量子数，设它的编码符号为 f ， $f=6^2$ 或 6^0 。

其次，以上 (4-1、2、3、4、5、6) 等 6 式中，(1×1) 和 (1×1)、(1×2) 和 (1×2)、(1×1) 和 (1×2)、(2×5) 和 (2×2)、(2×3) 和 (4×4)、(3×3) 和 (3×4) 等，各个配对中里的第一项，如 (1×1)、(1×2)、(1×1)、(2×5)、(2×3)、(3×3) 等 6 项里的组合，称为首部量子数，设编码符号为 S ，再设 $S=n \times m$ 。其次，6 式中各个配对里的第二项，如 (1×1)、(1×2)、(1×2)、(2×2)、(4×4)、(3×4) 等，称为尾部量子数，设编码符号为 W ，再 $W=m \times n$ 。这里 S 和 W 中的那些数字，不全是单纯的编码号数。作为整体马蹄形的两极，由于航道多少是对称破缺的，但作为类似单独航道的夸克，仍然是按两边各自质量的大小编号编码的。此类 $n=1、2、3、4$ ，和 $m=1、2、3、4、5$ 。因此如设 $S=nm$ ， $W=mn$ ，由此在大多数时候， $S \neq W$ ，但少数时也可 $S=W$ ，这也是以上 6 式配对的来历。

4) 总结以上全部的研究和分析，现在我们可以得出新量子数质量谱公式的格林夸克质量谱中，对应的正切函数的角度 $\angle \theta_n$ 的分数值 θ_n 公式：

$$\theta_n = \theta fS \pm W^2 \quad (5)$$

(5) 式中 $\theta = 15'$ ，称为质量基角。 f 称为质量繁殖量子数， $f=6^2$ 或 6^0 。 S 称为首部量子数， W 称为尾部量子数； $S=n \times m$ ， $W=m \times n$ ，但大多数时候 $S \neq W$ ，少数时也可 $S=W$ ；其中 $m=1、2、3、4、5$ ， $n=1、2、3、4$ 。由此格林夸克质量谱公式为：

$$M = G \operatorname{tg} \theta_n = G \operatorname{tg} (\theta fS \pm W^2) \quad (6)$$

由于 $G=1\text{Gev}$ ，上式可写为 $M = \operatorname{tg} (\theta fS \pm W^2)$ 。我们可以向世界宣布，新量子数质量谱公式只需要用一个质量基角常量 $\theta = 15'$ ，就可以求出格林夸克质量谱中的 6 个夸克质量值。设 G 为质量单位符号， $G=1\text{Gev}$ ，下面是我们的验算：

$$\text{上夸克 } u: M_1 = G \operatorname{tg} (\theta fS \pm W^2) = \operatorname{tg} \theta_1 = \operatorname{tg} 16' = \operatorname{tg} 0^\circ 16' = 0.0046\text{Gev}$$

$$\text{下夸克 } d: M_2 = G \operatorname{tg} (\theta fS \pm W^2) = \operatorname{tg} \theta_2 = \operatorname{tg} 26' = \operatorname{tg} 0^\circ 26' = 0.0076\text{Gev}$$

$$\text{奇夸克 } s: M_3 = G \operatorname{tg} (\theta fS \pm W^2) = \operatorname{tg} \theta_3 = \operatorname{tg} 544' = \operatorname{tg} 9^\circ 4' = 0.16\text{Gev}$$

$$\text{粲夸克 } c: M_4 = G \operatorname{tg} (\theta fS \pm W^2) = \operatorname{tg} \theta_4 = \operatorname{tg} 3495' = \operatorname{tg} 58^\circ 15' = 1.6\text{Gev}$$

$$\text{底夸克 } b: M_5 = G \operatorname{tg} (\theta fS \pm W^2) = \operatorname{tg} \theta_5 = \operatorname{tg} 4716' = \operatorname{tg} 78^\circ 36' = 5.0\text{Gev}$$

$$\text{顶夸克 } t: M_6 = G \operatorname{tg} (\theta fS \pm W^2) = \operatorname{tg} \theta_6 = \operatorname{tg} 5384' = \operatorname{tg} 89^\circ 44' = 202\text{Gev}$$

三、玻尔对巴尔末公式再发现是必需转向量子弦论

1、2012 年是粒子物理迎来革命的转折之年

科学是一种类似手术和自手术的现象。人类做工程、做实验，是对自然的一种手术或他手术行为。而自然本身的大风暴、大地震，微观粒子的衰变、嬗变等现象，则类似自然自身的自手术行为。其次，人类头脑对归类收集到的工程、实验、自然现象等信息，进行分析、计算、设计、预测等理论指导，也类似一种自手术行为。

从科学是一种手术和自手术现象的意义上说，2012 年是一个转折之年：欧核中心 (CERN) 的大

型强子对撞机 (LHC) 测“上帝粒子”，大亚湾测中微子，北京等地环保测 PM2.5 粒子，等等，前两者是非常之不容易。作为科学是一种手术和自手术，如何快速、低廉、准确地测量基本粒子？LHC 的“手术”更是不容易。

2012 年 7 月，欧核中心发布 LHC 的两个实验合作组 CMS (超环面仪器) 和 ATLAS (紧凑缪子线圈)，分别发现了质量为 $125.3 \pm 0.6\text{GeV} \sim 126.5\text{GeV}$ 的疑似希格斯玻色子或称“上帝粒子”的新粒子。但在 2012 年 11 月有环球网报道，据来自 LHC 底夸克探测器 (LHCb) 的实验物理学家说，

现在还不能对该现象进行反驳，但也无法进一步支持。还请在 LHC 紧凑 μ 子线圈工作的物理学家多里戈讲：在此之前与实验观测较为相符的超对称理论，很好地解释了标准模型框架下亚原子粒子的行为，但新粒子的发现，因对超对称理论构成打击，被受到质疑。可见对 LHC 的“自手术”也不容易。

而且反相反量群体中有人还说，LHC 的粒子相撞，就像打碎瓦片，除瓦片碎片，没有原子。没有分子，什么也没有一样，LHC 的方法不对。又有人说，门捷列夫周期表是错的，对元素 >18 核外电子排列按周期性排列是跳跃式排列，元素没有周期性。

与以上“自手术”观点不同，我们认为 2012 年欧核中心 LHC 既发现了上帝粒子又发现了超对称！为什么？高能粒子对撞是一个特殊的研究对象。LHC 不是像打碎瓦片一样，LHC 作为一种手术与自手术行为，有严密的规律和要求，如 LHC 的粒子相撞是沿着从卢瑟福的“原子对撞机”就开始继承，并一直延续下来的。从卢瑟福到 LHC 实验的辐射粒子相撞，都是自然粒子自身有衰变的“自手术”，人类才能对此自然物质进行的手术。在 LHC 的世界里，粒子对撞都处于激发态，它们质量谱如何分布？

对卢瑟福“原子对撞机”实验的辐射粒子相撞的手术现象，玻尔在“自手术”中提出了“核式弦图”，说明了有巴尔末公式类似的量子勾股数的规律。在上世纪 60 年代以前，中国历史上没有西方式大型粒子对撞机的手术与自手术行为，但中华民族的医学也没有离开是一种手术和自手术的现象，而且类似的“核式弦图”的勾股数的规律，即中国“商高定理”比西方的“毕达哥拉斯定理”的发现，早得多。即中国“弦图”比西方的“弦图”早得多。没有大型粒子对撞机类似的手术与自手术，中华民族历史上，除依靠实用的工程技术和实验的实践外，还主要是对自然全息现象的重视。

1) 中科院高能研究所所长王贻芳教授对《中国科学报》采访他的记者吴益超说：“国外的科研环境和体系要比中国成熟得多，中国的体系不是自己长出来的，是学来的，硬生生地嫁接到中国的人文社会环境中，自然就会变异，发生一些显然有违科学本意的事。这一点，我们只能通过长期的努力去改变，使得我们的科研体系和科学思想更深入人心”。王贻芳教授讲的“深入人心”，就是要懂得科学是手术与自手术。

2) 我们研究统一基本粒子系和原子系弦学之桥的目的，是因为巴尔末公式已为我们提供了一种减少基本常量的重要方法，学基因测序也要在向快速、低廉、准确地测量基本粒子进军；因为联系弦图，我国已有 3070 多年的历史。所以说，作为科

学是一种手术和自手术的现象，在中国民间即使科研环境和体系不够成熟，但也不一定是硬生生地从国外嫁接到中国的民间社会环境中的。中国研究统一基本粒子系和原子系弦学之桥的体系，是自己长出来的，当然也有学来的。这一点，其实在我国也有基础。

3) 问题的尖锐性还在于，弦论、弦学、弦图，在国外的科研环境和体系中，已发展成了一种统一的科学理论。即使在国，怀疑的人更多，但反对科学是一种手术和自手术，其行为无异乎是一种科学的自杀。其实辩证地看，这类“自杀”也是一类“自手术”，是目前中国科学手术和自手术另一面的荣誉与尊严。例如，“弦图”一词，中国最早已经出现在公元 3 世纪三国时期的赵爽，作“勾股圆方图”注释《周髀算经》一书中。而《周髀算经》卷上，又最早记载西周开国时期，周公与大夫商高讨论勾股测量对话，就提到勾股定理的特列。可见“弦图”用于工程测量，这本身就一种手术与自手术行为，在西周开国时期的统治者和贵族也很重视。

4) 但无可讳言，科学作为一种手术与自手术，后来在中国的科研环境和体系中没有深入人心。典型的就中医的内科强于外科；西医强于中医，也是外科强于中医。虽然三国时是中医的华佗，有对他刮骨疗伤、开颅止痛手术功夫的传说，但照当时的普通条件去实践，检验还不行。现代西医外科强于中医，这已是铁的事实。所以王贻芳所长说的，作为手术与自手术的科学体系，近代是硬生生地嫁接到中国的人文社会环境中，不是自己长出来的，也是有事实根据的。19 世纪末 20 世纪初，人类开始走进微观世界，国外的科研环境和体系中提出了许多关于原子机构的模型，都来自卢瑟福的“原子对撞机”类似手术的实验，以及玻尔的“自手术”类似其粒子是连续和不连续运动的弦路进行的。中国能成为弦论、弦学、弦图的世界大国、强国吗？

我们认为，此路只有一条，中国也要一心一意，挖空心思打造弦论。

2、学习玻尔挖空心思打造弦论

中国科学的自强，当然只能依靠我们自己。如果这条道路是沿着 3070 多年前开辟的实用弦图，打造实用弦论，这像基因测序的美国基因学家文特尔，创立塞莱拉基因公司开发霰弹枪法测序新技术，单挑“国际人类基因组计划”，追上多国合作小组一样，我们也能单挑 LHC 既测上帝粒子又测超对称！这行吗？我们来看玻尔的成功。

重庆出版集团出版库马尔的《量子理论》一书中说：当年类似搞 LHC 测粒子的卢瑟福，是玻尔的导师。1913 年青年的玻尔，没有完全按照导师卢瑟福的“原子对撞机”类似的实验及其粒子是连续运动的

弦路前进，而是标新立异，搞量子弦原子类似的把围绕轨道弦旋转的电子的角动量量子化，使核原子稳定了下来。

众所周知，人们做礼炮烟花烟火早就知道：明火的颜色与蒸发的金属有关：明黄色的是钠，深红色的是锂，紫色的是钾；每个元素都有自己独一无二的一组光谱线，在光谱中有固定的位置。每一种特定元素的原子所产生的光谱线的数量、间隔和波长都是独一无二的，像光的指纹一样可以用来指认这一元素。所以玻尔一看到巴尔末的公式后立刻就明白：这是电子在不同的允许轨道之间跃迁，从而导致原子释放出这些光谱线。由玻尔的理论发展而来的现代量子物理学认为，原子的可能状态是不连续的，因此各状态对应能量也是不连续的。这些能量值就是能级。

1) 卢瑟福的核式模型，能很好地解释自己的实验现象，因而得到许多人的支持；但是该模型与经典的电磁理论有着深刻的矛盾。按经典电磁理论，电子绕核转动具有加速度，加速运动着的电荷(电子)要向周围空间辐射电磁波，电磁波频率等于电子绕核旋转的频率，随着不断地向外辐射能量，原子系统的能量逐渐减少，电子运动的轨道半径也越来越小，绕核旋转的频率连续增大，电子辐射的电磁波频率也在连续地变化，因而所呈现的光谱应为连续光谱。

由于电子绕核运动时不断向外辐射电磁波，电子能量不断减少，电子将沿螺旋形轨迹逐渐接近原子核，最后落于核上，这样，原子应是一个不稳定系统。实验事实：原子具有高度的稳定性，即使受到外界干扰，也很不易改变原子的属性；且氢原子所发出的光谱为线状光谱，与经典电磁理论得出的结论完全不同。

2) 原子核的能级，是原子核所处的各种能量状态。它们直接反映核子间的相互作用以及原子核多体系统的运动规律。目前对于核能级的性质已有了一定的理解，特别是对低激发能级的性质已有了较好的理解。能级的标定：原子核能级的性质决定于核子间的相互作用，后者主要包括强相互作用(即核力)及电磁相互作用。在一个多体系统中，粒子间的相互作用所具有的不变性，能为这个多体系统提供了好的量子数。

由于核力和电磁力都具有转动不变性及空间反射不变性，所以角动量 I 和宇称 π 都是原子核的好量子数(即守恒量量子数)，它们是除能量以外标定能级的最基本的量子数。此外，核力还较好地满足同位旋空间转动不变性，但电磁力不具有这种不变性。所以在后者所起的作用不大的情况下，例如在轻核中，同位旋 T 仍是一个近似的好量子数，用它来标定能级是有意义的。能级的激发性质从原

子核的衰变、反应性质和核结构理论可判定某一能级的激发性质。典型的激发有两类：一类是单粒子激发，如奇核子从一个单粒子态跃迁到另一个单粒子态。另一类是集体性质的激发，它是由许多单核子激发的相干叠加而成的激发。

玻尔在 1913 年提出了自己的原子结构假说，认为围绕原子核运动的电子轨道半径只能取某些分立的数值，这种现象叫轨道弦的量子化，不同的轨道弦对应着不同的状态，在这些状态中，尽管电子在做高速运动，但不向外辐射能量，因而这些状态是稳定的。原子在不同的状态下有着不同的能量，所以原子的能量也是量子化的。

在正常状态下，原子处于最低能级，电子在离核最近的轨道弦上运动的定态称为基态；原子吸收能量后从基态跃迁到较高能级，电子在较远的轨道上运动的定态称为激发态。一群氢原子处于量子数为 n 的激发态时，可能辐射出的光谱线条数为： $N = n(n-1)/2$ ；辐射出的光的频率 ν 由 $h\nu = E$ 决定，其中 h 为普朗克常量。

3) 但是探测器中捕获的撞击、散射、交换、吸引、排斥、衰变、嬗变和湮灭的基本粒子或粒子碎片粒子的质量谱，与粒子波动的光谱线系列的波长谱是相同的吗？也许玻尔他们当时给出的科学创建和发展，是分波动面或动量(或粒子质量)面进行的。这类似从两种角度 θ 摆置的同样弦图。

例如先说太阳系的弦图，这类似是无穷大 ∞ ，难以看清摆置的是椭圆面、双曲面、抛物面还是平面，就不去说它。这也类似相对原子系的波动面的角度 θ 的三角函数值系数为 1，质量面的角度 θ 的三角函数值是 0；但波动面的波长和动量面的质量则有对应性。这里有称为“三旋理论”新弦学的实践，其量子数质量谱公式也称“物质族基本粒子质量谱计算公式”。库马尔《量子理论》书中的巴尔末公式和玻尔对巴尔末公式转向量子弦论的再发现分析，可对比《三旋理论初探》、《求衡论—庞加莱猜想应用》两书。后者也得到了一种类似的结论：决定一个粒子在三旋规范夸克立方周期编码全表中的位置的是基本粒子量子数的弦数，而不是基本粒子的质量(能量或希格斯场)。量子数与量子弦性质相同，普朗克常数是量子弦的单位。这样原子系中的放射性元素，对应等价基本粒子系的超对称粒子现象就不足为怪；在当时的条件下，门捷列夫周期表的认识，就像初期物质族基本粒子质量谱公式一样。

4) 如果把巴尔末公式 $\lambda = b[m^2/(m^2 - n^2)]$ 中 m 和 n 看成链式量子数，那么 m 和 n 为何物？如果一个具体的基本粒子的量子弦数，是由三旋规范夸克立方周期编码全表中的位置，即就是它的基本粒子量子数决定的，而不是它的希格斯场的质量在作

决定，那么这不也类似门捷列夫元素周期表中原子系的放射性同位素模式。这里 m 和 n ，就类似三旋规范夸克立方周期编码全表中激发态分类的代数的起点和终点位置。

如果说这也是受玻尔对巴尔末公式必需转向量子弦论的再发现分析的启发，那么玻尔确实也是在有意忽略卢瑟福的核式模型的原子核从旁经过的阿尔法粒子的任何影响，而把注意力集中在原子的电子量子弦数上。对应 LHC 中的质子对撞所产生的粒子能量，如何办？是否也应是由它和夸克中的量子弦基本振动模式所代替？

5) 现在来看 LHC 测粒子中有没有局限性？我们认为，对 LHC 所产生粒子和它们的量子弦进行思考，注意的是解释质子粒子是如何与夸克中量子弦进行互动的理论，才会揭示测量 LHC 中粒子产生的真实结构，把 LHC 中产生的基本粒子分析转变到对量子弦式粒子的分析：所有粒子都是振动的基本模式决定，而不是粒子连续释放的。这种超弦说法，超越被奉为经典的标准模型的领域，架构了波动面的波长和动量面的质量有对应性和等量性，是连接了巴尔末公式和新量子数质量谱公式之桥；因为这很清楚，LHC 是以某种方式受到量子弦论的调节。

巴尔末公式 $\lambda = b[m^2 / (m^2 - n^2)]$ 中， m 代表电子跃迁从激发态起点的轨道弦层圈的编号， n 代表电子激发态跃迁到落脚点的轨道弦层圈的编号。所以埃斯特伦发现并测量和分别取名为阿尔法、贝塔、伽马和德尔塔的四条光谱线，并不是元素原子

的核外希格斯海能量层级轨道环圈的弦线，而是粒子激发态跃迁那段看不到的间断时空中的希格斯海能量弦的振动或波动。弦论使波粒二象性统一，光谱线使虚拟的弦模型得以间接的实在验证。所以玻尔挖空心思打造弦论，被卢瑟福说成：他们一起导演的量子弦化的原子，是思维对物质取得的一次胜利。

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