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学术争鸣

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

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

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进化与遗传余波新浪解读

王用道

Recommended by 王德奎
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摘要: 人生而平等, 国家不分大小一律平等, 粒子也生而平等吗? 各种场粒子, 能量粒子, 电子、夸克、胶子、电子云、胶子海, 海夸克等粒子的不同, 也许有基因嵌合、循环核酸等类似的物联网、云计算的泛着色, 使粒子、人、国家等才涉及量子色动物物理学和量子色动生物学前沿。

[王用道. 进化与遗传余波新浪解读. Academia Arena, 2011;3(12):1-12] (ISSN 1553-992X).
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关键词: 进化遗传 云计算 物联网 点内空间

Introduction

李政道先生说: 现在是一个非常令人激动的时代。物理学正处在一个极其富有挑战性的时代, 就像 20 世纪初那样。20 世纪的前 25 年, 相对论、量子力学相继被提出。20 世纪中期, 时代以更快的步伐做研究来发展相对论和量子力学。今天我们面临着与 20 世纪初期同样巨大的挑战, 并且相信我们做出的结果, 将与相对论和量子力学具有同样深刻的意义。李先生的这个说法, 适用于 21 世纪今天生物学的现状吗?

进化与遗传是生物学中永恒的主题, 在这方面基因组学、云计算等正在磅礴发展, 但更加深奥的重大发现还在等待当中。例如海归王文先生和刘用生先生提出的一些比较颠覆性的问题, 就属于从进化论到基因说以前学过东西的余波新浪, 这是否靠谱和揭示未来的端谜? 我们来解读。

一、是基因翻牌还是转座子基因?

王文先生是中国科学院昆明动物研究所研究员、中德马普青年科学家进化基因组学小组组长, 从事分子进化和进化基因组学研究。新基因及其新功能的起源和进化问题, 是他目前的主要研究方向。而他干的追问生命终极秘密的事业, 证明了从头起源是新基因起源不可忽略的重要机制。这种颠覆“进化不可能从头产生”的观点, 是基因学说又一余波新浪。

据 2011 年 11 月 23 日《科学时报》刘丹记者报导, 王文先生是在美国跟随著名华裔教授龙

漫远导师, 作博士后研究时找到颠覆“进化不可能从头产生”发现的第一个年轻基因——Sphinx (斯芬克斯) 基因的。众所周知, 生命最终秘密的载体是基因, 但在生命和物种的起源进化中, 基因究竟是如何产生的? 新基因是怎样把一个新的分子功能, 加进一个自然界长期演化历史形成的功能系统及其基因控制网络中, 进而改变这一系统功能的? 现在并不知道这所有的答案。

在古希腊神话中, 斯芬克斯是一种具有人头、狮身、天使翅膀的怪物。用斯芬克斯基因命名, 就是因为这个基因由预先存在于基因组中的两个基因嵌合而成, 是世界上首次发现的由蛋白质基因转变而成的 RNA 基因, 其产生距今不超过 200 万年。研究还表明, 斯芬克斯基因的形成过程受到正选择的驱动。在敲除了斯芬克斯基因后, 虽然单个的雄性果蝇在形态上并无变化, 但是当把这些缺失斯芬克斯基因功能的雄性黑腹果蝇放在一起时, 它们就会发生明显的相互性吸引, 也就是出现了同性恋行为。

1、于是王文先生建立了新基因搜寻体系。王文团队通过系统搜寻, 鉴别到了数十个年轻基因, 包括 2004 年发表的猴王基因——其在 100 万年的时间里分裂出了 4 个新基因, 就像神话故事中“美猴王”孙悟空, 拔毛吹气变出许多小猴子那样。因此他们形象地把这个新发现的基因家族, 命名为“猴王基因”——他们第一次阐明了基因分裂是如何实现的, 此前生物学界早已有“基因分裂”的猜想, 但科学家一直没有找到直接证据。

2、2001年，时任中科院昆明动物所所长的季维智，利用机会前往芝加哥“游说”王文回归。王文毅然回国。在回国后的短短八九年间，王文完成了新基因起源进化的全貌绘制，阐明新基因起源的普遍模式和规律，并全面评估了新基因起源的各种机制及角色。

王文带领的马普青年科学家小组与国际一些研究小组合作，已陆续报道了包括“猴王”、“Hun”、BSC4、MDF1和nsr等在内的一系列新近产生的新基因。这些研究成果表明，新基因起源是一个重要的生物学现象，但全基因组水平具体有哪些重要的新基因起源机制，它们各自的角色是什么，却一直不清楚。2008年，王文小组利用最新发表的12个果蝇种的全基因组序列，将新基因起源的研究，提升到阐明全基因组水平模式的高度。他们通过大规模的基因组比较，鉴定了300多个果蝇物种特异的年轻基因。他们通过对这些基因起源机制的分析发现，基因重复是产生新基因最主要的机制。80%的新生基因拷贝由串联重复产生，它们之后又可能转化成散在形式的基因重复。在这项最新的研究中，发现有12%左右的新基因，是由非编码序列“变废为宝”而来的。这一发现颠覆了该领域长期存在的“进化不可能从头产生”的观点，证明了从头起源是新基因起源不可忽略的重要机制。

3、王文小组对所有新基因及其祖先基因的结构比较发现，有30%的新基因通过外显子重排等方式，招募祖先基因不具有的序列，形成了新的嵌合基因。这样的结构为新基因提供了立即获得新的结构域和功能的机会，促使它们可以快速在群体内被自然选择固定。这些研究成果表明新基因的起源是一个重要的生物学现象。随着基因组测序的增多，他们将在其他物种里进行类似的探讨，研究其是否具有相同的模式；另一方面，将深入研究这些新基因对生物的进化、发育和功能起到的作用，这对生物发育、遗传、进化这3个重要生命科学现象的整合非常有帮助。

其次，一个新的基因是怎样出现的，出现以后通过怎样的分子机制实现什么样的功能；这些功能对生物进化有什么样的意义；很多基因参与了生物的个体发育，这些个体发育展现出来的性状或体态有什么进化价值，这些都是今后研究较为重要的方面。

二、是转座子基因还是获得性遗传？

刘用生先生是河南科技学院园林学院的教授，河南科技学院园艺研究所所长，主讲《园艺植物育种学》；长期从事果树资源改良、农业嫁接与育种技术方面的研究。他写的有关“达尔文与高尔顿在《自然》上争论为哪般？”的博文，提出的是进化论的余波新浪。

1、达尔文揭示过进化论的基因端谜

刘用生先生说，达尔文在《物种起源》一书中，虽然并没有多谈遗传和变异的原理，但他在九年后出版的与《物种起源》互为姐妹篇的《动物和植物在家养下的变异》两卷巨著中，已经明确指出遗传与变异规律的研究，是生物进化论的基础。

达尔文是把人工选择和自然选择对比起来研究，并把遗传、变异和发育密切联系起来，提出了第一个全面的遗传理论--泛生论

(Pangenesis)，试图对所有的遗传变异现象做出统一的解释。

泛生论是对当时的细胞理论的修改和补充，认为细胞除了拥有自我分裂的生长力以外，还能够释放出微小的、可在细胞之间移动的、可自我复制的遗传分子。达尔文称之为Gemmules。中文翻译，叫“微芽”或“芽球”，可对应现代的“基因”一词。即基因就是由这个词演变过来的。

基因泛生假说不仅解释了性状的优势遗传现象，这就是后来被称为的显性遗传或孟德尔式遗传；而且还解释了获得性遗传，即当时的拉马克式遗传，和嫁接杂交，即后来米丘林所谓的无性杂交，以及返祖遗传，先父遗传，花粉直感，器官转位，再生和发育等。

基因泛生假说的提出，赞成和支持的不多，怀疑和反对的不少。例如当时有些人非常刻薄讥笑达尔文，说他假设的遗传分子“微芽”或“芽球”，是抄袭如同化学上的原子论一样，是谁也看不见摸不着的；这自然无法使人们相信。

2、达尔文生物进化论不排斥获得性遗传

1) 刘用生先生说，达尔文的表兄弟、著名生物学家高尔顿，当时已经意识到达尔文的所谓基因泛生微芽，就是遗传物质，于是决定用实验去证明它。

因为基因泛生既然说微芽可以散布于整个系统，可以在生物体内循环，那么血液里就可能

含有微芽基因。而血液是周身循环的，他设想，通过输血的方法把具有不同性状的两个动物的血液混合，如果血液里的微芽真的和遗传有关，那么接受输血的个体的后代，就应该表现出血液供体的性状。高尔顿把白兔的血液注入灰兔体内，期望来自白兔血液里的微芽可以输送并聚集到灰兔的生殖细胞内，使灰兔的后代表现出白兔的性状。但令人失望：在后代中没有表现出任何杂种性状。于是高尔顿认为，他的实验结果，毫无疑问地证明达尔文的生物进化泛生基因说破产。

2) 达尔文得知高尔顿把反对进化论基因说的试验发表在《皇家学会会报》上后，其反应是一反常态的愤怒，因为达尔文太珍爱他花费了约 27 年时间创立的进化论基因遗传理论。1871 年 4 月 27 日，达尔文在《自然》上发表了题为《泛生论》的短篇通讯，争辩说他在基因泛生论里，并没有提到“血液”两个字。但他承认，他的确曾想过在血液中，大概有基因泛生的微芽存在，但微芽基因虽微小，却是与整个身体的稳定遗传在一起的，所以那不是遗传物质泛生的必要部分；当然微芽基因泛生，可以显著地应用于植物和低等动物。

因为达尔文已经明白，如果高尔顿能够用试验证实高等动物的生殖要素，这相当于我们现在所说的遗传物质，包含在血液里，那才算是取得了一个非常重大的生理学发现。即达尔文认为，高尔顿的实验结论有点草率。1871 年 5 月 4 日，高尔顿在《自然》杂志上发表公开道歉，说他误解了“泛生基因说”的意思。

3) 但高尔顿的公开道歉，并没有动摇人们对“实验可以推翻理论，而理论无法推翻实验”的实践第一的通常观点，从此以后，基因泛生论被认为是达尔文的错误。虽然达尔文相信将来总有一天，基因泛生论会被重新认识的，但他也无可奈何地把泛生基因论称作“可怜且心爱的孩子”。

但事实胜于雄辩，在高尔顿输血试验，检验否定达尔文泛生基因论 80 多年后，前苏联的索皮柯夫却通过输血的方法，成功地使家禽动物的后代，产生了可遗传的变异，并且培养出了鸡新品种。原因是，索皮柯夫做的是称为“动物无性杂交”的试验。他是用澳洲黑鸡的血液，多次地注射到白色的来杭鸡体内。来杭鸡孵育出的小鸡身上，出现了黑色绒毛，成年后长了 8-40 根黑色羽毛。相反的试验---接受来杭鸡血液的澳洲

黑鸡后代小鸡，也有白色绒毛，长大后有 5-25 根白色羽毛。在 1000 只试验小鸡中，发现有 92 只有杂色花斑羽毛。

其次，家禽的输血方法，通常是在幼年时或产卵前几个星期开始，每周输血两次，每次 5-10 毫升，产卵时隔一天输血一次。索皮柯夫注意到，在不同的动物中，引起遗传性变异所需要的输血总量，是有差别的：鸡 100-200 毫升，鸭 200-350 毫升，兔子 200-400 毫升。他还发现，家禽类动物，比兔子的变异要表现得早。如果说家禽遗传性状的改变，是在第 1 或 2 代中就出现，并在以后世代中得到加强的话，那么在兔子中，这些变化要在第 2 或第 3 代中才表现出来，并且只有在给受体一代代地进行多次输血的情况下，才能在以后世代中得到加强。索皮柯夫的试验结果，不仅被许多前苏联的动物遗传育种工作者所证实，而且被瑞士和法国的研究者所证实。

4) 1869 年，是达尔文发表基因泛生论后的一年，就有 F.Miescher 发现了，被后来确定为具有遗传功能的分子核酸。在 1948 年，又有法国学者 Mandel 和 Metais1 首次在血液中，检测到一种存在于动植物和人体中的细胞外游离状态的核酸“循环核酸”。但这些重要发现，当时不仅没有引起人们的重视，反而被怀疑为由污染造成的赝象。直到 20 世纪 60 年代，才逐渐引起一些学者的关注，而现在已经是热门的研究领域。

5) 刘用生教授说，用“循环核酸”的概念，也有他的贡献。因为到 2000 年，他才注意到循环核酸的文献，如黄瓜和西葫芦嫁接试验，证明特定的 mRNA 分子可以通过韧皮部在植物体内长距离运输，知道血液中也有循环 DNA 和 RNA，所以他把达尔文的泛生基因论的“微芽”，理解为“循环 DNA/RNA”，或未知的分子。

循环核酸的发现，不仅在疾病诊断等方面有广阔的应用前景，也为达尔文的基因泛生论提供了有力的证据。例如 1997 年，中国香港的学者 Lo 等在孕妇母体血液中，发现了胎儿 DNA 的存在。这一发现，不仅可以用于无创伤产前诊断，而且可以为先父遗传这个长期争论的学术问题提供一种解释。但如何用现代分子生物学知识，去理解达尔文所谓泛生基因论的微芽，还需要进一步讨论。刘用生认为，循环核酸的来源及其发生机制，有两种假说：(a) 生活细胞不断主

动释放核酸, 进入血液循环; (b) 细胞的坏死或凋亡。

6) 而且刘用生教授认为, 如果高尔顿用的试验材料, 是鸡而不是兔子, 很可能他会获得正面的试验结果。反之, 孟德尔的豌豆试验, 如果孟德尔用的试验材料, 不是豌豆而是靠嫁接繁殖的多年生果树, 也是难以成功的。因为要在果树中寻找性状呈 3: 1 和 9: 3: 3: 1 等分离的例证, 非常困难。

其次, 魏斯曼用切老鼠尾巴的试验, 否定了获得性遗传; 但如果魏斯曼选择把纤毛虫切成两半, 而不是连续几代斩断老鼠尾巴, 那么一代就足以出现遗传性的改变。因为论文发表在《中国科学》上的我国学者张作人先生, 将原生动物的棘尾虫切去 3/4 的部分, 剩下的部分经再生调节功能的配合, 竟然获得了两个仔体相并联的畸形虫。这个获得性不但能遗传, 而且连续传下将近万代了。这已获得美国的学者, 重复试验成功的证明。

3、实验检验科学标准新论

刘用生先生说, 实验检验在肯定或否定一个重要理论或学术观点时, 应该做尽可能系统和仔细的研究。例如, 采用试验方法来检验输血能否诱导变异方面, 高尔顿是第一人。虽然任何初次的试验, 不可能尽善尽美, 但在作结论时还是要慎重。其实, 达尔文是希望高尔顿多做几代试验的。但是高尔顿觉得, 试验持续的时间已经不短了, 就没有再坚持做下去。而索皮柯夫的输血检验, 与家禽相比, 偏偏兔子是需要更大的输血量, 和观察更多代数, 才可能出现遗传性的变异。

1) 科学史学家和实验生物学家, 有各自的优势和局限性。科学史学家对达尔文的基因泛生论研究得很详细, 但他们一般仅读历史资料, 对新资料重视不够, 不知道自 1950 年后已经有通过输血诱发新变异的报道, 也不知道循环核酸的新发现。而许多实验生物学家并不知道达尔文的基因泛生论以及高尔顿的输血试验。而且索皮柯夫的家禽输血试验, 也只受启发于米丘林在植物嫁接杂交方面的研究, 所以他才积极支持李森科推行的米丘林学说, 与宣称重新发现了达尔文的基因泛生论擦肩而过。

2) 应该佩服达尔文的想象力和预见性, 因为在达尔文创立基因泛生论时, 细胞学说刚刚提出不久; 达尔文想象, 既然细胞可以通过自我分

裂来增殖, 那么细胞里的遗传分子也一定会自我分裂或自我复制。甚至他大胆地设想, 遗传分子可以在体外增殖。而基因泛生体外增殖, 在数小时之内大量扩增目的基因或 DNA 片段的 PCR 技术, 是今天才敢想象的技术。

三、解读进化与遗传余波新浪未来科学

生物学中的“进化与遗传”, 和物理学中的“超导与节能”对应, 有一些启示意义。因为如果进化、基因、超导、能量等概念要进入科学理论, 达到定性定量描述能认可的高度, 就会成为一种标度, 一种度规, 一种规范, 也就具有标度、度规、规范的不变性。但正是有标度、度规、规范的不变性, 也就有标度、度规、规范的可变性、反常、破缺。

例如百年超导的探索, 其标度、度规、规范已进一步分为: 重费米子超导体, 有机超导体, 铜氧化物高温超导体和铁基超导体等。这中间就有标度、度规、规范的不变性, 也有标度、度规、规范的可变性、反常、破缺。其 BCS 理论的超导解释, 就类似摩尔根奠定的基因线性学说。

这还是在超导发现 46 年后的 1957 年, 由巴丁、库珀和施里弗三人提出的“BCS 理论”, 才真正第一次从微观角度解释了超导转变机制。这个理论的基本观点认为: 与晶格(或声子)的耦合可导致原本互相排斥的电子之间出现有效的吸引力, 自旋和动量相反的两个电子通过声子作为媒介形成一个束缚态, 即所谓“库珀对”。而“库珀对”能不受散射, 顺利地通过晶格。一个比较形象的理解是: 当一个电子经过晶格时会吸引带正电的阳离子而使晶格产生畸变, 就如在平静的水面投入一个石子激起的波纹一样。由于电子的运动速度比晶格离子快很多, 当电子离开后, 晶格仍旧保持畸变的状态, 这时另一个电子经过畸变的晶格, 就会受畸变晶格的作用在一定条件下和第一个电子形成“库珀对”。“库珀对”和“库珀对”之间的相互重叠, 使得大量“库珀对”进入相干的宏观“凝聚”态。这一凝聚态是体系的一个宏观量子本征基态, 具有空间平移不变性, 因此可以相对于晶格匀速运动而不受散射, 即形成超流体, 这种带电电荷的超流现象就是“超导”。

BCS 理论虽是超导研究历史中具有里程碑意义的重大发现, 它从微观层次解释了当时发现的大多数常规超导体的转变机制。但随后大量无法用 BCS 电声子耦合配对理论解释的非常规超

导体被陆续发现,使人们意识到 BCS 理论的局限性。其中最具有代表性的就是 1986 年发现的铜氧化物高温超导材料和 2008 年发现的铁基超导体,无法用 BCS 理论解释。

类此,如果说摩尔根的基因学说类似 BCS 理论的超导解释也会受冲击,那么植物学家巴巴拉·麦克林托克的转座因子理论,就是冲击摩尔根的第一波。因为摩尔根认为,生物细胞的遗传物质是很稳定的,遗传基因在染色体上有固定的位置,并且以一定的秩序在染色体上作直线排列。虽然基因之间有时也会发生有秩序的交流,但只限于在同源染色体的等位基因之间进行,并且不会打乱原有的顺序。除了频率极为稀少的染色体倒位和易位之外,人们再也想象不出,还有什么机制可以改变基因位置。但是在 1932 年,麦克林托克发现某些玉米秧苗叶子的颜色会自动消失,而另一些叶子,则呈现这种颜色。经过十多年的潜心研究,1947 年,她提出了基因可以移动的“转座因子”理论。她认为,转移后的基因,可以从染色体上的某一个位置,跳到另一个位置,甚至可以从一条染色体跳到另一条染色体。麦克林托克的这一“转座因子”理论,是同美国当时遗传权威摩尔根关于“基因是固定不变”这个传统学说相悖,因此被视为异说。

大约过了 20 多年,美国塔夫兹大学的梅勒米、德国科伦大学的焦敦和英国剑桥大学的薛帕洛等人,分别在原核生物中发现插入突变,这一发现动摇了摩尔根有关基因排列的某些观点。不久,东京大学的三桥发现细菌中的抗药性基因,可在亲缘关系很远的细菌之间发生转移,并提出转座因子不仅可在同一细胞内的非同源染色体区段之间发生转移,还有可能在不同生物的染色体之间转移。1974 年,在伦敦海墨史密斯医院工作的海奇和雅各布,也详细研究了细菌抗药性基因的转移过程。他们发现,抗药性基因必须装载在一段特殊的 DNA 片断上才能发生转移。他们把这个 DNA 片断,称为“转座子”。

现在回头来看王文和刘用生先生从进化论到基因说,提出以上的那些比较颠覆性东西的余波新浪,实际也可以看成麦克林托克的这一“转座因子”理论的延伸和发展,因此还是属于李政道先生分析的 20 世纪中期的那个研究步伐越来越快的类似时期的物理学。但我们不是说,王文和刘用生先生从事的探索,没有价值或没有意义;恰恰相反,他们是继续在打完从进化论到基因说的两场伟大战争,而李政道先生则是在着眼

于,如何再次进入辉煌时期的科学战争。

1、未来的量子色动物物理学和量子色动生物学

据 2011 年《科学》杂志第 6 期发表“史密斯访谈李政道”的报导,李政道先生说,科学实验所开创的应用,将会以料想不到的方式发展。到现在为止所有的新技术,包括激光和其他新技术都来自于物理学。“在我看来,物理学未来的发展很重要。生物学很重要,但其源头是物理学”。例如万维网(WWW)就来自 1993—1994 年,从欧洲核子中心发展出来的。当时由于欧洲核子中心加速器的复杂性,他们发展了一种系统,即万维网,作为一个传递数据的系统。欧洲核子中心决定把万维网无偿地推广给整个世界。在一年之内,就发展到每个人都能免费使用了,但是现在没有人知道它来自高能物理。如果欧洲核子中心要向每次使用收一分钱的话,将会有充裕的经费。当然那里做的量子色动力学,也需要用到很多类似超级计算机的帮助计算。

如果说万维网连接了云计算,也联结了海科技,那么可知李政道的眼光正向着“色动”这个非常激动人心的时代,他说:“我们期待新的爱因斯坦、新的玻尔、新的费米的出现”。李政道当然不是空穴来风,他还具体给出了统一前沿量子色动物物理学和量子色动生物学的路线图。

1) 光靠大型强子对撞机不行,还要大型相对论重离子对撞机。李政道说,现在生活的节奏太快了,每个人都关心着筹措经费、在下一代对撞机上做实验。但是,如果想培育下一世纪的诺贝尔奖获得者,那不是正确的道路。现在我坚信它是跟暗能量和宇宙学常数相关的。因为在所有我们已经发现的场中,其中有一个惯性场,什么场能够改变惯性呢?就是大家称之为希格斯场的场。已发现的场的粒子都有自旋,有角动量。希格斯场的角动量是零,它还没有被发现,我想这是由于我们用了找共振的方法去寻找希格斯粒子,但不是所有的粒子都能被共振的方法所发现。

例子就是超导的库珀对。库珀因而获得了诺贝尔奖,但不是用共振的方法发现的库珀对。任何有复杂结构的粒子,都不能被共振的方法发现;库珀对拥有很多耦合道,类似物联网,不能被像针一样地捡出来。这是一个集合模式,需要用不同的方法去寻找集合模式。

希格斯场有类似惯性的变换,因此,如果取一个较大体积,希格斯场就有一个平均值,可定义它跟惯性的值成比例。因此如果此值改变,

这一体积内的每一个粒子的惯性也随之改变。这种集合模式，我们从没有在实验中研究过，这需要用相对论重离子碰撞去改变背景。这也是为什么建造相对论重离子对撞机的原因。1999年在布鲁克黑文国家实验室，建成的相对论重离子对撞机，可加速金原子核，让两束金原子核对撞，金原子核的每个核子的能量达100吉电子伏，但还太小。李政道的意思也许还有，希格斯场联系惯性、惯性质量和重力，这就把人和粒子统一了起来。因为有关人和社会的千条定理、万条定理，都是在省略惯性质量和重力的背景场条件下作出的；一旦条件恶化，这些定理就不能成立。

所以对于社会、国家等组织机构来说，人也类似最基本粒子，就类似把人追溯到微观粒子的普朗克常数大小的程度。当然人还可以从基因嵌合、循环核酸等大小谈组成，这正是人生而平等的自然基础；但要谈人的类似“平等”的不同，倒可以借助基因嵌合、循环核酸的组成谈人体内的类似物联网、云计算的泛着色。由此对应各种场粒子，能量粒子，电子、夸克、胶子、电子云、胶子海，海夸克等粒子的不同，是因为它们体内也有的类似物联网、云计算的泛着色。

众所周知，大型强子对撞机可以查到在质子、中子等结构中，夸克是类似部分子，它周围还有海夸克、夸克海、胶子海等粒子，夸克就类似一所综合性大学的校长、院长，下面还有很多老师、学生一样。校长、院长、老师、学生在生理上是大致相同的，这类似对应人生而平等。但校长、院长在学校的组织结构中担任的角色是不同的，这就类似质子、中子等结构中的夸克角色。

2) 懂得这一点，我们来看刘全慧先生的“请从统计物理入行”，是站在李政道先生分析培育下一世纪人才的那条道上？刘全慧1963年2月出生，湖南大学物理学教授、理论物理研究所所长、理论物理博士、凝聚态物理博导、中国量子力学研究会常务理事。他说：“热力学与统计物理”和“量子统计”讲了十来遍，一维谐振子的每个量子态，占据一个普朗克常数的相空间体(面)积元，那么基态占据多大的相空间？没有理由说只有一半普朗克常数那么大吧？

刘全慧说，这个问题的答案即使有，也成了一个物理问题。一个甚至几个量子态，在全部微观状态中，微不足道，就不要去追究了。麻烦的是证明一个三维体系中每个量子态，占据一个普朗克常数三次方的相空间体积元，为什么准经典理论这么准？在Pathria的《统计物理》书中暗示：量子态占据多大的相空间体积元，其实是

一个假设或者拟合。从刘先生的话分析，他只是主流的理论物理家和量子力学家，而不是李政道式的主流量子色动边缘物理学家。

且不说量子态占据多大的相空间体积元不是个假设或者拟合，也有圈量子引力物理成果具体导出了计算面积和体积的量子化公式。例如1996年，Rovelli应用K. Krasnov观念，从环量子引力基本上导出了黑洞熵的贝肯斯坦-霍金公式。该公式在一维普朗克尺度范围也成立。

因为从观控相对界看，这同生物和物理的认识相通，即物质不能直接进入大脑变成为意识，物质和信息常常是结合在一起的。把大脑比作一个点，那么物质进入点内，信息即是进入点内的代表。它的观控来源于物质和信息相对观控界面是有眼孔的，这类似生物膜的离子通道。就是说，任何宏观物质要变为信息，都要类似化为微观物质，通过观控相对界的点孔进行比特计量。这里不但把宏观和微观联系在一起了，而且把物质熵和信息熵也联系在一起了。因为物质熵全息界可以像一个球面一样是封闭的，一定空间体积的物质或能量所能包含信息量的最大可能的熵值，取决于球的边界面积而不是体积，因此物质熵A可设为球的边界面积：

$$A=4\pi r^2=4S \quad (1)$$

$$S=A/4 \quad (2)$$

这里S为物质熵A球面穿过观控相对界的圆眼孔面积 πr^2 ，可看作全息界的信息熵。想象一束短暂的光线从观控相对界的实数类一边垂直射入，这里唯一的要求就是这些虚拟的光线都是从观控界膜的类似离子通道进入或录入虚数类的。如果该物质能坍塌为信息，则最终形成的信息熵的视界表面积 πr^2 将不能大于A/4。按照该系统的熵不能减少，因而

$$A=V \cdot S \quad (3)$$

(3)式为通道流量公式，V为流速，r为观控相对界信息熵的视界通道半径，由于观控界膜的类似离子通道进入或录入的眼孔只能为点孔，即观控界膜的类似离子通道可多于一个以上，此时r并不是点孔的半径，而是点孔视界表面积积分求和值s的换算半径；A也为点孔视界信息熵流量的积分求和值。弦理论认为物质可分的极限为普朗克长度，即约为 10^{-33} 厘米，那么观控界膜的类似离子通道的最小切面极限也为普朗克表面积，即它的平方。由于不管虚实或正负的物质要转化为信息，都要从观控界膜的类似离子通

道进入或录入, 设每经过普朗克表面积极限孔一次为信息单位一比特, 那么一个类似普朗克长度半径的球体物质 A 的信息量, 为 $H=A/4$ 比特。

更能显示刘全慧教授对量子色动物理学物联网、云计算认识不足的是, 他说: “没有理由说只有一半普朗克常数那么大吧?” 但为什么不可以有一半普朗克常数那么大的嵌合呢?

把皮球内表面, 不破翻转成外表面, 涉及更深的数学“点”问题。联系把普朗克常数的数量级比作针尖, 一个数量级中从 1 至 9 可容纳 9 个连续自然数, 即这针尖上可站 9 个天使。所以一个甚至几个量子态, 在全部微观状态中, 不是微不足道, 它们可以组成海量子、量子海, 它们对应的量子物联网、云计算, 可以使从夸克到人着上“色”。更进一步地说, 一半对一半普朗克常数的嵌合, 还是属于庞加莱猜想的内外无破裂翻皮球与全息相关的重大数学物理问题。

美国科学家萨斯坎德在《黑洞战争》一书中, 谈到的“持球跑进”与诺贝尔物理奖获得者特霍夫特等以全息原理保卫信息守恒这一个自然基本定律的联系, 其实求解办法, 就可以从庞加莱猜想翻转引理, 试着不用其他维度去想象线和珠子。这里的“线”不再是圆柱面的线材, 而是圆柱面的管子; 珠子也不是在圆柱面外移动类似的算盘珠子, 而是在圆柱管内移动的, 类似球面或环面的珠子。当然如果珠子的自旋只有面旋和线旋, 要持球跑进相互穿越交流发送信息也不行。

在三旋理论中, 类圈体(如环圈)内禀自旋有三种: 面旋、体旋和线旋。类圈体的面旋、体旋和线旋还可两两组合, 或三三组合, 合计的标志值个数就是 62。空心圆球内表面翻转成外表面, 把管道及珠子推理到普朗克尺度, 只给一维的沿着管线内壁移动。内外各自持球跑进的珠子相遇, 在转点的普朗克尺度上, 由于还可以各占一半合成一个球体, 作体旋翻转后, 各自再分开, 恢复原来各自的形态。此前, “转点”的“庞加莱猜想球”自旋, 如果是作纯面旋, 那么从内向外或从外向内的交流就会被阻塞; 不堵塞只能作纯体旋和四类组合旋。只不过纯体旋的转轴方向, 与管柱壁的管长方向的中心线垂直。空心圆球内表面翻转成外表面, 在庞加莱猜想球式的“转点”自旋这里, 存在量子论类似的“间断”性。原因是, 其一, 即使球体的纯体旋不阻塞从内向外或从外向内的交流, 但由于“转点”外的交流是在同一段线上运动, 根据广义泡利不相容原理, 它们必须“间断”交换才能进行。其二, 如果是四类组合旋有一个被选择, 本身也产生

“间断”, 原因是它有旋到纯面旋位置的时候, 这种阻塞即使时间是短暂的, 因双方运动的速度或频率差, 也要用普朗克尺度来截止可能涉及小数点后面的无理数或有理数的位数计算。由此, 全息翻转到外表的信息像素粒子, 排列的点阵列色调图案, 不管是全黑色噪声、全白色噪声、全棕色噪声、全粉色噪声, 还是一半对一半、表面均匀与不均匀, 或雪花点的那种随机的杂乱无章, 所有这许多不同方式的重组, 并不改变系统的信息守恒的基本特征。

2、量子色动边缘物理学着眼的是无污染的未来量子色动能源

李政道先生说, 下一个爱因斯坦、玻尔, 或者费米, 真正的巨人将会出现, 需要集体的努力。一个人能做他所擅长做的任何事情, 但是对于物理的探索, 需要一种集体的模式。在我们的宇宙中, 除了暗物质和暗能量外, 我们已知的物质的基本成分是 12 种, 但 50 年前我们仅仅知道 2 种。

人生而平等, 国家不分大小一律平等, 粒子也生而平等吗? 各种场粒子, 能量粒子, 电子、夸克、胶子、电子云、胶子海, 海夸克等粒子的不同, 也许有基因嵌合、循环核酸等类似的物联网、云计算的泛着色, 使粒子、人、国家等才涉及量子色动物理学和量子色动生物学前沿。而李政道式的主流量子色动力学边缘物理学家, 着眼的正是无核污染的未来量子色动能源、材料和环境。

1) 冰是原子和分子层次的水的固态形式。最近, 吉林大学马琰铭研究组有理论预言, 冰在低温条件下, 可以在超高压 (>1400 万大气压) 驱动下, 形成由 $(OH)^-$ 和 $(H_3O)^+$ 单元构成的具有部分离子性的冰, 其中 $(OH)^-$ 和 $(H_3O)^+$ 单元之间存在相对较弱的共价相互作用。而在压力-温度维度区间, 冰的存在形式总计有 15 种; 若以化学成键方式可归为三类: 第一类是冰的最普遍存在方式, H_2O 分子间通过弱的氢键相结合; 第二类是在压力作用下 H_2O 分子间的氢键发生对称化, 形成原子相的冰; 第三类是处于高温和高压条件下的超离子态冰, 此时氧原子固定在晶格格点上, 但氢原子受高温 (>2000 K) 的激发脱离氧的束缚自由运动。这些都类似原子和分子层次的着“色”或色动力学。

史密斯说, 有一位诺贝尔医学奖得主在诺贝尔奖演讲中, 他着重强调他在做与干细胞相关的研究, 引起了大家对拯救生命的技术的广泛关

注，但是他的本意不是真正努力去解救生命，而是去了解自然。然而量子色动边缘物理学家，则不全是为了去了解自然，而就是要对人类有核污染的能源作拯救和改变，向夸克、胶子、电子云、胶子海，海夸克等层次的相变要量子色动能源。

即从化学能越过化学量子能或核能，直接提取量子色动能，这个原理，类似把原子和分子层次水的类似相变研究，延伸到夸克、胶子、电子云、胶子海，海夸克等层次的量子色荷云流的相变研究，那么在电子云、胶子海，海夸克等层次存在的相变形式，总计有多少种、多少类呢？这只是用类似量子物联网、云计算的方法，才能理解那里可提取的量子色动能源。

李政道先生说：物理学不是数学，任何我们在宇宙中不了解的事情都是一个挑战。仅在两年前，物质的集体运动模式被美国物理学会认为是一大发现。这个集体运动模式的性质仍然不太清楚。可能是夸克—胶子等离子体，我十分相信最终能证明它和暗能量是同一种东西。对于自然界的每一项理解，总是使我们面临更深一步的谜团。在 50 年前，并没人知道六个夸克，甚至有人对此提出过质疑。至于六个轻子，那时我们只知道电子和 μ 子，那时提出的中微子，也不是我们现在所知道的真正的中微子。李政道先生说的夸克—胶子等离子体集体运动模式，就是电子云、胶子海，海夸克等层次。欧洲核子研究中心的科学家认为，“夸克球”可以为人类提供几乎用之不尽的无核污染的未来量子色动能源。

他们认为，通常的微观粒子都是旋转的，但“超夸克”和“超电子”等则不旋转，因而大量的“超夸克”和“超电子”集中在一起比较稳定，能组成粒子数量庞大的结构，即“夸克球”。“夸克球”可小至一个原子，也可大到一个星球，其尺寸是没有限制的。看来“夸克球”也有点类似希格斯场粒子；所以寻找希格斯粒子，实际也是在为寻找未来无核污染的量子色动能源。

我们非常赞成李政道说的希格斯场是一种集合模式，有类似惯性的变换，如果取一个较大体积，希格斯场就有一个平均值，而且跟惯性的值成比例；如果此值改变，这一体积内的每一个粒子的惯性也随之改变的说法。因为我们在求证物质族质量谱公式的过程中，发现将计算得出的物质族基本粒子质量谱分成两组各三代，那么希格斯粒子类似质量的单位粒子，它既可以是两组各三代中最大基本粒子质量单位的集合模

式“1”，反之小的就成了该代大的的分数；也可以是有质量数基本粒子中以最小质量取的单位“1”；而且还可以是最小质量单位为“0”。这里的“0”涉及时空场“点内空间”。因为我们已知的物质，是由宇宙大爆炸所产生的，即是“有生于无”。

2)量子色动能物理来源于量子粒子“着色”，数学来源于球面或环面拓扑类型自旋的表达。在比较中，“类圈体”和“点内空间”更能体现量子色动的云计算与物联网功能。我们把此研究称为量子色动边缘物理学。李政道先生说：牛顿的三大定律是自然的法则。第一定律、第三定律，都很合理。牛顿第二定律 $f=ma$ ，他认为是牛顿最伟大的贡献：方程式左边是 f ，并不知道它是什么。右边是加速度，这是要把它求出来的。在两种情况下，牛顿认识到力是空间的函数。这个函数是与弹性有关的， f 与距离 R 有线性关系。另一种情况是重力。所以，一旦左侧是一个已知的空间函数，就可以解这个方程式，求出右边加速度的值，他感到这很有趣。

李政道式的主流量子色动边缘物理学家的产生，他的说法是，他开始进入科学的大门，与别人不同。他受的教育因战争而中断，所以并没有真正从头开始受过正规的培训。他出生在一个知识分子家庭。1941年，也就是日本偷袭珍珠港那一年，他离开了家。他的教育在中学四年级中断，一般应该在中学六年后才上大学。在战争时期，他只上了两年大学。在那段时期，他倾向于用自己的方式更深入地思考。他接触物理是偶然看到物理学书籍，与传统的中国式教育非常不同。物理书中讲自然规律，而传统中国教育读的经书不讲自然规律，而是大量的行为准则。他相信自然规律是客观存在的，如牛顿定律。而且感到数学比较容易，物理更难，因为数学是从条件推出结论，相对来说容易些。李政道模式也许是永恒的，中国是一个负责任的大国，不管什么灾难，人民中不能不产生自己的量子色动边缘物理学家。

与李政道中断正规的培训的情况，又发生在1958年大跃进后的三年自然灾害时期。那时加上苏联撤走专家和要还贷款，国民经济到了崩溃的边缘，成千上万的工厂、工程、学校下马，成千上万的职工、学生下岗。在大跃进时期学校正规培训不正常，教材改厚为薄，以劳动代替上课。然而1957年李政道和杨振宁在美国打破宇称守

恒获得诺贝尔物理奖的消息已传回国内。到 60 年代初期,西方早已热火地在讨论量子色动力学。但在我国主流物理学界,不怎么讨论,为什么?我国盛行“理论联系实际”的高质量教学法,要赶快培养出能为社会主义工农业和国防建设用途服务的一大批毕业生来,以改变敌我斗争中的竞争态势。于是类似牛顿第一定律、第三定律这种直观、合理的有用科普联系,主流物理学界曾讨论的是物质无限可分。李政道式用自己的方式更深入地思考物质无限可分和宇称守恒与不守恒,以及“有生于无”和“点内空间”,类似牛顿第二定律说力是空间的函数较浓厚联系的量子色动边缘物理学,就只好靠边站了。所以我国 60 多年来在量子力学领域作出一些重要工作的物理学家,都是主流的理论物理家和量子力学家。

这种主流使其他他们或者领导的爱好者,也探讨未来量子能源,如在 60 多年来的实数超光速和近 30 多年来的核裂变聚变混合“水变油”的追逐中,形成与分化为一道“读经”、“反相”、“反伪”的景观。我国能走出这种实际的大联合吗?我们来看清华大学曹栋兴教授的一种主流探索。

3) 曹栋兴教授在《化学量子能的发现鉴定和应用》中说:化学量子能是处在化学能与核能间的一个新层次。过能主要来自原子外层电子向低能态跃迁时放出的能量,只有在向“能穴”共振能量转移的触发下,才有释放过能的条件。新型氢能源,作为可持续发展的能源,可以用水在线作为氢燃料源。以自然界中存在的氢-氢系统反应为例,氢离子就是这种“能穴”,已在实验室中测到了过能,输出输入比有超过 10 倍的。微观上用能谱学方法测得过程中各个阶段核素变化发出的,或用激发的方法产生的特征谱线来鉴定发生的共振能量转移,触发外层电子的量子跃迁,放出化学量子能等过程,以及产生的新型氢化合物。

另外,曹栋兴教授 1989 年开始的冷聚变研究,借助一种改进型托卡马克一球环,提出在一定条件下,固体中的化学反应促使核反应发生的论点,取得了进入科学开发的阶段性突破。

而冷聚变生产核能,意大利物理学家安德烈-罗西称,已经设法成功实现能在不产生有害辐射物的情况下,生产出大量安全核能。罗西的新机器,是在室温环境下使镍和氢发生聚变,产生

近乎无穷无尽的能量。另外,美国《电子工程时报》网络版刊也报道,美国、日本和德国的科学家已在实验室证实了冷聚变。冷聚变的理论假设是,当对氘核进行电解时,分子被融进氮气内,释放一个高能中子,科学家已经探测到了大量热量,然而没有人探测到释放出来的中子。

美国圣地亚哥海军空间和海洋作战部队系统指挥中心的莫希伯斯讲,问题是测量仪器无法检测出这么少量的中子。为了感应这样小的质量,她使用了一个特定的塑料探测器 CR-39。该探测器由镍和金的合金组成,将其插入一个氯化钡和氘的混合物中。该塑料探测器捕捉到了许多微小的距离很近的小坑,莫希伯斯说是中子存在的确凿证据,证明室温下可以出现聚变反应。但是目前存在的一个问题是,很多科学家认为它有违物理学原理;迄今为止,也仍没有人能够充分解释清楚冷聚变的工作原理,以及它为什么会产生作用。

3、走出“读经”、“反相”、“反伪”三大学派的大联合

网名“龙江墨客”的说,王洪成历经磨难,仍对党和政府无怨无悔;始终将“水变油---水基燃料”机密发明的根,牢牢地扎在神州大地。肖钦羨先生说,《科技之光》发表许驭等人的文章指出,化学元素之间存在一定转化规律,冷裂变,冷聚变,地球上元素不是在高温高压下实现的,而是在冷态下实现的,各种元素都是冷转化的结果!许驭提出,氧核吸收了光能及引力能后产生冷核裂变的碳,是处于负熵态,有极其重要的历史意义!

热裂变、热聚变、冷裂变、冷聚变,从化学能到化学量子能和核能,是主流的理论物理家和量子力学家难迈开的坎,这是由曹栋兴到刘全慧,再到肖钦羨、许驭、王洪成等已能说明的。

1) 从化学能到化学量子能或核能,再到量子色动化学能,是一次飞跃。李政道式的主流量子色动边缘物理学家,在 21 世纪一开始已在我国公开耕耘。但他们讲的量子色动能源,都涉及十分昂贵的高精尖科技大型设备。例如高能对撞,能形成夸克-胶子等离子体这种炽热、稠密的物质,包含有数量大致相当的夸克和反夸克粒子。据报道,美国布鲁克海文国家实验室的相对论重离子对撞机,已观察到了新型反物质反氦-4。2011 年观察到的新型反物质“反超氘”,

是反氦-4 出现之前最重的反物质，也是首个含有反夸克的粒子。

而反氦-4 很可能是迄今观察到的最重的反物质。夸克-胶子等离子体逐渐冷却后，会变成一种强子气体并产生质子、中子和它们的反粒子。科学家们在金核相互对撞 10 亿次后形成的强子气体中，共观察到了 18 个反氦-4，证明反氦-4 确实存在，其包含 4 个反物质粒子：2 个反质子和 2 个反中子。反超氦、反氦并不等于夸克、反夸克、胶子、电子云、胶子海，海夸克等层次的相变的粒子，但从激光、闪电、大地震等宏观自然现象中，确有量子色动化学能的参与。

量子色动化学能，是从化学能到化学量子能和核能之后的下一个新层次。那么在没有大型强子对撞机、相对论重离子对撞机的情况下，能否从化学能直接引导出外源性量子色动化学能呢？马成金工程师探索到了。1984 年，马成金在四川盐亭县科协做实验，他用极少量的粉剂，放入一大碗兑有极少量盐巴的水，会使其剧烈“燃烧”，很快蒸发殆尽。2009 年 3 月马成金先生解密，说用的是类似金属钾、硝基苯、苯酚等材料制造的粉剂。该实验有毒和爆炸性，没有条件一般不能去作。马成金属于一个边缘物理化学爱好者。1959 年大跃进在大炼钢铁运动中，他在绵阳地区农机校读中专，开水碗溅水进铁水槽发生爆炸，他由此产生寻求释放巨大能量的水很快蒸发的探索。可惜他的知识功底，使他至今仍徘徊在化学能解释的阶段。

曹栋兴教授是属于核物理化学家，他指的化学量子能的过能，来自原子外层电子向低能态跃迁在共振能量转移触发的“能穴”，是放出能量的条件。如果把“能穴”转换看成一种“微腔”的话，那么马成金从一般的化学键想到的“油包水”、“水包油”微粒，其油膜或水膜也类似一种“微腔”。由此问量子色动化学能，有没有共振能量转移触发的“能穴”的微腔？这就是量子卡西米尔效应平板组织的“微腔”。量子色动化学过能就来自夸克、反夸克、胶子、电子云、胶子海，海夸克等层次的量子色荷云流相变，向低能态跃迁时放出的能量；这只有在向“点外空间”共振能量转移的触发下，才有释放过能的条件。即水中氧核不必变成碳核，就可以从液态转化为气态。许驭的氧核冷核裂变成碳的假设，也没有走到量子色动化学能认识的这一步。但马成金得到国家部级曾专职负责王洪成“水变油---

水基燃料”实验的官员和科学家的严谷良司长的专程看望。严谷良司长是清华大学核物理学专业的毕业生，与曹栋兴教授同属核物理化学“能穴”认识化学量子能阶梯。

2) 其实在化学能阶梯、化学量子能阶梯、量子色动化学能阶梯，哪一阶梯都有工作可做。类似刘用生教授说，高尔顿的输血实验不能否定达尔文的微芽泛生基因学说一样；也类似李政道教授说，大型强子对撞机实验不能否定希格斯场粒子的存在一样，量子色动化学能类似牛顿第二定律说力是空间的函数，要把能穴、微腔概念联系“点内空间”概念，可以再重温李政道教授关于弱相互作用中宇称不守恒的宇称思维。这要把中微子和光子，联系鸭子和鸡作对比。

鸭子和鸡都同属家禽，但鸭子类似鱼鹰能一闪一隐穿行于水中，而鸡却不行，为什么？

同理，中微子和光子同属基本粒子，中微子传输振荡运动的路线是一闪一隐穿行于“点外”和“点内”时空，是快子与慢子兼顾的物质，而光子却不能穿行于“点内”时空，为什么？

这里把“点内空间”比作“水”，再把“水内”和“水外”比作“宇称”的概念。进入“点内空间”能作超光速，即中微子能超光速，类似鸭子；光子不能进入“点内空间”，类似鸡。这种情况类似宇称不守恒和宇称守恒两类粒子，真有这种情况吗？这里我们再把进入“点内空间”比作人的生命进入“死亡”，是一种虚拟的虚数生存。人是有生命的生物，那么有生命的生物，被整体切割后就一定进入死亡吗？即有类似宇称不守恒和宇称守恒两类粒子的情况吗？在植物有这种情况，如植物的扦插；还有在低等动物中，如张作人先生将原生动物的棘尾虫切去 3/4 的部分，剩下的部分经再生调节功能的配合也能存活。这类似弱相互作用中存在的宇称不守恒。

李政道教授说，宇称是当量子力学开始发展的时候，人们从对称性认识到宇称的。1930 年代考克斯做宇称实验，第一次实验用的是来自 β 衰变的电子，其束流较弱，见到宇称不守恒。第二次试着去加强，用更强的电子源去重复实验，他改用热发射电子枪，结果就与宇称守恒理论符合。但当时只质疑第一次实验，没有人质疑第二次实验，人们一致认为它才是正确的。人们不能认识“点内空间”是一种虚拟的虚数生存，也是

类此情况。

3) “点内空间”联系量子云计算, 也有八元数理论在探索。例如天津理工学院基础教育学院的王洪吉教授, 就在研究八元数物理数学。王洪吉教授研究的八元数是四元数的一个非结合推广。众所周知, 四元数类似复数的推广, 复数就是承认和重视虚数的存在。就像四元数可以用一对复数来定义一样, 八元数可以用一对四元数来定义。八元数的加法是把对应的系数相加, 就像复数和四元数一样。八元数可以视为实数的八元组。每一个八元数都是单位八元数 $\{1, i, j, k, l, il, jl, kl\}$ 的线性组合。也就是说, 每一个八元数 x 都可以写成其中系数 x_a 是实数。

八元数有道理, 但“点内空间”联系量子物联网, 我们以庞加莱的复值函数四维空间坐标为例, 设想绕着转动的原点, 如像正立方体的房子。一般人只想到绕着房子外面的前后左右上下 6 方的转动。甚至把复值函数, 也只想成绕着房子外面的前后左右上下的正负组合。但这些都只与点外空间类似。现在设想把正立方体每边扩大一倍, 成为超立方体, 原来的小立方体, 就类似在点内空间的房子里面的原点, 其绕着原点的前后左右上下 6 方的转动, 就类似虚数的世界。这只是其一。其二, 设想房子本身有内外, 但房子内都只类似一种虚数单位, 那么点外和点内的前后左右上下 6 方, 也可以各自虚实组合。即点外的前后左右上下 6 方和点内的虚组合, 是七个八元数。再加上绕着原点的 0 位, 一共就是八元数。

4) 传统的八元数, 作为古希腊毕达哥拉斯数开方上的延伸, 据巴艾兹、伍尔达的文章介绍, 早在文艺复兴时期, 已有意大利数学家卡丹诺引入-1 的平方根数。

-1 的平方根是真实的存在吗? 数学家跟随卡丹诺的脚步, 开始运用形如 $a+bi$ 的复数, 其中 a 和 b 是普通的实数。到约 1806 年, 瑞士数学家阿尔冈提出用 $a+bi$ 描述平面点的方法, a 表示这个点的横向位置, b 表示纵向的位置, 这样就可以将复数视为平面上的点。而且阿尔冈还说明了如何将复数的四则运算, 解释成平面上的几何操作。

例如在实数线上做加、减, 就是往右或往左移动; 而乘、除一个正实数, 相当於将实数线做伸缩。若乘以-1, 则是将直线左右翻转。类似的想法也可以用到复数, 只是将平面上一点加上 $a+bi$, 相当於将该点往右(左)移动 a , 再往上(下)移动 b 。而乘以一个复数, 则是除了将平

面放大或缩小之外, 还多了平面的旋转。其中特别的是, 乘以 i 相当於将平面逆时针转 $1/4$ 圈, 因此将 1 乘以 i 再乘以 i , 相当於将平面转了半圈, 也就是从 1 转到 -1 。最后, 除法是乘法的相反, 因此除以一个复数, 是将放大换成缩小, 或是反过来将缩小换成放大, 然后再反方向旋转。

四元数是由爱尔兰数学兼物理学家汉米尔顿发现的。1835 年汉米尔顿发现用实数对来处理复数的方法: 复数 $a+bi$ 也可以用两个实数 a 与 b 的某种特别记法来表示, 例如实数对 (a,b) 。到 1843 年 10 月 16 日他想到: 在三维空间中, 如果要描述旋转与伸缩, 不能只用三个数, 需要第四个数。即形如 $a+bi+cj+dk$ 的四元数, 其中 i 、 j 、 k 都是-1 的平方根, 彼此并不相等。

四维空间描述三维空间的变化, 是因为其中有三个数要用来描述三维空间中的旋转。如果用开飞机来想象, 为了定向, 需要控制机身和水平面的夹角这类俯仰角, 这类似圈体的体旋; 其次也需要像开车一样控制左右转角这类偏航角, 这类似圈体的面旋; 最后还有控制两边机翼与水平面夹角的滚转角, 这类似圈体的线旋。第四个数则是用来描述伸缩的程度。

汉米尔顿的大学友人葛瑞夫兹, 不但是汉米尔顿对复数和四元数感兴趣的引导人, 而且在汉米尔顿发明四元数后又提出: 已经定义-1 的平方根 i 了, 那么 j 和 k 究竟是什麼? 这些-1 的平方根真的存在吗? 到 1843 年 12 月葛瑞夫兹自己也发明了一种八维数系的八阶数, 即现称的八元数。

八元数的行为, 乘法不只违背交换律, 还破坏结合律: $(xy)z=x(yz)$ 。但到 1845 年, 年轻的天才凯利也发现了八元数, 并且抢在葛瑞夫兹之前发表, 所以有时八元数也称为凯利数。

八元数联系到对称与弦, 是在 1970 与 1980 年代, 理论物理学家发展出超对称概念, 认为在宇宙最基本的层次上, 大自然的物质和作用力具有对称性, 每个物质粒子, 例如电子, 都具有可携带作用力的伴粒子, 而每个作用力粒子, 例如携带电磁力的光子, 也都有孪生物质粒子。

超对称还认为, 物理定律在交换所有的物质粒子与作用力粒子后, 仍然要保持不变。想像从一面镜子观察宇宙, 这面镜子不是普通的左右对调, 而是将所有的作用力粒子换成物质粒子, 而且将物质粒子换成作用力粒子。如果超对称是对的, 真能描述我们的宇宙, 那麼镜中的宇宙将和我们的宇宙一样。因为根据量子力学, 粒子也是波。在量子力学中, 物质粒子的波动是以一类数

(旋量)来描述的。而作用力粒子的波动,则以另一类数(向量)来描述。

这时如果用八元数从另一个角度思考宇宙,想像一个只有空间没有时间的奇异宇宙,这个宇宙的维度是1、2、4或8,那么物质粒子和作用粒子的波动,就可以只用一类数来描述,而且这类数是可以做加、减、乘、除的可除代数。在这类空间中,将不区分旋量和向量,只有实数、复数、四元数,或者八元数。超对称会自然显现出来,提供统一物质和作用力的描述方法。只要简单的乘法就可以描述粒子的相互作用,所有粒子---无论是物质粒子或作用力粒子,都使用同一种数系。再当考虑到时间,在固定时刻,弦像曲线或直线一样,是一维的。而随著时间流动,弦的轨迹会扫出一个二维的曲面。这个弦随时间演变的考虑,改变了超对称自然出现的维度,使得我们得再加上两个维度:弦和时间。因此从原本1、2、4、8维的超对称,变成了3、4、6、10维的超对称。

除了弦,还有膜理论,例如二维的膜,在固定时刻看来就像张纸片,而随著时间流过,膜的轨迹会在三维时空扫出一个立体区域。如果在弦论中,是在1、2、4、8维空间再加两维,那么膜理论得加3维。因此在处理膜理论时,超对称会自然出现的维度是4、5、7、11。M理论正是11维的理论(M即膜),自然运用了八元数。弦论学家宣称只有10维的弦论理论,才没有矛盾,其他的维度则都会出现异常,让相同的事物在不同的算法下,会得到不同的结果。

就是说,除了10维的情况之外,弦论都是失败的。所以10维弦论正是运用八元数的版本。如果弦论是正确的,那么八元数就不再是无用的玩物,它可以从根本回答宇宙为什麼是10维。因为在10维时空中,物质和作用力都体现了同一种数,也就是八元数。若八元数真是编织宇宙的织线,会有像复数等许多数学发展的故事。

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Effect Of Magnetic Field On Seed Germination And Transplant Growth Of Tomato

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ABSTRACT: Tomato (*Lycopersicon esculentum* Mill) cv. Castrock seeds were exposed to different magnetic strengths (0.1, 0.15 and 0.2 Tesla) for periods of 1, 5, 10 and 15 minutes and the treated seeds were germinated under distilled water or in saline concentration levels of 2500, 5000 and 7500 ppm. The results indicated that the magnetic field treatments led to a significant increase in the germination percentage, reduced the time needed for germination and improved seed germination under saline conditions. The best results were found by magnetic seed treatment with 0.1 Tesla for 15 min. On the contrary, high salinity concentrations decreased the germination of seeds, as for the saline concentration of the 2500 ppm activated the seed germination. In the nursery experiment, applying the optimal magnetic seed treatment (0.1 T for 15 min) and/or irrigation with magnetized water gave significant increases in transplant stem length, stem diameter, leaf area and fresh and dry weight than those in the control treatment which grew by untreated seeds and irrigated by ordinary (untreated water) water.

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Key words: Tomato, *Lycopersicon esculentum* Mill, Germination, Transplant, Magnetic field, Magnetic seed treatments, Magnetic water treatment, Magnetize water.

Antioxidant Activity- Guided fractionation of aqueous extracts from *Lepidium sativum* and identification of active flavonol glycosides

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ABSTRACT: *Lepidium sativum* (Fam. Brassicaceae), a popular vegetable producing plant of low reaches of Kumaun Himalaya, is an annual herb and its leaves are used as a Traditional Medicines to cure abdominal pains, asthma and lowering blood pressure. An aqueous Extract derived from the leaves of the plant, highly food supplement for human, has previously been screened for various biological activities, hypotensive, antimicrobial, bronchodilator, hypoglycemic and allelopathic. n-Butanol fraction of aqueous-methanolic extract, a highly flavonoid enriched and antioxidative active against DPPH and ABTS free radicals, afforded three flavonol glycosides, quercetin-3-O- β -glucosyl (1 \rightarrow 2)- glucopyranoside- 7-O- glucopyranoside, kaempferol-3-O- β -glucosyl (1 \rightarrow 2)- glucopyranoside - 7 - O - β - glucopyranoside and isorhamnetin - 3 - O - sophoroside -7 - O - β - D - glucopyranoside . The antioxidant activity of quercetin - 3, 7 - di-O-glycoside was found higher compared to the corresponding 3,7-di-o-glycosides of kaempferol and isorhamnetin.

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KEY WORDS: - *Lepidium sativum*, antioxidative activity, Flavonol glycosides.

INTRODUCTION

Lepidium sativum (Fam. Brassicaceae) is a small annual herb with 30 to 50 cm in height and bears lacinate pinnate entire leaves. It is a food plant and leaves are used as a traditional vegetable by some ethnic groups of Kumaun Himalayas. The aqueous extracts, of the plant has previously been screened for various biological activities, cardiogenic hypotensive, antimicrobial, bronchodilator, hypoglycemic and allelopathic (Kartar and Akulyan, 1971; Singh et al, 1984; Carbajal et al, 1991; Hasegawa et al, 1992; Alcalade et al, 2005, Osana et al, 2006). Glucosinolates, a class of naturally occurring thioglycosides, have been identified as a principle bioactive constituents of *Lepidium sativum* (Fahey et al, 2001). An essential oil composition and imidazole alkaloids from the plant have been investigated (Maier et al, 1998; Mirza and Navaei, 2006). The flavonoids, a diversified group of secondary metabolites and a polyphenolic heterocyclic compounds biogenetically synthesised from phenyl propanoids, have been identified as a potent antioxidants and have widely been used to cure diseases associated to oxidative stress (Jovanovic et al, 1994; Shui and Peng, 2004).

It has previously been established that the curing of various disease from the extracts of traditional medicinal plants have been attributed to the presence of polyphenolic compounds particularly flavonoids. The polyphenolic fraction from the H₂O extract of the plants, a highly recognised hydrogen and electron donating and a class of potent radical

scavenging activity bearing fraction, have highly been investigated previously from various traditional medicinal food and fodder plants for active flavonoids. Presence communication reveals isolation and characterisation of flavonol glycosides from the antioxidative active fraction of n-BuOH soluble.

MATERIAL AND METHODS

Plant material

The leaves of *L. sativum* were collected from the agriculture fields of Kumaun Himalayan hills in September 2010. The plant was identified by professor Y.S. Pangati, Department of Botany, Kumaun University, Nainital. A voucher specimen by *L. sativum* (No. 43) was deposited in the chemistry department of Kumaun University at Almora (Campus).

Extraction and isolation

5 kg. air dried and powdered aerial parts of *Lepidium sativum* was extracted with 80% aq. MeOH for six days by cold percolation method. The extract was filtered and evaporated to dryness under reduced pressure until only H₂O layer (approx 50 ml) remained. It was partitioned with dichloromethane and H₂O (1:1). After removing CH₂Cl₂ fraction, H₂O layer was further partitioned with EtOAc and n-BuOH. The n-BuOH soluble was concentrated in vacuo at 60°C and the residue was chromatographed on sephadex LH-20 cc using H₂O as an initial eluting solvent then successively eluted with 10% MeOH to 100% MeOH. A total of 90 fraction (each with 200

ml) were collected and each fraction was chromatographically examined on cellulose TLC Using 15% HoAc as an eluent. Fractions containing similar compounds were combined into three major fractions, with fraction-I (30–50% MeOH) containing 30 – 45, fraction – II (60% MeOH), containing (60 – 65) and Fraction-III (90 – 100% MeOH) containing (70 – 75). Eluates derived from Fraction I, II and III were separately concentrated under reduced pressure and examined on 2DPC using BAW and 30% HOAc as a developing solvent and ammonical AgNO₃ as a spraying reagent. The fraction I, II and III produced 3, 3 and 2 flavonoid positive spots respectively on 2DPC.

RESULTS AND DISCUSSION

Fraction, I, II and III were separately evaluated for antioxidant activity by DPPH assay and characterized by the concentration which produced 50% quenching of the free radical.

Fractions
DPPH Assay
IC 50 ±SD (µg/ml)
Fraction-I
5.04 ±0.40
Fraction-II
12.05 ±0.17
Fraction-III
13.06 ±0.05

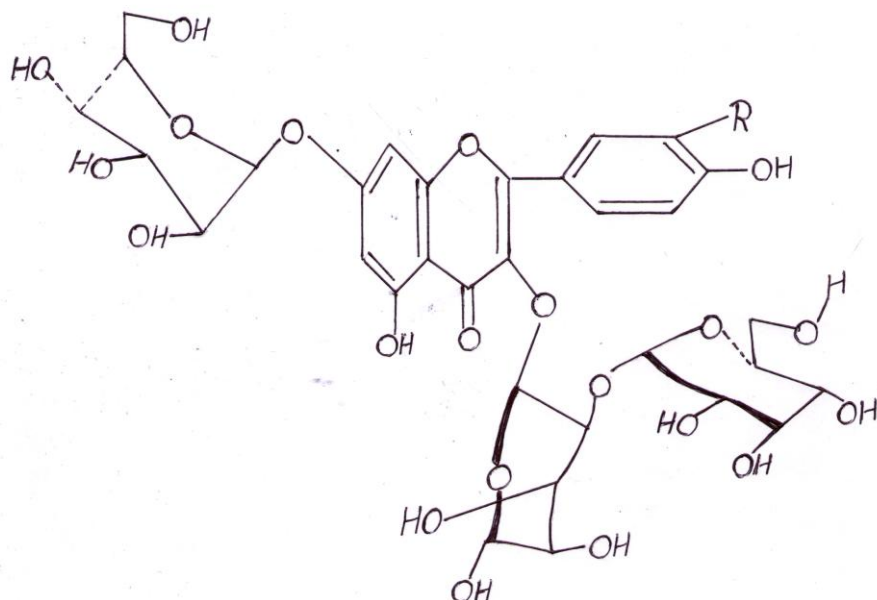
Fraction-I, which has been identified as a prominent antioxidant compared to Fraction-II and III, was analysed for positive flavonoid compounds. Fraction-I was evaporated to dryness and it was dissolved into MeOH. The MeOH soluble was band on whatman N.3 PC and repeatedly developed three times in BAW (4:1:5). Three Fluorescent (dark purple violet) band were observed on PC and each was cut and eluted separately in 70% aq. EtOH. An eluate derived from faster fluorescent bands representing compounds 1, 2 and 3 respectively.

Compound 1, representing a violet fluorescent spot on PC at Rf 43 in BAW, was identified as a flavonol glycoside on the basis colour reactions with FeCl₃, α-naphthol, Mg+HCl, ammonical AgNO₃ and NA reagent (Mabry et al, 1970; Markham, 1982). Complete acid hydrolysis of 1 with 2NHCl afforded isorhamnetin and glucose and were

characterized by comparing with their standards on PC. LC-MS-FABMS (deprotonated) exhibited molecular ion at m/e 801 (M-H)⁻ and other prominent ions observed at m/e 639 (m/e 801– glucose)– and m/e 315 [(m/e 639–(glucose + glucose))⁻ suggesting abstraction of three molecules of glucose from isorhamnetin. H₂O₂ oxidation of 1 gave a disaccharide sugar molecule, sophrose(glucose 1 → 2 glucose) and an aglycone representing compound 1(a). The UV, MS, ¹HNMR and ¹³CNMR Data of 1(a) were found similar to those reported in the literature to isorhamnetin-7-O-β-D-glucopyranoside. Thus, compound 1 could be identified as isorhamnetin-3-O-sophoroside-7-O-glucoside.

Finally, the structure of 1 was identified by ¹HNMR in DMSO-d₆ (400 MHz); ¹HNMR of 1 showed five signals in aromatic region at δ 6.42 (1 H,d, J = 2.0 Hz), δ 6.77 (1 H,d, J = 2.0 Hz), δ 6.96 (1 H, d, J= 8.5 Hz), δ 7.66 (1H,d,2.0Hz) and δ 7.82 (1H,dd, 2.0 and 8.5 Hz) representing H-6,H-8,H-5',H-2' and H-6', respectively of isorhamnetin. The anomeric protons at δ 5.72 (d, 7.6Hz) and δ 5.10(d, J=7.5Hz) were attributed to two glucose moieties (β – configuration) directly linked to the aromatic rings at 3- and 7- positions, respectively. A third anomeric proton was located upfield at δ 4.60 (1H, d, 7.8Hz) was assigned to a glucose moiety linked to the 3-O-glucosyl moiety with interglycosidic linkage, 1 → 2 (Altona and Haasnoot, 1980). Thus, compound 1 was identified as isorhamnetin – 3 – 0 – glucosyl (1 → 2) – glucopyranoside – 7 – 0 – β – D – glucopyranoside.

Compound 2, representing a dark purple fluorescent on PC under UV light at Rf 40 (in BAW) gave positive colour reactions to Mg+HCl, α-naphthol and FeCl₃ – K₄ Fe (CN)₆, complete acid hydrolysis of 2 with 2 NHCl afforded Kaempferol (CoPC), and glucose (CoPC). H₂O₂ oxidation of 2 gave sophrose (CoPC) and a fluorescent yellow aglycone 2(a). The 2(a) was identified as kaempferol – 7-0 – β – D – glucopyranoside by UV, ¹HNMR and FABMS studies. LC-FABMS (deprotonated) gave a molecular ion at m/e 771 (M-H)⁻ and other prominent ions observed at m/e 609 (m/e 771 – glucose) and m/e 285 (m/e 609 – (glucose + glucose) – representing three molecules of glucose from kaempferol.

**COMPOUNDS:**

1. R=OCH₃
2. R=H
3. R=OH

¹HNMR of 2 in DMSO-d₆ (400 MHz) gave four signals in aromatic region at δ 6.47 (1H, d, 2.0 Hz), δ 6.81 (1H, d, 2.0 Hz), δ 6.90 (2H, d, 8.5 Hz) and δ 8.05 (2H, d, 8.5 Hz) were assigned to H-6, H-8, H-3'/5' and H-2'/6' of kaempferol. The anomeric proton signals appeared at δ 5.72 (d, J = 7.6 Hz), δ 5.10 (d, J = 7.5 Hz) and δ 4.60 (d, J = 7.8 Hz) were found similar to the corresponding anomeric proton signals of compound 1. Thus, 2 was identified as kaempferol - 3-O- β -glucosyl-(1 \rightarrow 2)- β -glucopyranoside - 7-O- β -glucopyranoside.

Compound 3, representing a dark purple fluorescent spot on PC at R_f 36 (in BAW), gave a positive colour reactions with FeCl₃, Mg + HCl, AgNO₃ (Ammonical), α -naphthol and NA (in MeOH), suggesting a flavonol glycoside. Complete acid hydrolysis of 3 with 2 NHCl afforded quercetin (CoPC) and glucose (CoPC). LC - FABMS (-) of 3 exhibited a molecular ion at m/e 787 (M-H)⁻ and other prominent ions observed at m/e 625 (m/e 787 - glucose)⁻ and m/e 301 (m/e 787 - (glucose + glucose)⁻, representing abstraction of three molecules

of glucose from quercetin. ¹HNMR showed five signals in aromatic region at δ 6.41 (1H, d, 2.0), δ 6.74 (1H, d, 2.0 Hz), δ 6.80 (1H, d, 8.5), δ 7.50 (1H, d, J = 2.0 Hz) and δ 7.50 - 7.60 (1H, dd, 2.0 and 8.5 Hz), representing H - 6', H - 8, H - 3', H-2' and H-6', respectively of quercetin. The anomeric proton signals of 3 were found similar to the corresponding anomeric protons of 2 and 1. Thus compound 3 was identified as quercetin - 3 - O - β - glucosyl (1 \rightarrow 2) - glucopyranoside - 7 - O - β - D - glucopyranosides.

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Technical and Vocational Education and Training: Vehicle for Sustainable Development in Nigeria.

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Abstract: Vocational education and training is very cardinal to any economic development of a country. Training in general has potential benefits which accrue to the individual, organization and the nation in general. To the individual training enhances their future earning potentials career progression and employability. To achieve the above, the paper argues that the individual or groups will need skills to perform competently. With skill the individual can determine their own destiny. Because of the importance of skills to the individual, it is important that every individual access training to contribute to development. Currently Nigeria, not everybody is able to access training with the rise in population growth and economy going down, governments are unable to offer social amenities. Even schools and colleges cannot match the rising population and as a result fewer and fewer people are accessing training. The paper therefore focused on the contribution of a revitalized technical and vocational education and training to improve the economic status of the country and welfare of the people, trigger entrepreneurship which would eventually lead to job creation. The paper concludes that to solve the problem of widespread poverty, unemployment and national food deficit, priority should be giving to revitalized-technical and vocational education.

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Key words: Education, vocational, technical, sustainable development.

Introduction

Education of all levels can shape the world of tomorrow, equipping individuals and societies with the skills, perspectives, knowledge and values to live in a sustainable manner. Education for sustainable development (ESD) is a vision of education that seeks to balance human and economic well-being with cultural traditions and respect for the earth's natural resources. ESD applies transdisciplinary educational methods and approaches to develop an ethic for lifelong learning; fosters respect for human needs that are compatible with sustainable use of natural resources and the needs of the planet; and nurtures a sense of global solidarity (UNESCO, 2005)

Education for sustainable development is a dynamic concept that encompasses a new vision of education that seeks to empower people of all ages to assume responsibility for creating and enjoying a sustainable future". The overall aim of ESD is to empower citizens to act for positive environmental and social change, implying a participatory and action-oriented approach.

ESD integrates concepts and analytical tools from a variety of disciplines to help people better understand the world in which they live. Pursuing sustainable development through education requires educators and learners to reflect critically on their own communities, identify non-viable

elements in their lives; and explore tension among conflicting values and goals. ESD brings a new motivation to learning as pupils become empowered to develop and evaluate alternative visions of a sustainable future and to work to collectively fulfill these visions.

The Four Major Thrusts of Education for Sustainable Development

- Promotion and improvement of basic education: Access to basic education remains a problem for many especially girl children and illiterate adults. Simply increasing basic literacy and numeracy, as currently taught, will not significantly advance sustainable societies. Instead, basic education must focus on imparting knowledge, skills, values, and perspectives that encourage and support citizens to lead sustainable lives.

Why Refocus Vocational Education in the 21st Century Nigeria?

According to Calhoun and Finch (1982), vocational education has always been refocused by the changing needs of people and society. The basic concern of vocational education is for the people who provide the goods and services required by society. Calhoun and Finch further

explain that, vocational education should satisfy the needs of society to fill required positions necessary for the efficient operation of the economic system as well as the needs of individuals to find personally satisfying positions in the occupational structure.

Nigeria as a nation presently has many social and economic problems to handle in the twenty-first (21st) century. Most Nigerians are just recovering from chronic case of negative attitude towards vocational, technical and technological education. Nigeria is similarly just awakening from her long sleep of negligence of these aspects of education in her educational system (Apagu and Andural, 2007). The nation and her citizens are in the twenty-first century questioning the quantity and quality of these aspects of education in the nation's system of education and among Nigerians, especially among the youths.

Another problem necessitating refocusing of Nigeria's vocational education in this 21st century is youth unemployment which appears to be accelerating every year. According to Adefaye (2004, p.30), the neglect of vocational and technical education in the country has increased youth unemployment. Adefaye explains that, in 2003, primary school leavers accounted for 14% unemployment, secondary school leavers accounted for 53.6% while tertiary education graduates shared 12.4%. From this data on unemployment situation among school graduates, there is a clear indication that the primary and secondary school leavers have total unemployment of 67.76%. Presently, about seventy-five (75) percent of secondary school leavers in Nigeria do not go further in higher academic pursuit, It is therefore, disturbing to have a situation where many youths who are most physically able to render services towards national development are highly unemployed.

Public education does not have the right to throw its rejects into the ranks of the unemployed in the community". Rhodes' statement implies that, public education system should find a way of making all citizens capable of contributing to the economy of the nation. If public education that is meant for everybody cannot prepare citizens for work, who else can do it? It is worth mentioning here that the problem of Nigerian youths' unemployment can be reduced to a very large scale through relevant vocational education programmes. Unfortunately, it appears the Nigerian system of education is more interested in sieving the academically talented youths from the non-academically-talented, and then allowing the non-

academically talented human resources to waste away (Apagu and Andural, 2007).

According to Tommy (as reported in Adefaye, 2005):Despite the country's abundant resources, Nigeria had continued to manifest abysmal industrial performance record over the years because of the country's inability to synergies its resources to spawn an organic productive sector capable of engendering sustainable development and alleviate wide spread poverty.

The nation's predicament is heavily dependent on her ability to come up with a competent and dedicated workforce. The lack of dedicated and competent workforce is Nigeria's headache and the most militating force against the nation's technological, industrial and any type of national development. Vocational and technical education at this point stand very tall in helping the nation get out of the problem of lack of appropriate manpower and therefore, needs just refocusing to produce the desired result.

Nigeria's current efforts at educational reforms and restructuring are aimed at focusing issues: redesigning curriculum, increasing funding, refocusing monitoring process, accountability and transparency. Nigeria's present predicament was similarly experienced long ago by USA and the country's Advisory Council on Vocational Education. Vocational education which faces a unique challenge in the years ahead-a challenge rooted in the social and economic welfare of people. In the contemporary social scene with its large city problems, the ghettos, school dropouts, and variety of disadvantaged groups, the need for vocational education stands out clearly.

Calhoun and Finch (1982), in same vein emphasize that: Vocational education through the years has been responsive to the needs of society. When geographic and occupational mobility of workers, accelerated and improved technology required a higher degree of trained skills, society turned to the schools to supply its need for trained workers.

Calhoun and Finch further explain that because society currently insists that everyone leaving the public school system should have some type of occupational skill appropriate to earn a living, new importance has been attached to vocational education. Nigeria therefore, stands to gain from the longstanding experience of USA. There is therefore, no doubt that the Nigerian vocational education needs to be refocused for effectiveness and sustainable national development.

Reorienting existing education at all levels to address sustainable development

Rethinking and revising education from nursery school through university to include more principles, skills, perspectives, and values related to sustainability in each of the three - social, environmental, and economic-is important to our current and future societies.

Developing Public Understanding and Awareness of Sustainability

Making progress towards more sustainable societies requires a population that is aware of the goals of sustainable societies and has the knowledge and skills to contribute toward those objectives. Informed voting citizenry and knowledgeable consumers can help communities and governments enact sustainability measures and move toward more sustainable societies.

Training

All sectors of the workforce can contribute to local, regional, and national, sustainability. The development of specialized training programmes to ensure that all sectors of the workforce have the knowledge and skills necessary to perform their work in a sustainable manner has been identified as a critical component of ESD.

The Concept of Vocation Education

Vocational education is education and training for work. It is an education where skills are taught for the purpose of gaining employment through exposure to practical experience for self-actualization. Vocational education is education designed to prepare skill workers for industries, agriculture, commerce etc. Vocational education can be regarded as experience gained directly or indirectly that enables one to participate in a socially useful occupation either in or out of school, at various levels and to be sufficiently equipped to become an intelligent creator of goods and services. The continued deterioration of the national economy is a clear signal to every Nigerian try hard for a reliable and independent means of survival. This can only be realized through improved vocational training programmes with emphasis on functional agricultural education.

Vocational Education and the rural poor

Technical and vocational education and training plays an essential role in improving the wellbeing of rural families and communities. It increases productivity, empowers individual to become self-reliant and stimulates entrepreneurship. Businesses are more willing to invest in a community with strong human resources. Skills development can therefore contribute to

strengthening the social links of a community by promoting local employment, creativity and sustainable means of subsistence. Since there is a strong link between poverty and rurality, in Nigeria over 70% of poor people in rural areas where enrolment rates in all types of education are low, reducing poverty therefore will entail increasing rural educational opportunities as part of an overall development strategy. Here WET becomes a handy tool, as it can be both formal and informal. Such skill development of the rural poor must take into account:

- skills to diversity the rural economy rather than reliance on agriculture alone;
- equipping the people to add value to agriculture based product;
- training in basic literacy, numeracy and life skills should be In an integral part of the whole program;
- the promotion of the growth and profitability f local traditional crafts and industries.

However statistics as cited by Biakpara (2004) reveals that agriculture contributes about 41% to GDP and remains the lead sector for providing income and employment for the rural poor people. According to him, it employs 90% of the rural poor, nearly 70% of the total labour force and provides 90% of non-oil export revenue. Therefore a functional agricultural education through a well designed vocational programme remain one of the major key to alleviating poverty among the rural poor for sustainable development.

Technical and Vocational Education for Sustainable Development

Edition in whatever form is aimed at modeling a child or the individual into a better person relevant to his immediate environment. Sustainable development cannot be achieved without education. Development is a process where an economy undergoes social and economic transformation leading to a rise in the standard of living, access to basic amenities for all through knowledge.

It is in recognition of the above concept of development that technical and vocational education and training for poverty alleviation should be given utmost priority by government, having in mind the future consequence and task ahead for sustainable development. The future prospect and success of the WET would depend on the continuation and expansion of the existing cooperation both with national and international, as well as by starting non formal training programmes for the unemployed and the community at large as part of the government poverty alleviation efforts

toward sustaining welfare of the people and development (Hamza, 2005).

Women Empowerment and Agricultural Education

Though WET can be a decisive instrument in increasing opportunities for women to participate in the workforce and to improve their living conditions and social status through agricultural education, gender disparities still persist in many countries including Nigeria. Efforts should therefore be geared towards ensuring equal access to and participation in WET programmes for girls and women especially those who are marginalized. Women are responsible for half of the world food production and between 60% and 80% of the food in most developing countries. Not only are women the mainstay of the agricultural food sector, labour force, and food systems, they are also largely responsible for post harvest activities. However women fundamental contribution is continually under-appreciated and under-supported, and is often adversely affected by prevailing economic policies and other development conditions. This situation must be given serious attention by government, since sustainable rural development through agriculture cannot be achieved without the full participation of women. Agricultural education is therefore a sure means through which gender equality and women empowerment can be achieved, as a greater number of the rural poor are made up of women and children (Hamza, 2004; Hamza, 2005)

Integrating skill development in Education for all (EFA)

Ensuring that all learning needs of young people and adults are met through equitable access to appropriate learning and life skills programmes is one of the six educations for all (EFA) goals established at the world education forum in Dakar 2000. So the provision of the vocational skills training on agricultural education should therefore constitute an important component in national strategies if the EFA goal is to be achieved. But developing countries including Nigeria tend to concentrate on universal primary education and literacy, but do not pay sufficient attention to skill training for youths and adults, even though there are numerous initiatives focusing on providing education and training people from marginalized group. This in most case are often small in scale and are not always recognized as part of a comprehensive national education strategy. There is the need for government to urgently consider redesigning the curricula with emphasis on skill acquisition, especially agricultural education, if the

government target of reducing or eradicating poverty by the year 2020 is to be achieved.

In 2003, existing skills training programmes for the disadvantage groups were reviewed, and policies and institutional environment were analyzed in four countries in Africa and Asia (Mali, Senegal, Laos and Nepal). The experience of these selected countries was shared with other developing countries at an inter-regional seminar held at the international institute for education planning (Paris 22-23, January 2004). Suggestion to a more comprehensive approach to EFA was discussed and all stakeholders to EFA are to implement some of the policies and strategies for efficient result and feedback.

Incorporating WET in the EFA programme is a necessity in all developing countries because it advocates for flexible access to learning and training throughout life while down playing the short coming of the beneficiary in other to accommodate a larger group for sustainable development and improve / enhance productivity (Hamza, 2005).

The value of technical and Vocational Training

Skills are essential to the development of any economy. It is through skills that products in the form of goods and services are produced to the requirements of customers. With the skills an individual will be employable and participate in the production of goods and services. The reward to this participation is income that will be earned. Now when one is skilled, the rewards in terms of whatever income will be greater than one who is not skilled. With skills, the individual is able to perform a basic confidently and is able to sell himself or herself with less difficulty. With these capacities developed, one is able to earn a livelihood- regardless of whatever form it may come (Kombe, 2003)

Tevet contribution to sustainable development

Brundtland report of 1987 defines sustainable development as development that meets the needs of the present without compromising the ability of the future to generations to meet their own needs.

The Contribution of TEVET to sustainable development and improved livelihoods are:

- Tevet prepares people for the world of work.
- Through TEVET people acquire skills0 knowledge, attitudes and values.
- Skills, knowledge, attitudes and values help people participate in production of goods and services.

- Through TEVET people can acquire skills, knowledge values and attitudes that can help them use natural resources optimally.

For example, in Zambia these are people who cut trees in forests and make charcoal for sell. Since this is their livelihood, these people do not anything wrong in the cutting of trees indiscriminately. Instead of stopping them from carrying out the activity from which they are earning a livelihood, the people are given business management courses to enhance their business. This kind of programme therefore require a component of environmental issues. Therefore there will be need to redesign curriculum to take care of sustainable development issues. For example a business management course for this group of people would require to include say a business management course for charcoal burners. The implementation of the sustainable development mission statement also represent a major challenge for vocational education and training stakeholders. In scarcely any other field of education does the acquisition of competences for sustainable employability skills exert such a major effect on the future viability of economic, technical, social and ecological developments than is the case in companies involved in trade and industry. For this reason, the task vocational education and training is to provide people at all levels from skilled worker to management with the ability to assume responsibility and conduct economic activity in a resource-efficient and sustainable manner whilst also shaping globalization in a just and socially acceptable way. Both the inherent insecurities and contradictions involved and the increasing attendant complexity and networking require an expert approach to be adopted (Dettrich, *et al.*, 2009).

Strategies for Refocusing Vocational Education in Nigeria in the 21st Century

Ensuring Equality of Access to Vocational Education by all Nigerians

The National Board for Technical Education [NBTE] and the National Business and Technical Examination Board [NABTEB] have already started the process of refocusing vocational education in terms of providing equality of access to all Nigerians. NBTE has done a good job of coming up with a modular curriculum for this aspect of education in Nigeria. The modular curriculum is to make vocational education affordable by all Nigerians irrespective of academic standing. The academically strong persons can go ahead and take all the prescribed modules in an occupational area of interest, sit for the NTC or

NBC examinations and head for technical education or higher training at a tertiary education institution, then become professionals later in life. This cadre of personnel will grow up to occupy leadership positions in their chosen occupations.

The academically weak persons are in no way kept out of the programmes. They are free to take as many modules of the curriculum and practice to the level that their abilities may lead them without necessarily taking the NTC or NBC examinations or heading to the challenge of tertiary education. This situation will thereby, ensure an array of categories of workforce for national development. What is left undone here is public enlightenment by NBTE and NABTEB. These bodies need full government support to that effect.

Coping with Possible Enrolment Explosion in Vocational Education Programmes in Nigeria

The question that may readily come to mind in a situation whereby all Nigerians are to have equality of access to vocational education in the country may be “how can the few vocational education institutions in the country cope with the enrolment explosion?” One way of coping with the possible enrolment explosion will therefore, be to allocate more money to the area and have more vocational education institutions established, even though these schools are capital intensive. What is worth doing is worth doing well.

The second way to cope with possible enrolment explosion is to improve the introductory technology education facilities available in the secondary schools to enable the vocational education programmes take-off at the senior secondary schools with the determination to improve the facilities gradually with time. The third way out is to admit students in streams (A, B, C,) and run shifting system at the presently available science and technical colleges in the country, especially in the urban areas where electrical power sources may be readily available to improve lighting at night as well as power machineries and other appliances/equipment. In this way, it is advisable that non-boarding system be employed with morning and afternoon sessions.

Relevant Curricula in Vocational Education

Another way of refocusing vocational education for sustainable national development is to reengineer the curricular offering in vocational education institutions in the country. According to World Bank and the Nigerian Institute of Social and Economic Research [NISER] (as cited in Ajala, 2002), one of the major causes of declining quality of university education in Nigeria is irrelevant

curriculum and poor preparation and presentation of lesson notes by teachers. This point also applies to vocational and technical education. Nigerian educational system has for too long looked at curriculum development as a global project and consequently, almost ignoring her needs. Nigerians can do better at curriculum development if they consider it as a curriculum to first prepare Nigerians to live a happy and satisfying life in Nigeria using Nigerian indigenous technologies and materials; secondly, to prepare Nigerians to live in other parts of the world if they so wish. This situation will make Nigerian vocational education more relevant to the needs of the majority of Nigerians who may be even in the rural areas. There is nothing wrong with learning basket weaving along side the use and maintenance of computers, television, automobiles and so on, provided there is demand for the weaving and use of baskets in Nigeria. Vocational education is expected to prepare people to come up with products or render services in areas of local needs, not only in modern imported technologies.

Relevant curriculum may attract even adult Nigerians who live in rural areas, have less formal education, are unemployed and can benefit from such curricula/training to get enrolled in these programmes. This situation will allow the use of local ideas, tools/equipment and materials which will definitely minimize the nation's dependence on imported modern technologies and products. The situation will challenge the intellect of Nigerians and cause them to reason out ways of improvement on the indigenous materials and technologies and eventually evolve industrialization and sustainable development. This is truly a sign of sustainable development because the local raw materials/tools and equipment can always be made available or sustained. This situation will provide more employment outside farming for our rural populace. The nation's over dependence on imported vocational education curricula has resulted to the present high rate of unemployment even among the vocational education programme graduates. This is so because what is needed by society is not taught/learned. The time for the re-engineering of the nation's vocational education curriculum is now for tomorrow will definitely be late.

Reviving Handicrafts Subject at the Primary School Level

There is need to revive the handicrafts subject in the primary school curriculum and monitor its teaching/learning. Many Nigerian primary school teachers at present do collect

money from the pupils in place of physical handicrafts produced by the pupils. The teachers do so because they (teachers) lack the skills and knowledge regarding the handicrafts and consequently, cannot teach the subjects. They therefore, tend to hide their ignorance and find it very difficult to challenge students. The question is, "should students be given more marks for the demonstration of their ability to perform some skills or for paying more money, which might have not even been earned by them?" The Nigerian primary education system needs to include the study of handicrafts in its curriculum because these aspects of education mark the introduction of the teaching of Nigerian indigenous technologies in the formal school system.

The primary school teachers lack the knowledge and skills in the handicrafts subject because the curriculum used in preparing them lacks these aspects of education. Therefore, just as a bank cannot give out money which is more than what is available in the strong room, the teacher finds it difficult to teach what he did not learn/cover during the teacher education process. There is therefore, need to include this aspect of education in the primary teacher education curriculum to equip the teacher adequately and enable him face the challenge on the field effectively. There is also the need to include effective vocational guidance and counseling using vocational aptitude lessons in the handicrafts lessons. This situation will help inculcate positive attitude towards vocational/technical and Nigerian indigenous technological education among the Nigerian youths during the early part of their formal education.

The inculcation of appropriate attitude towards vocational/technical and Nigerian indigenous technological education in the youths is very important. A battle in which people are being forced to accept training against their wish cannot be won. The Nigerian youths therefore have to be nurtured early in life towards the creation of good society and capacity to compete globally and successfully.

Conclusion

The ideal of sustainable development and poverty alleviation, although broad and tinged with ambiguity in its understanding and application, it is still palatable to everybody as it forms the bedrock of government socioeconomic policies and programmes. For government to solve the problem of widespread poverty, national food deficits, and unemployment, technical and vocational education and training be giving top priority.

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