

主持人语

当代关于人的科学正在悄悄发生突破性进展,这种进展可能出现在学科交叉地带,尤其是文科和理工科的交叉地带,更具体地说是出现在文科知识和以神经科学(脑科学)为首的理工科知识的交叉地带。人文社会科学自近代以来就有倾听自然科学新发展的好学“习惯”,有时,倾听和学习甚至会带来整个认识纲领意义上的深刻革命,引发是否应当“第二次起航”的大讨论。近代牛顿力学成功后,在人文学中唤起了一波波建立“人的力学”或“人的几何学”的激情;19世纪以来实验心理学、量子力学和控制论的发展也曾在人文学科中一再引发新的方法论借鉴热潮。然而应当看到,近半个世纪以来的这次最新的“自然主义大潮”是史无前例的,因为这次科学的领头雁是神经科学(其主要伙伴是人工智能学)。人文学在过去遇到自然主义冲击时往往躲向“心灵”,而这次脑科学家正是直指心灵的本质,借助突破性的、日新月异的各种神经—脑科学技术的进步。可以预期,新的科学知识革命对人的自我理解所带来的影响将不仅是少许表层扰动,而是本体论和方法论意义上的范式革命。事实上,已经有不少文科学者在热切学习和接受新的方法论,如心智学中的主流派(丘奇兰德、克里克等);而且,善于学习者甚至在逐步形成崭新的“学科”(不仅拥有自觉的典范解题方法与文献积累,而且拥有专业杂志、专业学会、年会等等外在形式),如“神经经济学”、“神经法学”、“神经伦理学”、“神经教育学”、“神经管理学”等。尤其值得一提的是瓦雷拉等人倡导的“神经现象学”,它代表了积极结合传统文科研究方法(现象学方法、佛教内观方法)和新自然主义方法论而形成的一个很有前景的跨学科研究纲领。

由神经科学发展领头的自然科学新进展对人文学科最终会产生什么样的深刻影响?是全面铺开上述的“神经××学”,还是会激起像维科、斯诺、狄尔泰、柏林等人曾强调的科学与人文学的激烈冲突?这是所有人都应当关注的问题。毕竟,这关系到人类自身。所谓“文化强国”或“文化大国”,不可能对这样的根本性问题漠然无视。更何况这不仅涉及理论家的论辩,而且具有很强的技术应用前景。通过日益完善的“读心术”、脑区实时扫描、精神疾病遗传基础等新技术,神经科学的发展难道不会很快彻底改变人类的本体论境遇(human condition)吗?对此“大问题”,国外学界关心较早,不仅有专门探讨的论文,而且有面向大众的“启蒙”。其中一个典例是荷兰皇家脑科学所前所长、浙江大学曹光彪讲席教授狄克·斯瓦伯(D. F. Swaab)所写的《我即我脑》一书。该书立足于神经科学实验的最新发展,系统全面地对意识的本质、自由意志、宗教的本质、司法的有效性、生命的价值等提出了大量挑战性看法。斯瓦伯教授在西方和中国的演讲也引起了人文学者的热烈争论,甚至进入2012年全荷兰高中毕业考试(“高考”)的考卷。浙江大学人文学院、医学院和理学院相关学者认为,不妨以此为契机,展开深入推动跨学科研究进程的讨论。

摆在读者面前的这篇文章直面所谓心智学乃至人学的“难问题”——心智的本质、人的本质、心身关系、决定论与自由意志、机械论与目的论等。斯瓦伯教授及其脑科学的同行们在主题文章中的观点旗帜鲜明:心智是神经系统的产物,其性质与荷尔蒙是大脑的产物没有两样,所以是客观的。意识或者主体性的概念没有任何独立地位;自由意志是一个幻觉^①。他的观点在人文学者的回应中不乏质疑的声音。哲学学者李恒威认为,“我即我脑”的命题涉及心—身关系这个根本的形而上学问题,如果不澄清与之相关的存在论和认识论,就难以完全理解描述“人之现象”的种种概念,如物质、心智、意识、自由、价值等。为此,作者提出了“两视一元论”的形而上学构想,认为人类描述意识的两个范畴是视角变换的结果,它们之间是一种相应性的关系,而不是产生和被产生的关系,因此,意识体验与脑神经活动之间没有因果作用^②。历史学者孙仲、张文喜则认为:神经科学的最新发展并不能证明心智被大脑完全决定;在关于人类行动和历史的有意义的描述中,“脑主体”(cerebral subject)没有意义,必须以人为本位;自由是人类历史中的真实存在^③。

可以看到,本期所发表的文章代表了相当不同甚至极度对立的观点,但我们欢迎争议,欢迎交锋,因为真理在讨论中才会日益显明。我们欢迎更多的学者参与讨论。

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① 参见包爱民、罗建红、[荷兰]狄克·斯瓦伯《从脑科学的新发展看人文学问题》,载《浙江大学学报(人文社会科学版)》2012年第4期,第5-17页。

② 参见李恒威《意识的形而上学与两视一元论》,载《浙江大学学报(人文社会科学版)》2012年第4期,第18-28页。

③ 参见孙仲、张文喜《“神经历史学”是否可能》,载《浙江大学学报(人文社会科学版)》2012年第4期,第29-36页。

从脑科学的新发展看人文学问题

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[摘要] 神经科学的发展已经形成了关于人文学某些经典问题的重新思考或认识。当前的神经科学发现显示：我们的大脑和意识都是物质性的，意识的身心二元论是不能成立的，应该回归于大脑一元论。大脑很重要的一部分工作是无意识的，但却能很好地完成许多在常人看来需要意识去完成的工作，这种无意识的大脑运作过程也是大脑的一种客观属性。另外，常识心理学中所谓自由意志的存在是很可疑的，大脑在意识到自己作出决定之前已经作了决定，无意识的意志根据环境中发生的情况而作出瞬间的决定，其过程主要由大脑在发育期间所形成的工作方式以及由之后我们所学到的知识(记忆)决定。当然，自由意志是否存在这个重要问题的最终答案还应该来自于未来更多的科学实验。

[关键词] 神经科学；人文学；大脑；意识；自由意志

Notes on Some Fundamental Questions in the Humanities Based on Progresses in Brain Research

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Abstract: The rapid and strong development of brain research in the recent decades necessitates a re-thinking or re-awaking of some classical questions in the humanities, which may have significant effects on our society. As neuroscientists we would like to share with our colleagues from the humanities our points of view concerning these questions. Our points presented in this paper concern three important issues: (i) essence of the human mind, (ii) consciousness and unconsciousness of the brain, and (iii) free will.

Ad (i) Our fundamental point of view is that the classical body-mind dualism has disappeared with the new development of neuroscience and should be replaced by a brain-monism. The mind is the result of our 100 billion brain cells working together, and is thus a product of the brain. The mind is produced by the brain by action potentials, neurotransmitters and synaptic changes,

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resulting in changes in the activities of the brain cells, and interactions of the brain areas. The results of brain work are objective since they are solely the consequences of the changes in transmitter release and activity of nerve cells in particular brain areas. There are also good neuroscientific explanations for the so-called "subjective" properties of one's personality or character. It is the genetic background, early brain development, and remodeling of the brain caused by later developmental experiences playing together to make each brain unique. These mind-differences can be explained on the basis of differences in brain structures and functions and they are purely objective.

Ad (ii) Most of our brain work is unconscious and it can very well carry out complex tasks this way. Such unconscious processing of the brain is also one of its objective properties. In addition, the brain (= I) does have the unconscious wish "to survive," which has developed during evolution and that during evolution the wish for food and reproduction are strongly coupled to our brain reward systems has proven to be an extremely efficient mechanism. These basic wishes are sublimated in the human being into products of work, science and art.

Ad (iii) Scientific experiments have shown that our brain makes decisions before we are conscious of them. These observations seriously question whether we have any degree of free will. The unconscious will takes split-second decisions on the basis of what is going on in our surroundings, a process that is importantly determined by the way our brains were formed during development and by what we have learned since then (= memories). That the feeling of "free will" is an illusion has gained support of many experimental data, although the final answer to this important question should come from future experiments.

Our current knowledge of neurobiology shows that many inherited factors and environmental influences during early development affect the structure and functioning of our brains for the rest of our lives. This means that along with all kinds of potentials and talents, we have many built-in limitations, including a given level of aggression, our gender identity and our sexual orientation, and a greater or lesser tendency to develop brain disorders such as ADHD, borderline personality disorder, depression or schizophrenia.

Finally, we think that developments in neuroscience not only promote our penetration into the essence of human beings, but also significantly inspire the improvement in our social ethics and mechanism, as for example, in the case of how we should fairly and efficiently punish the offenders who have psychiatric disorders.

Key words: neuroscience; humanities; brain; mind; free will

科学的每一项进步都有可能帮助我们在认识人类自身的问题上取得关键性突破,脑科学在近几十年中突飞猛进的发展的确起到了这样的作用。人类自古以来就致力于思考和质疑人类的本质,在人文学尤其是哲学中已经逐渐积累了一批经典问题。神经科学的发展也因此形成了关于人文学某些经典问题的重新思考和认识,甚至可以说,对其传统解答构成了挑战。作为神经科学工作者,我们愿意坦诚地与人文学科的同行人分享我们的新见解,也欢迎你们的回应。为了集中讨论,笔者将主要就人文学科中的三个重要问题发表见解:(1)人类心智的本质;(2)意识与无意识;(3)自由意志。我们的基本观点是:意识的身心二元论应该回归大脑一元论,大脑很重要的一部分工

作是无意识的意志(unconscious mind/will),常识心理学中的所谓自由意志是很可疑的。或许我们的见解会显得尖锐,但目的只是追求真理,因为科学家追求和遵循的只能是真理。

一、意识的身心二元论应该回归于大脑一元论

自笛卡儿以来,哲学家们一直困惑于二元论问题:精神和物质是两种绝对不同的实体。客观(物质的)事物如何在神经活动的最后阶段突然从客观领域跃升到一个完全不同性质的领域,即主观的意识领域中?客观的事物怎么能影响主观的事物?在当今哲学文献中占据了很大分量的心智哲学也沉浸于对这个问题的讨论。作为脑科学家,我们的回答是:意识并不是主观的,它是客观/物质的。它是我们大脑的属性之一,和其他“客观事物的属性”一样客观。大量有效的证据表明,思维的过程其实就是大脑的工作过程,丘奇兰德(Churchland)等学者也已得出结论:笛卡儿的“难题”应不再成立^[1]。

意识是大脑中一千亿个神经元共同工作的结果,是大脑的产物。大脑通过神经细胞的动作电位、神经递质与神经突触的变化改变神经细胞的活性,产生脑区之间的相互作用,于是便产生了意识。大脑的其他功能还包括通过自主神经系统调节身体功能、运动行为、激素释放等。从解剖学角度看,意识是“额外的”脑组织工作的产物。这部分额外的脑组织是人类在进化过程中获得的,它们位于那些调节身体基本功能的脑组织之“上”。因此,小鼠、大象、鲸鱼的意识都比我们人类要少得多^[2]。

大脑工作的结果(经验、精神/心理状态,如视觉、痛觉、快乐、悲伤等)是“主观的”吗?不是。它们不过是由大脑特定脑区内神经细胞的神经递质释放和活性改变产生的结果。例如,眼睛视网膜内光感受器细胞——视锥细胞对不同波长的光起反应,“颜色”被编码于这些视锥细胞的电活动里,然后在大脑皮层进行解码。我们看到红色是因为大脑皮层内特定的神经细胞对红色波长的编码进行了解码。各种意识的活动基础都是神经细胞某种特定的功能改变和/或神经细胞与其他特定脑区的神经细胞进行交流,这些大脑活动就是我们的意识或定性的经验/体验(qualitative experiences)。这些精神/心理状态可以被反思/内省,也可以用语言表述,而无论是反思/内省还是语言的基础都是客观的(物质的)。现代神经科学技术甚至能使人们对本来具有神秘感的脑—意识(身一心)关系进行彻底的“祛魅”(disenchantment,借用马克思·韦伯的术语)。人们可以通过客观的方法如电极、高效液相色谱(测定神经递质水平的一种方法)、分子检测技术、显微镜、功能性核磁共振成像,也可以通过行为学检测来测量大脑的工作。越来越精密的功能性核磁共振成像技术(“读心术”,mindreading)、电生理技术^{①[3-4]}、化学方法^②等已经开始解读大脑的意识活动。这些观察难道还不能说明意识是“客观的”吗?

如果说大脑神经细胞活动即意识是一种“共性”,那么个体因具有独特的大脑而具有的独特意识就是“个性”。对于人格、性格等所谓“主观”现象,目前神经科学也可以提供较好的解释。物种、遗传背景、大脑早期发育环境的差异与后来的成长环境或经历共同作用,使每个人的大脑都是独一无二的^[2]。由于拥有不同的大脑,不同的个体甚至可以基于不同的意愿而采取相同的行动。例如,个体A因感觉到同情而想帮助他人;个体B由于其大脑前额叶发育不良(mal-developed)而对他人感觉不到同情,但为了获取良好的个人名声及赚取钱财,他也帮助了他人。这些意识差异既然都可

① 例如测量大脑内仅仅对于比尔·克林顿的照片产生电反应的细胞——颞叶内的“人面辨识神经元”,它们仅仅在个体辨认特定的人面时放电/工作。

② 例如测定大脑内化学物质多巴胺的释放,它们作用于伏隔核神经细胞,产生愉快这种感觉。

以由大脑的不同结构和功能来解释,那么,我们为何要称它们是“主观的”呢?

最后,我们将用一个有趣的例子进一步支持“意识是客观的”这一观点:25岁的马修·纳格勒(Matthew Nagle)颈部被刺伤后导致全身瘫痪。医生在他的大脑运动皮层植入了一块4×4毫米的含有96根电极的薄片。该装置所导出的操纵运动功能的脑细胞的电活动能使他操作一台电脑,他只花了几分钟时间就学会了这项技能——要做的仅仅是“想”(thinking about)移动自己的手去跟踪电脑屏幕上移动的光标。他还成功地仅仅通过“想”就在电脑屏幕上画了一个圈并且能阅读电子邮件、玩电脑游戏,甚至张开、合拢自己假肢上的拳头。这个例子说明,“想”(意识)是一种可以采用电极来进行测定的大脑工作,并且可以转化为运动行为^[5]。

总之,当前的神经科学发现表明,我们的大脑和意识都是物质性的,这意味着二元论的难题(hard dualistic problem)事实上并不成立,或者说应该回归于大脑一元论^[1]。

二、有意识与“无意识”的大脑

大多数相信二元论的学者们在意识与物质之间划分出明显的界线,认为意识作为大脑的特性,与物理特性有根本的不同,比如它必然是“觉醒的”(aware)或“有意识的”(conscious)。然而,大脑的工作其实大多是“无意识的”(unconscious),却能很好地完成许多在常人看来需要意识去完成的工作。这种无意识的大脑运作过程是大脑的一种客观属性。

我们的大脑在很多方面可以被比拟为一台巨型的、无意识地工作着的电脑,在很大程度上不得不像自动驾驶仪般不假思索地工作。我们持续地被大量的信息轰炸着,无意识地用选择性注意来提取对我们来说重要的信息。我们的许多决定都是在“转瞬间”或者“本能地”,或凭我们的“直觉”、“胆魄”(gut feeling)而作出的,没有自觉地(有意识地)去思考。我们因为一见钟情而“选择”伴侣,而罪犯会在法庭上非常真诚地说他是在杀人之后才意识到自己杀了人。就像现代飞机可以不需要机长,由自动驾驶仪控制起飞和降落,大脑在无意识的情况下也能够出色地完成大部分的功能。当然,我们的大脑得经过训练才能做到这点。比如只有通过给无意识的大脑长时间地提供大量的艺术品信息,艺术鉴赏家才能够达到能立即“感觉”出赝品的水平;只有观察了大量的病例,医学专家才会获得一双“临床慧眼”——在看到病人刚走进房间时就能对其作出初步诊断。功能性脑扫描已经显示,我们在进行有意识的推理和凭直觉作决定时运用不同的大脑回路。有意识的推理过程的产物并不总是优越于无意识决定的结果,它们甚至有可能阻碍人们作出好的决定^[2]。

大脑这种物质在生命中并不具备高级任务机制,但大脑(即“我”)拥有“生存”这种无意识的愿望,这是在进化过程中获得的特征——那些缺乏这种愿望的有机体在长期进化过程中都消失了。获得食物和繁衍的愿望(食欲和性欲)是和我们大脑中的奖赏中心——伏隔核内神经递质多巴胺的释放密切关联的。这些基本的愿望在人类身上可以体现为工作、科学、艺术等产物,某些人所拥有的这种(生存)内驱力(drive)要多于其他人(个体差异)。值得一提的是,即使是最高级的电脑也不具有这种与生俱来的生存和繁衍的愿望,它们只是无生命的物质。

三、是否存在自由意志?

以上讨论还与另一个问题有关,即自由意志是否存在。许多人都坚持认为我们具有自由意志,然而科学实验显示,大脑在意识到自己作出决定之前就已经作出了决定。这些实验观察对我们具有任何程度的自由意志都提出了严肃的质疑。

如上所述,我们负担过重的大脑总是通过无意识的过程不断地作出决定,因此,美国哈佛大学

的心理学家丹·韦格纳(Dan Wegner)建议用“无意识的意志”(an unconscious will)来取代“自由意志”(a free will)^[6-7]。无意识的意志根据环境中发生的情况瞬间作出决定,其过程主要由大脑在发育期间所形成的工作方式以及之后我们所学到的知识(记忆)而决定。“自由意志”的信念部分来自于我们感到自己一直在作自由的选择,然而根据韦格纳的观点,这是一种错觉。他进行过一些实验来支持他的理论。例如,他让受试者A站在镜子面前,手臂置于镜子的视野以外。受试者B站在A的身后并将自己的手臂从A的腋窝下方伸出,从镜中看似是A的手臂。当B的手臂按照个体C大声说出的指令去完成动作(如“挠挠你的鼻子”、“挥挥你的右手”)时,A就会产生一种错觉,认为是自己的意志在控制这些动作。韦格纳的实验清楚地表明,A的大脑中的无意识过程引起了关于B的这些手臂动作以及去做动作的“有意识”的念头。当B做一个动作时,A的大脑所观看/记录到的“有意识的画面”让A感觉到那动作是他自己在有意识地做的。但事实上,A的大脑工作(感觉)和B的手臂动作之间没有因果关系。因此,A的感觉是错觉。

根据阿姆斯特丹心理学家维克多·拉姆(Victor Lamme)教授的观点,对“有意识的意志”的错觉都是延迟出现的,即它们仅仅发生于正在进行的动作的信息被传回大脑皮层之后。自由意志仅仅是错觉这一观点还得到了许多其他重要实验的支持。本杰明·利贝特(Benjamin Libet)通过他的著名实验显示,当我们的身体接受到刚刚超过意识的阈值下限的刺激时,在我们的大脑有意识地记录到这种刺激之前会有半秒钟的延搁。大脑皮层所引发的行动也有同样的表现。他得出的结论是,出现这样的行动之前,大脑有半秒钟的无意识活动(readiness potential,准备电位),这一结论对“我们的自由意志控制我们的行动”的假说提出了严肃的质疑^[8]。对于利贝特的实验发现一直存在着激烈的争论,然而近期的实验表明,上述潜伏期(准备电位的时间)甚至可能更长。弗里德(Fried)对大脑内被植入了电极的受试者进行研究。在受试者作出有意识地按压一个按钮的决定之前的一秒半钟,大脑中特定脑区内的个别神经元就已经开始活动。研究者可以在受试者作出决定前约700毫秒时预测其作出决定的时间,准确度达到80%^[9]。2007年,海恩斯(Haynes)研究组对受试者进行大脑功能性核磁共振成像检测,他们在受试者面前放置一块屏幕,其上闪烁着一连串的随机字母。受试者被告知无论何时只要感觉到有按压按钮的想法,就可以用左示指或右示指去按压按钮,同时记住作出这种决定时在屏幕上看到的字母。功能性核磁共振成像实时显示了受试者选择用右手或左手做按压按钮动作时的脑活动。实验表明,有意识地“按压按钮”的决定在实际发生按压动作约1秒钟之前就作出了,而在作出这种决定长达7秒钟之前,大脑活动的一个模式似乎已经预告了这种决定的作出^[10]。还有实验显示,意识滞后于行动而发生:受试者被要求快速地点击在电脑屏幕上出现的闪光点,闪光点出现后的0.1秒,信息就从大脑视觉皮层发射到运动皮层,从而启动受试者点击屏幕上亮点的行动。如果采用磁脉冲干扰视觉皮层的信息处理过程,受试者会做出点击屏幕的动作,但无法“意识到”电脑屏幕上出现了亮点^[11-12]。

所有这些观察都指向同一个结论,即关于这些行动是由“自由意志”引起的想法的确是一个错觉。当然,对于自由意志是否存在这个重要问题的最终答案还应该来自于未来更多的科学实验。

当今的神经生物学知识还显示,遗传因素及大脑发育早期阶段的环境因素影响了我们余生大脑的结构和功能。这意味着我们在拥有各种各样的天赋和潜能的同时,也有着固有的局限性/限制性,包括攻击性的基础水平、对自身性别的认同感、性取向,以及发生精神分裂症、抑郁症、边缘性人格障碍、多动症等疾病的倾向性。此外,我们出生后就生活在一个特殊的语言(母语)环境中,即使我们不具备选择母语的能力,也不拥有掌握这门语言的遗传性天赋,这种语言也会对我们大脑的结构和功能产生重要影响。我们出生后生存环境中的宗教信仰也会使我们内在的灵性(spirituality)具体化,使我们成为诸如宗教信仰徒、唯物主义者或深度关切环境的人^[2]。

四、结 语

在上文中,我们从三个方面探讨了神经科学的新发展对于人文学的经典问题的可能解答。总体而言,笔者认为意识是客观的。众多因素决定了每个大脑的独特性,这使在“大脑产生意识”这种共性之外,还存在着“每个大脑的意识都不相同”的个性,而这两种属性都是客观的。我们还指出了大脑在很大程度上进行着高效而无意识的工作,即作出快速决定。同时,大脑的无意识工作方式有助于证明意识的客观性和“有意识的”、“自由的”意志是可疑的。

我们认为,脑科学近几十年的快速发展不仅有助于人类对自己的本质有更深入的认识,而且对于改善社会伦理和机制也有重要的启发作用。那些认为我们可以自由地选择如何去行动的观念不仅是错误的,还曾经制造过大量悲剧。例如,过去人们普遍认为我们的性取向,即异性恋、同性恋或者双性恋是一个“选择”问题,所有的宗教都认为同性恋是作出了“错误的选择”,直到不久之前同性恋还被判定是非法行为并被认作是一种畸变。人们曾经尝试了所有的办法来“治疗”同性恋者的“病态”行为,但没有一种方法显示出任何微小的“疗效”。神经科学已经发现,每一位个体在出生之前,其脑中已经不可逆转地形成了决定其性别的认同感、性取向的脑结构^[13]。

在许多国家的刑法中,因大脑发育缺陷或精神疾病而无法对自己的行为负责的人是可以免除刑事责任的。从总体上说,人们都同意“精神病患者没有自由意志”的观点。今天,监狱里的犯人们仍然有着高比例的精神疾病,这一事实应该引起社会的广泛关注:如今的法律应当如何公正而有效地处理这些个体?我们应该如何去惩罚这些罪犯?

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Notes on Some Fundamental Questions in the Humanities Based on Progresses in Brain Research

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Scientific progress may help us make breakthroughs in understanding the essence of human nature. The rapid and strong development of brain research in recent decades may indeed play such a role. Since ancient times, human beings have committed themselves to thinking about questions concerning the essence of human beings. This has gradually culminated in a number of common questions in the humanities, especially in philosophy. Recent development in the neurosciences is causing a re-thinking or reawakening of these classic humanity questions, and even constitutes a challenge to the traditional answers of these questions. As scientists, we would like to sincerely share with our colleagues in the humanities our new view points and we also welcome their responses. In order to focus the discussion, we would like to present our points concerning three important issues in the humanity sciences: (I) The essence of the human mind, (II) the conscious and unconscious brain, and (III) and the question of whether we have free will. Our fundamental viewpoints are: the body-mind dualism should be explained by brain-monism; a major part of the brain's working is unconscious mind/will; and free will in the common psychological sense does not exist. These view points may seem to be intense, but our goal is purely about the pursuit of truth, because that is the sole norm that scientists should pursue and follow.

I. The Body-mind Dualism Should be Explained by Brain-monism

Since Descartes, philosophers have always been puzzled by the problem of dualism: mind and matter are two entirely different entities. How could objective (material) matter, during the last

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stage of the neuronal processing, zoom from the objective field into a completely different property field, i. e. the subjective field of the mind? How could objective things affect subjective things? The huge amount of literature on "Philosophy of Mind" which occupies a large proportion of today's philosophy seems immersed in the discussion of this question. As brain scientists, our answer to this issue is that the mind is not subjective, it is objective/matter. It is one of the properties of our brain, and is as objective as the other "properties of objective things." Since the weight of evidence indicates that mental processes actually are processes of the brain, Descartes' problem has disappeared, as Churchland (2008) rightly concluded^[1].

The mind is the result of our 100 billion brain cells working together, and is thus a product of the brain. The mind is produced by the brain by action potentials, neurotransmitters and synaptic changes, resulting in changes in activity of brain cells and interactions of brain areas. Other products of the brain are the regulation of body functions by the autonomic nervous system, motor behavior, and the release of hormones. From an anatomic point of view, the mind is the product of the "extra" brain tissue that we obtained during evolution on top of the brain tissue that we need to regulate those basic body functions. Therefore, not only mice, but also elephants and whales have (in spite of the fact that the latter two have larger brains than we) much less mind than we do^[2].

Are the results of the brain work (experiences, mental states such as vision, pain, pleasure, happiness, colour red etc.) subjective? No, they are objective, since they are solely the consequence of the changes in transmitter release and activity of nerve cells in particular brain areas. For example, cone cells, the photoreceptor cells in the retina of the eye, respond to light of different wavelengths. The "colour" is coded in the electrical activity of the cones and decoded in the cortex. We see a red color because special cortical cells decode the code for the wavelength of red (colour). The basis of various mind activities is always a particular activity change of nerve cells and/or the communication of nerve cells with other particular brain areas. These brain activities are the production of our mind or qualitative experiences. These mental states can be introspected or expressed in language, while the bases of both introspection and language are objective (material). The modern neuroscientific technology can even enable us a thorough "disenchantment" (a term used by Max Weber) for the originally mysterious relationship between brain and mind. One can measure the working of the brain in an objective way by electrodes, HPLC, molecular techniques, microscopes, fMRI, and by behaviour. The increasingly precise fMRI (mindreading), electrophysiology (e. g. the brain cells that only electrically react when a picture of Bill Clinton is shown^[3-4]), electrical stimulation or a release of a chemical messenger (dopamine in the nucleus accumbens gives a pleasant feeling), have been used to interpret mind action of the brain. Do these observations not illustrate that our mind is "objective?"

If we regard the fact that the mind is produced by the brain as a "general character," the fact that each subject possesses a unique mind due to his unique brain gives him an "individual character." There are also good neuroscientific explanations for so-called "subjective" properties of one's personality or character. Factors of species, genetic background, differences in the environment during early brain development, and the remodelling of brain caused by the individual's later developmental circumstance or experiences, play together to make each brain different from each other^[2]. Please note that because different individuals own different brains, they may even show the same behaviour based upon totally different intentions. Subject A feels

empathy and wants to help other people, while subject B, due to a mal-developed prefrontal cortex, does not feel empathy, but also helps other people in order to gain reputation and money for himself. These mind-differences can be explained on the basis of differences in brain structure and functions, so why would we call them "subjective?"

Finally, we will give an interesting example that further supports our point of view that "mind is material": The 25-year-old Matthew Nagle was completely paralyzed after having been stabbed in the neck. A 4×4mm plate with 96 electrodes was implanted in his motor cortex. The derived electrical activity of his brain cells that guide motor function enabled him to operate a computer. He learned to do this in just a few minutes' time—merely by thinking about moving his hand and following a moving cursor on the computer screen. He also succeeded in drawing a circle on the screen, just by thinking about it, and to read his e-mail, to play a computer game and even to open and close the fist of a prosthetic hand. This example indicates that thinking is the brain's work that can be monitored by electrodes and translated into motor behaviour^[5].

In summary, current neuroscientific data indicate that brain and mind are both material, which implies that the so-called "hard dualistic problem" does in fact not exist and can be explained by brain-monism^[1].

II . The Conscious and Unconscious Brain

Most of the Dualistic scholars make a clear distinction between the mind and material, since they believe that the mind, as one of brain's characters, is essentially different from the other physical properties of the brain. For example, the mind must be aware or conscious. It should be noted, however, that most of our brain's working is unconscious and that it can very well carry out tasks which were generally believed to require consciousness. Such unconscious processing of the brain is also one of its objective properties.

The brain, in many aspects, could be compared to a giant, unconscious computer, which can, to a very large degree, work on autopilot. We are continually bombarded by an enormous amount of information and unconsciously use selective attention to extract what is important to us. Many of our decisions are indeed made "in a fraction of a second" or "instinctively," or on the basis of our "intuition," or "gut feelings" without thinking about them consciously. We "choose" a partner by falling in love at first sight, and an accused man will tell the court in all sincerity that he killed the victim before he knew it. Just as today's planes can fly and land on autopilot without the assistance of a captain, our brain can, to a very great extent, function excellently without conscious thought. Of course our brain has to be trained to do this. It is only by feeding the unconscious brain a huge amount of data over a long period of time that an art expert reaches the stage of immediately "sensing" that he's looking at a forgery, and it is only by seeing a great number of patients that a medical specialist can develop the "clinical glance" that enables him/her to have made a diagnosis by the time a patient enters the room. Functional brain scanning has shown that we use different brain circuits for conscious reasoning and for making intuitive decisions. The products of conscious reasoning processes are by no means always superior to unconscious decisions. They can even get in the way of good decisions^[2].

The material brain is indeed not provided with a higher task in this life. But the brain (= I) does have the unconscious wish "to survive," which has developed during evolution. Those

organisms that did not strive to survive died out during the long course of evolution. It is an efficient mechanism that during evolution the wish for food and reproduction are strongly coupled to dopamine release in the Nucleus Accumbens, our rewarding centre. These basic wishes are sublimated in humans through products of work, science and art. Some people have this drive more than others (individual variability). It is mentionable that even the best computer, in contrast to a human brain, does not have the inherent wish to survive and to (re)produce. They are non-living matter.

III. Do We Have Free Will?

The discussion mentioned above is also related to another question, i. e. , is there a free will? Many people would insist that we do have free will. However, scientific experiments have implied that our brain makes decisions before we are conscious of such a decision. These observations seriously question whether we have any degree of free will.

As mentioned above, our overburdened brain constantly takes decisions by means of unconscious processes. Harvard psychologist Dan Wegner thus proposed to speak of an unconscious will, rather than a free will^[6-7]. The unconscious will takes split-second decisions on the basis of what is going on in our surroundings, a process that is importantly determined by the way our brains were formed during development and by what we have learned since (= memories). The belief of "free will" comes partly from the feeling that we are constantly making free choices. According to Wegner, however, this is an illusion. He has carried out some experiments that support his theory. For instance person A stands in front of a mirror with his arms tucked out of sight. Person B stands behind him and stick his arms out under A's armpits, where A's arms would normally be. When B's arms carry out commands that are given aloud by person C (such as "scratch your nose," "wave your right hand"), A gets the illusion that he is controlling these actions with his will. Wegner's work clearly shows that both, the actions of B's arm movements and the "conscious" idea of initiating an action (B's arm movements) are prompted by unconscious processes in the brain of A. The "conscious picture" that A's brain registers when B carries out an action gives A the feeling that he (= A) has knowingly performed that action. But, the fact is that there is no causal link between the brain events (feeling) in A and the arm movements of B. Therefore the feeling of A is an illusion.

According to the Amsterdam psychologist Victor Lamme, the illusion of taking a conscious decision will only occur when the information on the action that is being performed is transmitted back to the cerebral cortex. The viewpoint that free will is simply an illusion is also supported by other experiments. Benjamin Libet showed in his famous experiments that when our bodies receive stimuli that are just above the threshold of awareness, there is half a second's delay before our brains consciously register them. The same applies to actions initiated from the cerebral cortex. His conclusion that such actions are preceded by half a second of unconscious brain activity (visible as a "readiness potential") raised serious doubts as to the possibility of acting by free will^[8]. Libet's observations have been hotly debated, but recent experiments even show longer latencies. Fried studied individuals with electrodes implanted in their brains. Fried's experiments showed that there was activity in individual neurons of particular brain areas about a second and a half before the subject made a conscious decision to press a button. With about 700 milliseconds to

go, the researchers could predict the timing of that decision with more than 80% accuracy^[9]. In 2007, Haynes put people into a brain scanner (fMRI) in which there was a display screen on which a succession of random letters flashed^[10]. The researchers told the subjects to press a button with either their right or left index fingers whenever they felt the urge, and to remember the letter that was showing on the screen when they made the decision. The fMRI revealed brain activity in real time as the volunteers chose to use their right or left hands. It was observed that the conscious decision to push the button was made about a second before the actual act, but the team discovered also that a pattern of brain activity seemed to predict that decision by as many as seven seconds. Long before the subjects were even aware of making a choice, their brains had already decided. Moreover, experiments have shown that consciousness lags behind the initiation of an action. In one such experiment, people were given the task of quickly touching a spot that lit up on a computer screen. Their visual cerebral cortexes worked with great speed. One tenth of a second after the light appeared, their brain fired off a message to the motor cerebral cortex to initiate the movement to touch the light. If the processing in the visual cerebral cortex was subsequently interrupted by a magnetic pulse, the action was carried out, but the person was not conscious of the screen lighting up^[11-12].

All these observations point to the same conclusion, i. e. , the notion that these actions are induced by free will is indeed illusory. The final answer to this important question, though, should come from future experiments.

Moreover, current knowledge of neurobiology shows that many inherited factors and environmental influences during early development affect the structure and functioning of our brains for the rest of our lives. This means that along with all kinds of potentials and talents, we have many built-in limitations, including a given level of aggression, our gender identity and our sexual orientation, and a greater or lesser tendency to develop ADHD, borderline personality disorder, depression or schizophrenia. In addition, we are born into a specific language area, which determines the structure and function of our brains to an important extent even though we have neither the ability to choose our mother tongue nor a genetically-based aptitude for it. The religious environment into which we are born determines how we flesh out our innate spirituality, whether with faith, materialism or a profound concern for the environment^[2].

IV. Epilogue

We have presented our viewpoints concerning three important issues in the humanity sciences based upon progress in brain research. In general we think that the mind is objective, and that various factors determine each of our unique brains, which allows the brain to have individual property besides its general property of "producing mind." Both properties are objective. In addition, we have pointed out that our brain has to work efficiently and unconsciously to make quick decisions. These unconscious decisions not only help to prove that our mind is objective, but also answer the question of "conscious, free will."

Furthermore, we think that the rapid development of neuroscience in recent decades not only promotes our exploration into the essence of human beings, but also significantly inspires our improving of social ethics and mechanisms. The notion that we are free to choose how to act is not only mistaken, but also has given rise to a great deal of misery. For instance, it used to be generally

accepted that our sexual orientation, i. e. , heterosexuality, homosexuality or bisexuality, was a matter of choice, and given that all religions regard homosexuals as having made the wrong choice, homosexuality was, until recently, criminalized and regarded as an aberration. All kinds of attempts were made to "cure" homosexuals of their supposed disorder, none of which had the slightest effect. Neuroscience has shown, however, that before birth, structural irreversible brain differences are already formed in relation to gender-identity and sexual orientation^[13].

In many countries, a person with a brain disorder who commits an offence for which he cannot be held accountable is not criminally liable. One generally agrees that in the case of a psychiatric disease free will cannot exist. The fact that prisoners have a very high prevalence of psychiatric disorders should raise serious concern in our society: how should our law deal with these people? How should we fairly and efficiently punish these offenders?

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