

# Neurotechnology and Neuroethics

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## Neurotechnology and Neuroethics

### 神经技术和神经伦理学

From drinking tea to deep brain stimulation and neurochemical manipulation  
从喝茶到深部脑刺激和神经化学操控  
Hans-Martin Sass

1. Natural foods for feeding and stimulating the brain: tea, chocolate, wine, opium, coffee, coke.  
为大脑提供营养并且刺激大脑的自然物质：茶、巧克力、红酒、鸦片、咖啡、可卡因
2. Natural events to stimulate/manipulate/modify brain activity: seen horrible or enjoyable photos, hearing stories, seeing a sexually attractive person, showing food to a hungry person.  
刺激、操控、修改大脑的活动：看到恐怖的或是令人赏心悦目的照片、听故事、看到一个性感的人，给饥饿的人看事物的照片

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3. Extreme forms of neurostimulation: causing extreme pain by torture, enhancing capacities and fighting sleep by neuroenhancing drugs, sedatives and sleeping pills.  
神经刺激的极端形式：通过折磨产生极端的痛苦，通过神经增强药物增强能力和与睡眠做斗争，镇静剂和促进睡眠的药物
4. Brain-machine interfaces [BMI] such as hearing aids or deep brain stimulation interactive or by remote control  
大脑机器界面，比如助听器、通过交互或是远程操控的深部脑刺激
5. Neurotechnological healing, care, and enhancement  
神经技术治疗、保健、增强

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Confucius:

孔子:

*"People are like precious pearls; they need to be polished in order to shine!"*

人就像珍贵的珍珠一样，他们需要抛光才能发光！

- How much polish is too much? How much is optimal? Who decides?

抛光到什么程度才算是抛光过度呢？什么程度是最佳的？这由谁来决定呢？

What are the ELSI - ethical, legal, social - implications?

什么是ELSI-伦理、法律、社会-影响？

What are benefits to patients?

患者的收益是什么？

What are potential abuses by individuals, societies, governments?  
个人、社会和政府可能会发生怎样滥用神经技术呢？

## The brain needs to be entertained, stimulated, cultivated

### 大脑需要被娱乐、被刺激、被培养

1. All forms of life need to be fed, to survive and to want to life a good life.  
所有的生命都需要被抚育、存活并且想要过好的生活
2. Drinking tea to feel fresh and alert or to sleep well is a civilized routine for many  
为了感觉清新爽快、警觉或是为了保障良好睡眠而喝茶对许多人来说是一种文明的日常生活
3. Other foods calm down alertness or anxiety, or enhance intellectual activity.  
另一些食物使人镇静，降低警觉和减少焦虑，或是增强智力活动
4. Wine 'makes happy', opium makes 'feel good', other drugs make 'feel high'.  
红酒使人感觉到快乐，鸦片使人感觉很好，其他的药片使人感觉亢奋
5. Painkillers and sedatives are of greatest service in certain situations.  
在特定的情况下，止痛药和镇静剂是能够提供的最好的服务

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## The brain needs to be entertained, stimulated, cultivated

### 大脑需要被娱乐、被刺激、被培养

Can you agree with the following personal responsibility and tolerance rule:  
你同意下述的个人责任和忍耐原则吗？

*Whenever philosophers, experts, politicians, wise people and their followers, individuals and moral communities morally disagree, one should respect a human and civil right to follow one's own conscience is the best course of action; of course, the decision maker has to bear personal consequences and those for others.*

无论何时哲学家、专家、政治家、聪慧的人和他们的追随者、个人和道德群体不同意，人们应当尊重人类，并且遵从自我良心的权利是行动的最佳的行动方案；当然，决策者不得不承担个人的后果和对其他人产生的后果

Which situations or cases would require legal or regulatory intervention?

什么样的情况或是案例需要法律或是监管干预？

## Deep brain stimulation I

### 深部的脑刺激

1. Successful usage of neurotechnologic devices in treating pain, depression and other neuropsychiatric disorders and for controls of computer games.  
在治疗疼痛、抑郁和神经精神疾病和控制电脑游戏方面成功的使用神经科技设备
  2. The relationship between the structure and function of the brain and conscience, emotions, feelings is not understood (body-mind problem)  
人们还没有理解 大脑的结构和功能与良心、情感和感情之间的关系（身体与思维的问题）
- Recommendation: 推荐
- (1) Regulation of interfaces and interventions when used by general public;  
当公众普遍使用神经技术设备的时候，需要对界面和干预加以管理

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## Deep brain stimulation II 深部的脑刺激

(2) *Regulation when used in clinical settings;*  
当在医疗情境中使用神经技术设备时需要管理

(3) *Special considerations for non-clinical, educational, cognitive uses*  
需要对非临床、教育和认知方面的应用加以特殊的考虑

The ELSI “safety of these neurotechnology products spans from good to dubious to potentially very bad”.  
伦理、法律、社会、影响“这些神经科技产品的安全性的跨度很大，有的很好，有的令人怀疑，有的有可能是十分坏的”

Giordano and DuRousseau Recommendation (Cognitive Technology 2010, 15(2)5-10

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## What is normal? What is enhancing? I 什么是正常的？什么才是增强的？

1. *What are the roles of education, cultivation, training? Do normal people need those services?*  
Confucius: ‘make pearls shining’

教育、培养以及训练的作用是什么呢？正常的人们需要这些服务吗？令人困惑的是：让珍珠闪亮

2. *What is the role of medicine and health care: health repair or health enhancement?* 医学和卫生保健的作用是什么？健康修复还是健康增强？

3. *Who decides – changing fads and cultures, experts, parents, autonomous citizens?*  
谁来决定改变时尚和文化？专家、家长还是自由的公民？

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## What is normal? What is enhancing? II 什么是正常的？什么才是增强的？

ELSI Proposal: 伦理法律社会影响建议:

“That neuroenhancement remains grounded within a framework of a core philosophy of medicine as profession and practice;  
作为专业和实践的核心医学哲学的框架内神经增强是有据可依的

That protocols for use be frequently assessed and revised so as to ensure sound and stringent provision of these interventions – as medically required; 根据医学要求，使用协议要经常地被评价和修改以确保这些干预措施的条款的合理性和严格性

That guidelines and policies be developed to afford equitable access to, and distribution of these resources and interventions”

制定的指导原则和政策要使人公平可及，对于这些资源和干预措施的分配也是如此

Gini, Rossi, Giordano, in *ajob Neuroscience* 2010, 1(1)25-27

## Neuroweapons in intelligence and combat I

• A weapon is ‘something used to injure, defeat or destroy’ such as augmenting or degrading functions of the nervous system, affecting cognitive, emotional or motor activity or function, such as perception, judgment, morale, pain tolerance, stamina, alertness.

• Neuroweapons may be produced by  
• neuropharmacology,  
• neuromicrobiology  
• neurotoxins

• Goals: mitigation of aggression or induction of pain or morbidity

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## Neuroweapons in intelligence and combat II

Manipulation of neurocognitive functions by pharmacological manipulation:

1. memory, learning, cognitive speed
2. Alertness and impulsive control
3. Mood, anxiety, self-perception
4. Creativity
5. Trust, empathy, decision-making
6. Waking and sleeping

Giordano J, Wurzman R 2011 *Neurotechnologies as weapons*. *Synesis* T:55-T:71

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## The case of Oscar Pistorius: Prosthetics Repair or Improvement 奥斯卡·皮斯托瑞斯案例：修补还是增强？



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The case of Oscar Pistorius:  
Prosthetics Repair or Improvement  
奥斯卡·皮斯托瑞斯案例：修补还是增强？

Oscar Pistorius, a famous South-African sprinter who has both legs amputated below his knees with carbon fiber sprinting prosthetics, called Cheetah blades. In 2008 he was not allowed to compete in races by the International Association of Athletics Federation, because his unfortunate disadvantage was overcompensated by an unfair advantage. Now, a group of famous scientists has lobbied that he may represent his country in the 2012 London Olympics.

奥斯卡·皮斯托瑞斯，一个有名南美短跑选手，他双腿从膝盖以下都被截肢了，安装了碳纤维短假肢，这个假肢被称为猎豹刀片。在2008年，国际田径联合会没有允许他参加比赛，因为他不幸的不利条件过度地被一种不公正的有利条件补偿。现在，一些有名的科学家游说他代表国家参加2012年伦敦奥运会。

Biological Science, Decision Making, Culture I  
生命科学、决策制定、文化

"The brains of social animals are wired to feel pleasure in the exercise of social dispositions such as grooming and cooperation, and they feel pain when shunned, scolded, or excluded. Neurochemicals such as vasopressin and oxytocin mediate pair-bonding, parent-offspring bonding, and probably also bonding kin to kin."

"在实践社会性格的时候社会动物的大脑会受到刺激而感到愉悦，如装扮和协作，并且当他们遭遇躲避、责骂，或排斥的时候会感到痛苦。影响神经系统的化学物质如血管加压素和催产素间接配对结合，亲子结合，也可能是家族间结合"

Patricia Churchland, 1986, Neurophilosophy

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Neural Implants: Repair or/and Enhancement I  
神经植入：修复或/且增强

Neural Implants are planted under the skull on the surface of the brain, they can listen or talk to the brain; diagnostic or therapeutic communication is wireless and can be done remote. Existing neural implants treat serious illnesses:

神经植入物被植入到颅内，它们能够与大脑进行信息传递；诊断性或治疗性的信息交换是以无线形式进行的，并且能够通过远程操作来完成。现有的治疗严重疾病的神经植入技术：

Cochlear implants deliver voice or music, collected from external microphones directly to the auditory nerve and into the brain (FDA: +200.000 worldwide)

人工耳蜗能够使从外部麦克风收集的声音或音乐，直接传递到听觉神经并传递到大脑。

1. 'Brain pacemakers' perform deep brain stimulation to treat Parkinson's disease.

"大脑起搏器"给予深度脑刺激来治疗帕金森病。

2. 'Epileptic alert' devices can sense the development of seizures and deliver brain stimulation to stop developing irregularities in brain activity and/or warn the patient.

"癫痫警报"装置能够感觉到癫痫的发展同时传递大脑刺激来阻止不规则的大脑活动的发作。并且/或向患者发出警告

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Neural Implants: Repair or/and Enhancement II  
神经植入：修复或/且增强

In the near future:

在不远的将来：

1. Detection of inattention and stimulation towards focused attention and alertness

疏忽和刺激的探测倾向于集中注意力和机敏。

2. Strengthen neural pathways associated with physical tasks, such as stroke victims learning to walk again or athletes vastly improving sprinting, swimming, baseball

加强神经通路与身体机能相结合，如中风患者再次学习行走或大幅提升运动员短跑、游泳、棒球的能力。

3. BrainGate implants for paralyzed people learning to move robotic arms by thought.

为瘫痪病人植入大脑之门(BrainGate)来学习通过自己的想法来移动机械手臂。

(Nature 2012, 485:372-375; Tetraplegics use a neurally controlled robot arm).

Biological Science, Decision Making, Culture II  
生命科学、决策制定、文化

Questions:

1. Can or should people be made more ethical or more intellectual by chemical or other direct neuronal intervention?

能够或应当通过化学或其他直接神经元干预使得人们更道德或更聪明吗？

2. Can or should I condition someone, who does not love me, neurologically to love me?

我能够或应当通过神经学使一个本不爱我的人爱我吗？

3. Is there a difference between beating people up and neuromanipulation?

打人和神经操控两者之间有不同吗？

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Biological Science, Decision Making, Culture III  
生命科学、决策制定、文化

4. Can or should people take neurochemicals in order to be more moral, more liked, more successful, more happy?

人们能够或应当为了更道德、更受喜爱、更成功、更幸福，而使用影响神经系统的化学物质吗？

5. Can or should government treat people neurochemically to make them more peaceable, more productive, more compassionate, more happy?

政府能够或应当为了使人们更和谐、更高效、更慈悲、更幸福而用影响神经的化合物来治疗他们吗？

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### Healing Acquired Aggressiveness by Neurosurgery? I 通过神经外科手术治愈后天侵略性?

Frontal lobe lesions have been associated with acquired aggressive behavior. Restoring neuronal and cognitive faculties of aggressive behavior by invasive brain surgery causes ethical, legal, and cultural issues. Acquired aggressive behavior is difficult to change and is a threat to the carrier and to her/his social environment.

额叶病变已经被证实与侵犯行为相关。通过侵入性的脑手术来修复好斗行为的神经元和认知能力，来解决伦理、法律，和文化问题。后天的侵犯行为很难改变，并且对行为本身和他/她的社会环境是一种威胁。

Frederic Gilbert, Andrej Vranic, Samia Hunt: *Involuntary and Voluntary Invasive Brain Surgery. Ethical Issues Related to Acquired Aggressiveness. Neuroethics* 2012 | DOI:10.1007/s12152-012-9160-9

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### Healing Acquired Aggressiveness by Neurosurgery? II 通过神经外科手术治愈后天侵略性?

1. Is coercive involuntary invasive surgery for the benefit of the individual and of others acceptable as 'therapy' when the individual cannot give consent or lacks the capacity to give consent?

当个体不能给予同意或缺乏给出同意的能力时，为了个体和其他人的利益，强迫的非自愿的侵入性手术能否作为“治疗”被接受？

2. If the individual has the capacity to give consent, does she/he have an obligation to consent for her/his own protection and for others?

如果个体具有同意的能力，为了自己和其他人利益，他/她是否有责任同意这样做？

3. If the individual has the capacity to consent and does not consent, may a paternalistic decision be made in her/his own interest (and in the interest of others) to change her/his behavior and eliminate the aggressive drives of his personality?

如果个体有同意的能力并且不同意做手术，为了他/她自己和他人的利益，能否做出一个家长主义的决定来改变他/她的行为并消除他/她个性中的侵略感冲动呢？

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### Healing Acquired Aggressiveness by Neurosurgery? III 通过神经外科手术治愈后天侵略性?

4. Are we not free to improve our 'natural capacities' as much as we want?

我们不能随意提升我们的“自然能力”吗？

5. Are we not free, to use tools such as nails, cars, internet, neural implants for fun and for success?

我们不能为了快乐和成功而随意使用工具吗？如钉子、汽车、互联网、神经植入技术。

Would re-education in prison be better or more successful?

监狱中的再教育会更好或更成功吗？

Who defines 'aggressiveness' neurologists, psychiatrists, family, society, government?

谁来定义“侵略性”？神经学家、心理学家、家庭、社会、政府？

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### Voluntary intellectual or emotional enhancement I 自愿的智力或情感的增强

Confucius: "People are like precious pearls; they need to be polished in order to shine!" – How much polish is too much? How much is optimal? Who decides?

孔子：“人们喜欢珍贵的珍珠；为了让它们闪闪发光，它们需要打磨”。多少的打磨是过多的？多少是最佳的？谁来决定？

Enhancement is a human dream.

增强是人类的梦想。

The drive to grow and to improve is a prime virtue.

成长和进步的动机是最重要的美德。

We compete as hard working human beings; some of us are better in sports, music, intellect, but in fair competition such as in Olympic sports doping is not accepted.

我们作为勤奋的人类而竞争；我们中的一些人在体育、音乐、智力方面出众，但在竞赛中公平竞争中兴奋剂是被禁止的，如在奥林匹克竞赛中。

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### Voluntary intellectual or emotional enhancement II 自愿的智力或情感的增强

1. If we replace education and self-cultivation by neurological enhancement, what will the consequences be for culture, job market, family and neighborhood relations?

如果我们用神经增强技术来替代教育和自我培养，文化、就业市场、家庭和邻里关系的结果会是什么样？

2. If some pay for intellectual enhancement, how will the normal competition and social justice be changed?

如果有人为智力增强付费，通常的竞争和社会公正将如何变化？

3. If the government or corporations require neuro-enhancement interventions, what will the future of individual human dignity, personal responsibility, and society be?

如果政府或公司需要神经增强干预，未来个体尊严、个人责任，和社会将是什么样？

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### Voluntary intellectual or emotional enhancement III 自愿的智力或情感的增强

A recent novel by Daniel H Wilson 'Amped', Random House 2012, describes a growing feud between neurologically enhanced people and normal people, culminating in fight and war of the enhanced (able, powerful, rich) against the 'rest'. The novel includes the 'historic document' that people in the US have the constitutional right to be free and develop free without interference from government, church, party, or anyone else.

Daniel H Wilson最近的著作“Amped”，描述了神经增强者和普通人之间不断增长的矛盾，最终导致增强者（有能力者、有权利者、富人）和“其余人”之间的冲突和战争。著作中包括“历史文件”，即美国人民有不受政府、教会、政党、或其他人干预的自由的权利和自由发展的权利。

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Associated Ethical and Cultural Questions I  
关于伦理和文化的问题

1. Can and should we replace philosophy, ethics, religion by neuronal treatment 'care'?  
我们能够和应当用神经治疗“关怀”来代替哲学、伦理、宗教吗？
2. Who decides about 'good therapy', the goal of tutelage, the limits of manipulation?  
谁来确定“好的治疗”、监护目标、操纵的限制？

Cases:

案例

1. Can and should we replace divorce by neuronal treatment of partners?  
我们能够和应当通过对夫妻进行神经元治疗来代替离婚吗？
2. Which role will/should neuronal 'therapy' play in the emotional, intellectual and social education of kids?  
神经元“治疗”在感情、智力和儿童社会教育中将/应当扮演哪种角色？

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Associated Ethical and Cultural Questions II  
关于伦理和文化的问题

3. Can we allow ourselves to be conditioned for better work and pay, for happier life and play?  
为了更好的工作和薪水、为了更幸福的生活和娱乐，我们能否允许我们自己被限制？
4. What are the limits to neurologically condition/modify people?  
神经学限制/修改人类的界限是什么？
5. Who decides about those limits? Who controls those decisions?  
谁来决定哪些限制？谁控制那些决定？
6. What is the role of government, what the role of the individual, what the role of the community/culture in making decisions, tolerating or prohibiting?  
在做决定时，政府、个人、社区/文化各自的作用是什么，默许或阻止？

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