

TED演讲者: Hugh Herr | 休·赫尔

演讲标题: How we'll become cyborgs and extend human potential | 如何成为生化人并扩展人类潜能

内容概要: Humans will soon have new bodies that forever blur the line between the natural and synthetic worlds, says bionics designer Hugh Herr. In an unforgettable talk, he details "NeuroEmbodied Design," a methodology for creating cyborg function that he's developing at the MIT Media Lab, and shows us a future where we've augmented our bodies in a way that will redefine human potential -- and, maybe, turn us into superheroes. "During the twilight years of this century, I believe humans will be unrecognizable in morphology and dynamics from what we are today," Herr says. "Humanity will take flight and soar."

仿生学设计师休·赫尔先生说,人类很快就会拥有新的身体,这将永远模糊自然世界与合成世界之间的界线。在一次令人难忘的谈话中,他详细介绍了“神经体现设计”,即他正在麻省理工学院开发的创建生化人功能的方法,并向我们展望未来会以一种重新定义人类潜能的方式提升我们人体机能——也许我们会变成超级英雄。“我相信本世纪末,与今天的我们相比,人类在形态和动力学方面将发生颠覆性的变化。”他说,“人类将会腾飞和翱翔。”

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I'm an MIT professor, but I do not design buildings or computer systems.

我是麻省理工学院的教授,但我并不设计建筑或计算机系统。[00:13]

Rather, I build body parts, **bionic** legs that **augment** human walking and running.

确切来说,我建造身体部位,增加人的行走和运行能力的仿生腿。[00:18]

In 1982, I was in a **mountain-climbing** accident, and both of my legs had to be **amputated** due to tissue damage from **frostbite**.

在1982年的登山事故中,因为双腿组织冻伤,我双腿膝盖以下被迫截肢。[00:25]

Here, you can see my legs: 24 **sensors**, six **microprocessors** and muscle-tendon-like **actuators**.

看,这就是我的双腿:有24个传感器,6个微处理器和像肌肉肌腱样的驱动器。[00:33]

I'm basically **a bunch of** nuts and **bolts** from the knee down.

我的膝盖以下就是一堆螺栓螺母。[00:40]

But with this advanced bionic technology, I can skip, dance and run.

但是,借助这种先进的仿生技术,我可以跳跃、舞蹈和跑步。[00:43]

(Applause) Thank you.

(掌声) 谢谢。[00:49]

(Applause) I'm a bionic man, but I'm **not yet** a **cyborg**.

我是一个仿生人,但还不是生化人。[00:52]

bionic: adj.仿生学的;利用仿生学的 **augment**: vi.增加;增大/vt.增加;增大/n.增加;增大 **mountain-climbing**: n.攀岩 **amputated**: 切断/锯掉/截(肢)(amputate的过去式和过去分词) **frostbite**: vt.使冻伤;使受霜害/vi.参加冬季帆船比赛/n.冻伤;冻疮;霜寒 **sensors**: n.[自]传感器;感应器;感测器(sensor的复数) **microprocessors**: n.[计]微处理器(microprocessor的复数);[计]微处理机 **actuators**: n.[电]致动器;制动器(actuator复数形式) **a bunch of**: 一群;一束;一堆 **bolts**: n.[机]螺栓;[机]螺钉(bolt的复数);膨胀锚钉;角钢螺丝;毛边书 **not yet**: 还没有,还没 **cyborg**: abbr.(部分机能由各种电子或电机装置代替的)半机械人;靠机械装置维持生命的人;受控机体(cybernetic organism)

When I think about moving my legs, **neural** signals from my central nervous system **pass through** my nerves and **activate** muscles within my **residual limbs**.

当我想移动双腿时,中枢神经系统会发出神经信号,通过神经进行传导,并激活我残余肢体的肌肉。[01:02]

Artificial **electrodes** sense these signals, and small computers in the bionic limb **decode** my nerve **pulses** into my intended movement patterns.

人造电极感应到这些信号,仿生肢体内的小计算机对我的神经脉冲解码并进入预期的运动模式。[01:15]

Stated simply, when I think about moving, that command is communicated to the **synthetic** part of my body.

简言之,当我想移动时,这个命令被传达到我身体的合成部分。[01:26]

However, those computers can't input information into my nervous system.

然而,计算机却无法将信息输入到我的神经系统。[01:34]

When I touch and move my synthetic limbs, I do not experience normal touch and movement **sensations**.

当我触摸和移动我的合成四肢时,我感受不到正常触摸和运动的感觉。[01:38]

If I were a cyborg and could feel my legs via small computers **inputting** information into my nervous system, it would fundamentally change, I believe, my relationship to my synthetic body.

如果我是生化人,而且能通过小电脑输入神经系统的信息而感觉到我腿的存在,我相信,它将从根本上改变我与我的合成身体之间的关系。[01:45]

neural: adj.神经的;神经系统的;背的;神经中枢的 **pass through**: 穿过...;通过... **activate**: vt.刺激;使活动;使活泼;使产生放射性/vi.激活;有活力 **residual**: n.剩余;残渣/adj.剩余的;残留的 **limbs**: n.[解剖]四肢(limb的复数) **electrodes**: n.[电]电极(electrode的复数);电焊条 **decode**: vt.[计][通信]译码,解码/vi.从事破译工作 **pulses**: n.[电子]脉冲(pulse的复数);干豆,豆类/v.使跳动;使以脉冲(pulse的三单形式) **Stated**: adj.规定的;阐明的;定期的/v.规定(state的过去分词);陈述;阐明 **synthetic**: adj.综合的;合成的,人造的/n.合成物 **sensations**: n.感觉;轰动;感动 **inputting**: n.输入/v.输入(imput的ing形式)

Today, I can't feel my legs, and because of that, my legs are separate tools from my mind and my body.

现在,我无法感受到双腿的存在,正因为如此,我的双腿事实上只是独立于我身体和意志之外的工具而已。[02:00]

They're not part of me.

它们根本不是我身体的一部分。[02:08]

I believe that if I were a cyborg and could feel my legs, they would become part of me, part of self.	我相信,如果我是生化人 且能感受到双腿的存在,它们会成为我身体的一部分、自我的一部分。[02:11]
At MIT, we're thinking about NeuroEmbodied Design.	在麻省理工学院, 我们正在考虑神经体现设计。[02:17]
In this design process, the designer designs human flesh and bone, the biological body itself, along with synthetics to enhance the bidirectional communication between the nervous system and the built world.	在这个设计过程中, 设计者们设计 人体肌肉和骨骼、生物体本身, 连同合成物们一起, 共同增进神经系统 与所构建世界之间的双向沟通。[02:21]
NeuroEmbodied Design is a methodology to create cyborg function.	神经体现设计是一种 创造生化人功能的方法。[02:39]
In this design process, designers contemplate a future in which technology no longer compromises separate, lifeless tools from our minds and our bodies,	在此设计过程里, 设计者们设想,在未来世界中 技术不再妥协于 与我们头脑和身体分离的、没有任何生命特征的工具;[02:45]
a future in which technology has been carefully integrated within our nature, a world in which what is biological and what is not, what is human and what is not, what is nature and what is not will be forever blurred .	未来世界中,技术已被精心整合到 我们人类的天性中; 一个是否是生物、 是否是人、 是否是自然本性的 界限将永远模糊的世界。[02:56]
synthetics: n.人工合成(绝缘)材料 methodology: n.方法学, 方法论 contemplate: vt.沉思;注视;思忖;预期/vi.冥思苦想;深思熟虑 compromises: n.妥协;和解;折中方案(compromise的复数)/v.妥协;折中(compromise的第三人称单数);退让 lifeless: adj.无生命的;死气沉沉的;无趣味的 integrated: adj.综合的;完整的;互相协调的/v.整合;使...成整体(integrate的过去分词) blurred: adj.模糊不清的;被弄污的/v.玷污;使...模糊不清;使感觉迟钝(blur的过去式和过去分词)	
That future will provide humanity new bodies.	未来将为人类提供新的身体。[03:11]
NeuroEmbodied Design will extend our nervous systems into the synthetic world, and the synthetic world into us, fundamentally changing who we are.	神经体现设计将我们的神经系统 延伸到合成世界中, 同时也将合成世界延伸到我们体内, 这些都将从根本上改变我们。[03:15]
By designing the biological body to better communicate with the built design world, humanity will end disability in this 21st century and establish the scientific and technological basis for human augmentation ,	通过设计生物体 人类将在二十一世纪终结残疾, 并为人类能力的强化 建立科学和技术基础;[03:26]
extending human capability beyond innate, physiological levels, cognitively, emotionally and physically.	在认知、感情和身体方面, 人类能力的提升 将超越先天和生理层面。[03:41]
There are many ways in which to build new bodies across scale, from the biomolecular to the scale of tissues and organs.	有许多方法可以超越常规 来建立新的身体, 从生物分子层面 到组织和器官层面。[03:50]
Today, I want to talk about one area of NeuroEmbodied Design, in which the body's tissues are manipulated and sculpted using surgical and regenerative processes.	今天,我想谈谈 神经体现设计中的一个领域, 使用外科手术和再生技术, 对人体组织进行处理和重塑。[03:58]
humanity: n.人类; 人道; 仁慈; 人文学科 communicate with: 沟通;通话 disability: n.残疾;无能;无资格;不利条件 augmentation: n.增加,增大;增加物 capability: n.才能, 能力; 性能, 容量 innate: adj.先天的; 固有的; 与生俱来的 physiological: adj.生理学的, 生理的 cognitively: adv.认知地 emotionally: adv.感情上;情绪上;令人激动地;情绪冲动地 biomolecular: 生物分子的 tissues: n.[组织]组织;薄的纱织品;面巾纸(tissue的复数) manipulated: v.操作(manipulate的过去分词) sculpted: v.雕刻(sculpt的过去式) regenerative: adj.再生的,更生的;更新的	
The current amputation paradigm hasn't changed fundamentally since the US Civil War and has grown obsolete in light of dramatic advancements in actuators, control systems and neural interfacing technologies.	自美国内战以来, 截肢规范并没有发生根本性的改变, 随着执行器、控制系统 和神经接口技术的迅猛发展, 原来的截肢规范早已过时。[04:10]
A major deficiency is the lack of dynamic muscle interactions for control and proprioception .	一个主要的缺陷是 缺少了用来进行控制和本体感知的 动态肌肉间的相互作用。[04:24]
What is proprioception?	什么是本体感知呢? [04:32]
When you flex your ankle, muscles in the front of your leg contract, simultaneously stretching muscles in the back of your leg.	当你弯曲脚踝时, 腿前部的肌肉就会收缩, 同时,腿后部的肌肉则会伸展。[04:34]
The opposite happens when you extend your ankle.	当你伸展脚踝时, 肌肉的作用正好相反。[04:40]
Here, muscles in the back of your leg contract, stretching muscles in the front.	当腿后面的肌肉收缩时, 腿前面的肌肉就会伸展。[04:43]
When these muscles flex and extend, biological sensors within the muscle tendons send information through nerves to the brain.	当这些肌肉弯曲和伸展时, 肌肉肌腱内的生物传感器 通过神经向大脑发送信息。[04:47]
amputation: n.截肢;切断(术) paradigm: n.范例;词形变化表 Civil War: 内战 obsolete: adj.废弃的;老式的/n.废词;陈腐的人/vt.淘汰;废弃 in light of: 根据;鉴于;从...观点 advancements: n.进步;进展(advancement的复数形式);升任 deficiency: n.缺陷, 缺点; 缺乏; 不足的数额 interactions: n.[计]交互,相互作用;相互交流(interaction复数) proprioception: n.[生理]本体感受 flex: vt.折曲;使收缩/vi.弯曲;收缩/n.屈曲;电线;松紧带/adj.弹性工作制的 simultaneously: adv.同时地 stretching:	

n.伸长;展宽/v.拉伸(stretch的ing形式) tendons : n.肌腱,[解剖]腱;蹄筋(tendon的复数)	
This is how we're able to feel where our feet are without seeing them with our eyes.	这就是为何我们根本不用看 就能感觉到脚的位置。[04:54]
The current amputation paradigm breaks these dynamic muscle relationships, and in so doing eliminates normal proprioceptive sensations.	目前的截肢范式 打破了这些动态肌肉间的关系, 这样做也消除了正常的本体感知能力。[05:00]
Consequently , a standard artificial limb cannot feed back information into the nervous system about where the prosthesis is in space.	因此,,一个标准的假肢 无法将假肢在空间中的位置信息 反馈回神经系统中。[05:08]
The patient therefore cannot sense and feel the positions and movements of the prosthetic joint without seeing it with their eyes.	病人因而也无法感知和感受到 假肢连接处的位置和动作, 除非自己亲眼看到。[05:16]
My legs were amputated using this Civil War-era methodology.	我的腿就是用这个 内战时期的方法截肢的,[05:25]
I can feel my feet, I can feel them right now as a phantom awareness .	我能感觉到我的双脚,, 现在就能感觉到它们的存在, 仅仅作为一种幻影意识。[05:30]
But when I try to move them, I cannot.	但是,当试图移动它们时, 我却做不到,[05:34]
It feels like they're stuck inside rigid ski boots.	感觉它们像被卡在 坚硬的溜冰鞋里一样。[05:36]
eliminates : 消除/排除 proprioceptive : adj.本体感受的 Consequently : adv.因此; 结果; 所以 feed back : 反馈;反应;回复 prosthesis : n.假体;添字首音;弥补;义体 prosthetic : adj.假体的;非肌基的 phantom : n.幽灵;幻影;虚位/adj.幽灵的;幻觉的;有名无实的 awareness : n.意识;认识;明白,知道 rigid : adj.严格的; 僵硬的, 死板的; 坚硬的; 精确的	
To solve these problems, at MIT, we invented the agonist-antagonist myoneural interface, or AMI, for short .	在麻省理工学院,, 为了解决这些问题, 我们发明了主动肌和 对抗肌神经的接口, 缩写为AMI。[05:40]
The AMI is a method to connect nerves within the residuum to an external, bionic prosthesis.	AMI 是一种将残肢中的神经 连接到外部仿生假肢的方法。[05:48]
How is the AMI designed, and how does it work?	AMI 是如何设计的, 又是如何工作的呢? [05:55]
The AMI comprises two muscles that are surgically connected, an agonist linked to an antagonist .	AMI 包括两块通过手术连接的肌肉: 主动肌和与之连接的对抗肌。[05:59]
When the agonist contracts upon electrical activation , it stretches the antagonist.	当主动肌在电激信号作用下收缩时, 它会伸展对抗肌。[06:05]
This muscle dynamic interaction causes biological sensors within the muscle tendon to send information through the nerve to the central nervous system, relating information on the muscle tendon's length, speed and force.	这种肌肉的动态交互作用 导致肌肉肌腱内的生物传感器 通过神经向中枢神经系统发送 有关肌肉肌腱长度、 速度和力量的信息。[06:11]
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This is how muscle tendon proprioception works, and it's the primary way we, as humans, can feel and sense the positions, movements and forces on our limbs.	这就是肌肉肌腱本身的工作原理, 它也是我们作为人类 感觉和感知四肢位置、 运动和力量的主要途径。[06:24]
for short : 简称;缩写 comprises : vt.包含;由...组成 surgically : adv.如外科手术般地 agonist : n.收缩筋;兴奋剂 antagonist : n.敌手;[解剖]对抗肌;[生化]拮抗物;反协同试剂 activation : n.[电子][物]激活;活化作用 stretches : 伸张	
When a limb is amputated, the surgeon connects these opposing muscles within the residuum to create an AMI.	当肢体被截掉以后, 外科医生把残肢内 这些拮抗肌连接起来, 形成AMI。[06:34]
Now, multiple AMI constructs can be created for the control and sensation of multiple prosthetic joints.	现在,可以创建多个AMI结构 用于多个人工关节的控制和感知。[06:40]
Artificial electrodes are then placed on each AMI muscle, and small computers within the bionic limb decode those signals to control powerful motors on the bionic limb.	然后,将人造电极 放在每块AMI 肌肉上, 仿生肢体内的小计算机 对这些信号解码, 以控制仿生肢上的强力马达。[06:48]
When the bionic limb moves, the AMI muscles move back and forth , sending signals through the nerve to the brain, enabling a person wearing the prosthesis to experience natural sensations of positions and movements of the prosthesis.	当仿生肢体移动时, AMI 上的肌肉来回移动, 通过神经向大脑发送信号, 使佩戴假肢的人能体验到 假肢的位置和运动的自然感觉。[06:58]
Can these tissue-design principles be used in an actual human being?	这些组织设计原则 能用于真正的人体吗? [07:12]
A few years ago, my good friend Jim Ewing -- of 34 years -- reached out to me for help.	几年前,我34岁的好朋友吉姆·尤文 向我求助。[07:17]
Jim was in an a terrible climbing accident.	吉姆经历了一次可怕的登山事故。[07:24]
opposing : adj.反对的;相对的;对面的/v.反对(oppose的ing形式) constructs : n.构念(construct的复数);建筑物;构图/v.设计(construct的三单形式);建造 motors : n.汽车;发动机(motor的复数);汽车公司证券 back and forth : 反复地,来回地 enabling : adj.授权的/v.使能够;授权给(enable的现在分词) Ewing : n.尤因(男子名);尤英(美国新泽西州西部一县属区);尤文氏肉瘤	
He fell 50 feet in the Cayman Islands when his rope failed to	在开曼群岛上,他下跌了50英尺, 他的绳子没能接住

catch him hitting the ground's surface.	他, 导致他直接撞到地上。[07:26]
He suffered many, many injuries: punctured lungs and many broken bones.	他身上多处受伤, 肺被刺穿、许多骨头都断了。[07:33]
After his accident, he dreamed of returning to his chosen sport of mountain climbing, but how might this be possible?	事故之后, 他依然梦想着回到自己选择的登山运动, 但这怎么可能呢? [07:39]
The answer was Team Cyborg, a team of surgeons , scientists and engineers assembled at MIT to rebuild Jim back to his former climbing prowess .	答案就来自于“生化人团队”, 一个由外科医生、科学家和工程师组成的团队, 聚集在麻省理工学院帮助吉姆恢复他以前的攀登能力。[07:49]
Team member Dr. Matthew Carty amputated Jim's badly damaged leg at Brigham and Women's Hospital in Boston , using the AMI surgical procedure.	小组成员马修·卡蒂博士在波士顿的布莱根妇女医院切除了吉姆严重受损的腿, 完全按照AMI手术步骤进行手术。[08:00]
Tendon pulleys were created and attached to Jim's tibia bone to reconnect the opposing muscles.	他把创建的肌腱滑轮连接到吉姆的胫骨上, 以重新连接拮抗肌。[08:09]
The AMI procedure reestablished the neural link between Jim's ankle-foot muscles and his brain.	AMI过程重新建立了吉姆脚踝脚肌肉和他的大脑之间的神经联系。[08:15]
Cayman: n. 鳄鱼 injuries: n. 伤害, 伤痛(injury的复数); 受伤 punctured: adj. 具刻点的; 被刺破的 surgeons: 外科医生 assembled: v. 装配(assemble的过去分词); 集合/adj. 组合的; 安装的 prowess: n. 英勇; 超凡技术; 勇猛 Boston: n. 波士顿(美国城市) pulleys: n. 滑轮(pulley的复数); 皮带轮 tibia: n. 胫骨; [昆] 胫节(昆虫) reconnect: vt. 使再接合 reestablished: vt. 恢复, 重建; 复兴	
When Jim moves his phantom limb, the reconnected muscles move in dynamic pairs, causing signals of proprioception to pass through nerves to the brain, so Jim experiences normal sensations with ankle-foot positions and movements, even when blindfolded .	当吉姆移动幻肢时, 重新连接的肌肉也动态成对移动, 把本体信号通过神经传送到大脑, 因此, 吉姆能体验到脚踝-脚的位置和运动的正常感觉, 即使蒙上眼睛。[08:21]
Here's Jim at the MIT laboratory after his surgeries .	这是在麻省理工实验室中, 手术后的吉姆。[08:37]
We electrically linked Jim's AMI muscles, via the electrodes, to a bionic limb, and Jim quickly learned how to move the bionic limb in four distinct ankle-foot movement directions.	我们通过电极将吉姆的AMI肌肉连接到仿生肢体上, 吉姆很快就学会了如何移动仿生肢体, 四个不同方向的脚踝-脚均可移动。[08:41]
We were excited by these results, but then Jim stood up, and what occurred was truly remarkable .	大家都对此兴奋不已, 而当吉姆站起来时, 接下来发生的一切则令人惊叹。[08:51]
All the natural biomechanics mediated by the central nervous system emerged via the synthetic limb as an involuntary, reflexive action.	所有由中枢神经系统调节的假体生理发展经由合成肢体以一种无意识的反射行为融合在一起。[08:57]
All the intricacies of foot placement during stair ascent --	上楼时脚步错综复杂的位置——[09:08]
reconnected: vt. 使再接合 blindfolded: v. 蒙住眼睛(blindfold的过去分词); 被蒙上眼/adj. 被蒙上眼睛的 surgeries: n. 外科手术(surgery复数) electrically: adv. 电力地; 有关电地 remarkable: adj. 卓越的; 非凡的; 值得注意的 biomechanics: n. 生物力学; 生物机械学 mediated: vt. 仲裁, 调停; 调解(mediate的过去式及过去分词形式) involuntary: adj. 无意识的; 自然而然的; 不知不觉的 reflexive: n. 反身代词; 反身动词/adj. 反身的; [物] 反射的 intricacies: n. 纷繁难懂之处; 错综复杂的事物 placement: n. 布置; 定位球; 人员配置 stair: n. 楼梯, 阶梯; 梯级 ascent: n. 上升; 上坡路; 登高	
(Applause) emerged before our eyes.	(掌声) 呈现在我们眼前。[09:12]
Here's Jim descending steps, reaching with his bionic toe to the next stair tread, automatically exhibiting natural motions without him even trying to move his limb.	这是吉姆走下台阶, 正伸出仿生脚趾到下一个台阶, 自动地展现自然的动作, 甚至不用有意识地试着移动肢体。[09:19]
Because Jim's central nervous system is receiving the proprioceptive signals, it knows exactly how to control the synthetic limb in a natural way.	因为吉姆的中枢神经系统能接收本体感知信号, 所以, 它确切知道如何自然地控制合成肢体。[09:29]
Now, Jim moves and behaves as if the synthetic limb is part of him.	吉姆活动和做事时, 合成肢体就像他的一部分。[09:39]
For example, one day in the lab, he accidentally stepped on a roll of electrical tape.	例如, 某天在实验室, 他意外地踩到一卷电工胶带上。[09:45]
Now, what do you do when something's stuck to your shoe? You don't reach down like this; it's way too awkward .	当东西粘上到你的鞋底上时, 你会怎么做? [09:50] 你不会弯腰去取的, 那样显得太笨了。[09:53]
Instead, you shake it off , and that's exactly what Jim did after being neurally connected to the limb for just a few hours.	相反, 你会抖掉它。吉姆正是这么做的, 神经接通肢体仅几小时后, 他就甩掉了胶带! [09:55]
descending: adj. 下降的; 下行的/n. 递减; 下行/v. 下降(descend的ing形式) tread: n. 踏; 胎面; 步态; 鞋底; 踏板; 梯级/vt. 踏; 踩; 践踏; 跳; 踩出/vi. 踏; 踩; 行走; 交尾 automatically: adv. 自动地; 机械地; 无意识地/adj. 不经思索的 exhibiting: 展览/陈列 behaves: vi. 表现; (机器等) 运转; 举止端正; (事物) 起某种作用/vt. 使守规矩; 使表现得... stepped: v. 踏; 行走(step的过去式和过去分词) awkward: adj. 尴尬的; 笨拙的; 棘手的; 不合适的 shake it off: 摇一摇; 摆脱	
What was most interesting to me is what Jim was telling us he was experiencing.	我觉得最有意思的是, 吉姆告诉我们他当时的感受。[10:03]
He said, "The robot became part of me."	他说: “机器已成为我的一部分。” [10:08]

Jim Ewing: The morning after the first time I was attached to the robot, my daughter came downstairs and asked me how it felt to be a cyborg, and my answer was that I didn't feel like a cyborg.	吉姆·尤文: 我连上机器后的次日早晨, 女儿下楼来,问我成为 生化人的感觉如何, 我回答说,不觉得自己是生化人,[10:12]
I felt like I had my leg, and it wasn't that I was attached to the robot so much as the robot was attached to me, and the robot became part of me.	而是觉得好像是自己的腿回来了。与其说我连在机器上, 倒不如说是机器连到我身上, 机器已然成为我的一部分,[10:25]
It became my leg pretty quickly.	很快就变成我的腿了。[10:38]
Hugh Herr: Thank you.	(掌声) 休·赫尔:谢谢。[10:41]
(Applause) By connecting Jim's nervous system bidirectionally to his synthetic limb, neurological embodiment was achieved.	(掌声) 通过将吉姆的神经系统双向连接到 他的合成肢体上, 实现了神经体现。[10:42]
I hypothesized that because Jim can think and move his synthetic limb, and because he can feel those movements within his nervous system, the prosthesis is no longer a separate tool, but an integral part of Jim, an integral part of his body.	我推测,因为吉姆能思考 和移动他的合成肢体, 他还能在神经系统内 感受到那些移动, 所以,假肢不再是单独的工具, 而是吉姆的一部分, 整个身体不可分割的一部分。[10:53]
so much as: 甚至于;连.....都不 neurological: adj.神经病学的,神经学上的 embodiment: n.体现;化身;具体化 hypothesized: v.假定,假设,猜测(hypothesize的过去式) integral: adj.积分的;完整的,整体的;必须的/n.积分;部分;完整	
Because of this neurological embodiment, Jim doesn't feel like a cyborg.	由于神经体现, 吉姆不觉得自己像生化人。[11:11]
He feels like he just has his leg back, that he has his body back.	他觉得就像找回了自己的腿、找回自己的身体而已。[11:17]
Now I'm often asked when I'm going to be neurally linked to my synthetic limbs bidirectionally, when I'm going to become a cyborg.	现在我经常被问到 何时会将我的合成肢体 双向接通神经, 准备何时成为生化人。[11:21]
The truth is, I'm hesitant to become a cyborg.	事实上, 我很犹豫要不要成为生化人。[11:27]
Before my legs were amputated, I was a terrible student.	截肢前我是个糟糕的学生。[11:31]
I got D's and often F's in school.	在学校的成绩是 D,常常是 F。[11:35]
Then, after my limbs were amputated, I suddenly became an MIT professor.	截肢后, 我突然成为麻省理工学院的教授了。[11:37]
(Laughter)	(笑声) [11:43]
(Applause) Now I'm worried that once I'm neurally connected to my limbs once again, my brain will remap back to its not-so-bright self.	(掌声) 现在我有担心, 我的肢体一旦接通神经, 大脑会重新回到那个 不太聪明的自己。[11:45]
(Laughter) But you know what, that's OK, because at MIT, I already have tenure .	(笑声) 不过没关系,你们也知道, 我已是麻省理工学院的终身教授了。[11:57]
(Laughter)	(笑声) [12:02]
(Applause) I believe the reach of NeuroEmbodied Design will extend far beyond limb replacement and will carry humanity into realms that fundamentally redefine human potential.	(掌声) 我相信,神经体现设计的范围 将远超替换肢体的范围, 它会将人类带入从根本上 重新定义人类潜能的领域。[12:04]
hesitant: adj.迟疑的;踌躇的;犹豫不定的 remap: n.重测图;再交换 tenure: n.任期;占有/vt.授予...终身职位 realms: n.领域 (realm的复数) redefine: vt.重新定义	
In this 21st century, designers will extend the nervous system into powerfully strong exoskeletons that humans can control and feel with their minds.	在二十一世纪, 设计师们会把神经系统 延伸到强大的外骨骼, 人类能用思想去控制和感知它们。[12:18]
Muscles within the body can be reconfigured for the control of powerful motors, and to feel and sense exoskeletal movements, augmenting humans' strength, jumping height and running speed.	体内的肌肉可重新配置, 以控制强大的马达, 并感受和感知外骨骼的动作, 进而增强人类力量、 跳跃高度和跑步速度。[12:29]
In this 21st century, I believe humans will become superheroes .	在二十一世纪,我相信 人类会成为超级英雄。[12:44]
Humans may also extend their bodies into non-anthropomorphic structures, such as wings, controlling and feeling each wing movement within the nervous system.	人类也可以延伸自己的身体 到拟人化的结构中,如翅膀, 在神经系统内控制 和感受每一个翅膀动作。[12:50]
Leonardo da Vinci said, "When once you have tasted flight, you will forever walk the earth with your eyes turned skyward , for there you have been and there you will always long to return."	达芬奇说过: "一旦尝过飞行的滋味, 在地上行走时, 你的眼睛依然会看向天空, 因为你曾去过那里, 而且会一直想回到那里。" [13:02]
During the twilight years of this century, I believe humans will be unrecognizable in morphology and dynamics from what we are today.	在本世纪末, 与今天的我们相比, 我相信人类在形态和动力学方面, 将发生颠覆性的改变。[13:15]
powerfully: adv.强大地;强烈地;非常 exoskeletons: n.[昆]外骨骼 feel with: 同情...;同感 reconfigured: vt.重新配置	

augmenting: v.增加;使扩张(augment的ing形式)	superheroes: 超级英雄(superhero的名词复数)	skyward: adj.向上的;向着天空的/adv.向上;朝天空
twilight: n.黎明,黄昏;薄暮;衰退期;朦胧状态/adj.昏暗的,微明的;暮年的	unrecognizable: adj.未被承认的;无法认出的	morphology: n.形态学,形态论;[语]词法,[语]词态学
dynamics: n.动力学,力学	Humanity will take flight and soar.	
Jim Ewing fell to earth and was badly broken, but his eyes turned skyward, where he always longed to return.		人类将会腾飞并翱翔。[13:23]
After his accident, he not only dreamed to walk again, but also to return to his chosen sport of mountain climbing.		虽然吉姆·尤恩坠地 并严重受伤, 但他的眼睛看着天空, 总是渴望回归。[13:27]
At MIT, Team Cyborg built Jim a specialized limb for the vertical world, a brain-controlled leg with full position and movement sensations.		事故后,他不仅梦想能再次走路, 还梦想回到 他所选择的登山运动。[13:35]
Using this technology, Jim returned to the Cayman Islands, the site of his accident, rebuilt as a cyborg to climb skyward once again.		在麻省理工学院,生化人团队 专门打造了用于垂直世界的特殊肢体, 即由大脑控制、 具有完整位置和动作感觉的腿。[13:41]
(Crashing waves)		用这种技术,吉姆重回开曼群岛的 事故现场, 作为被重建的生化人, 再次向着天空攀登。[13:51]
(Applause) Thank you.		(浪涛声) [14:01]
(Applause) Ladies and gentlemen, Jim Ewing, the first cyborg rock climber .		(掌声) 谢谢。[14:27]
(Applause)		(掌声) 先生女士们,这就是 第一个生化人攀岩者——吉姆·尤恩! [14:44]
specialized: adj.专业的;专门的/v.专攻(specialize的过去分词);使...专门化;详细说明		(掌声) [14:51]
自己社会地位的人		climber: n.登山者;攀缘植物;尽力改善自己社会地位的人

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