

## Biodiversity and the Anthropocene Earth: Challenges, Threats, and Hope Holmes Rolston III

# 生物多样性与人类世地球:挑战、威胁和希望

English text below

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**[摘 要]**人类主体能力增强带来的科技发展赋予了人类改变地球的巨大力量,从而导致人类世时代的日益凸显,生物多样性也因之面临诸多挑战。生态现代主义者就此提出“解耦于自然”的概念,认为人类可以利用技术发展来解决这些人为造成的问题,使地球重新恢复绿色生机。作为一个颇为棘手的“公地悲剧”,全球变暖也因各方利益冲突而无法处理。人工合成地球的提出者主张,人类可通过地球工程提供防御。除此之外,神经科学、社会科学和环境行为学以及“可持续生物圈”也都致力于在各自领域内探讨应对人类世的挑战。面对上述探索和困难,人类作为地球上唯一的道德物种,应作出改变,努力使这颗美丽的星球上呈现出文化价值和自然价值的完美交织,而这并不是一个遥不可及的梦想。

**[关键词]**人类世时代;生物多样性;与自然脱钩;人工合成的地球;可持续的生物圈

### 一、人类世时代

根据最近的记载,人类对世界的统治如此广泛,以至于地球进入了一个新的时代——人类世。<sup>①</sup>人类重塑其主体能力的精神活动导致了技术的发展,从而赋予人类巨大的力量,使其通过农业、工业和技术来改造他们的星球。在地球生命 45 亿年的时间长河中,我们已经进入了单一物种渴求管理地

球未来的第一个世纪之中。

经验证据是什么呢?人类世的狂热鼓吹者说:只需看看就知道,证据无处不在,俯拾皆是;与野生生态系统相比,人类主导的生态系统覆盖了更多的地球陆地表面。<sup>②</sup>与岩石的隆起和侵蚀的自然过程相比,人类的农业、建造和采矿活动移动了更多的土地。<sup>③</sup>“人类活动已经变得如此普遍和深刻,它们

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①Paul J. Crutzen, “The ‘Anthropocene’,” in Eckart Ehlers and Thomas Kraft, eds., *Earth System Science in the Anthropocene*, Berlin: Springer, 2006, pp. 13-18.

②J. M. McCloskey and H. Spalding, “A Reconnaissance Level Inventory of the Amount of Wilderness Remaining in the World,” *Ambio*, vol. 18, 1989, pp. 221-227; Jonathan A. Foley, Ruth DeFries and Gregory P. Asner, et al., “Global Consequences of Land Use,” *Science*, vol. 309, 22 July, 2005, pp. 570-574.

③Bruce H. Wilkinson and Brandon J. McElroy, “The Impact of Humans on Continental Erosion and Sedimentation,” *Geological Society of America Bulletin*, vol. 119, 2007, pp. 140-156.

可以与大自然的强大力量相互匹敌,并将地球推向未知的行星领域。”<sup>①</sup>国际地层学委员会下辖的一个工作小组建议将人类世视作一个地质单元。<sup>②</sup>

“人类世”已经成为一个“升降机词汇”,除了在地质学领域使用之外,还开始运用于哲学领域。《经济学人》有个封面故事写道:“欢迎来到人类世”“一个人造制造的世界”“人类世的挑战是利用人类的聪明才智对环境进行搭建组装,使地球能够完成 21 世纪的重任”。据他们预测,在一个以人类为中心的由地球工程、基因合成重构的地球上,将会有“100 亿位适度富有的人”。<sup>③</sup>根据美国地球科学研究所的说法,人类世是“人类的决定性时刻”,<sup>④</sup>“人类是终极的生态系统工程师”,<sup>⑤</sup>是“神一般的物种”。<sup>⑥</sup>

自从伽利略时代以来,地球似乎是一颗迷失在众星球中的小行星。自从达尔文时代以来,人类在这颗孤独的星球上姗姗来迟,最后登场。今天,至少在我们生活的地球上,一度偏离核心地位的人类被重新放回到地球舞台的中央。我们已经开启了人类帝国的时代。“实际上,只要我们还居住

于其中,我们所谓的‘拯救地球’就需要对人类的栖息地不断进行创造和再造。”<sup>⑦</sup>目前人类群体“相对于大自然而言过于庞大”。“让我们迎接挑战,掌控人类介入地球的活动”,<sup>⑧</sup>让我们进入设计师的世界吧。

上述这一点可以从人类对地球的改变如何导致全球变暖这样的事实中得到阐释。人类再也不需要像在更新世(Pleistocene)那样面对冰河时代了。环境哲学家艾伦·汤普森(Allen Thompson)怀抱着“在一个更温暖的世界里好好生活的根本希望”,敦促我们找到一个明显“没那么珍视自然性的地方”,用一种新的“环境之美……区别于自然的自主性”<sup>⑨</sup>取而代之。埃尔勒·埃利斯(Erle Ellis)赞美他所谓的“不归星球:人造地球上的人类适应力”,庆祝“一个充满人类主导机遇的新地质时代的开始”。<sup>⑩</sup>

## 二、生态现代主义:解耦于自然

十几位国际环保领袖在《一份生态现代主义宣言》中倡导了一个更加深谋远虑的人类未来。<sup>⑪</sup>这

①Will Steffen, Paul J. Crutzen and John R. Mitchell, “The Anthropocene: Are Humans Now Overwhelming the Great Forces of Nature?” *Ambio*, vol. 26, no. 2, 2007, p. 614.

②Colin N. Waters, et al., “The Anthropocene Is Functionally and Stratigraphically Distinct from the Holocene,” *Science*, vol. 351, 2016, p.137.

③“Welcome to the Anthropocene,” *The Economist*, vol. 399, no. 8735, 2011, p. 11, p. 81.

④George A. Seielstad, *Dawn of the Anthropocene: Humanity’s Defining Moment*, Alexandria, VA: American Geosciences Institute, 2012.

⑤Erle Ellis and Navin Ramankutty, “Anthropogenic Biomes, Encyclopedia of Earth,” 2009, [http://ecotope.org/people/ellis/papers/ellis\\_eoe\\_anthromes\\_2007.pdf](http://ecotope.org/people/ellis/papers/ellis_eoe_anthromes_2007.pdf).

⑥Mark Lynas, *The God Species: Saving the Planet in the Age of Humans*, Washington: National Geographic, 2011.

⑦M. Shellenberger and T. Nordhaus, “Evolve: A Case for Modernization as the Road to Salvation,” *Orion*, vol. 30, no. 1, September/October 2011, p. 61.

⑧Erle Ellis, “Too Big for Nature,” in Ben A. Minteer and Stephen J. Pyne, eds., *After Preservation: Saving American Nature in the Age of Humans*, Chicago: University of Chicago Press, 2015, pp. 24-31.

⑨Allen Thompson, “Radical Hope for Living Well in a Warmer World,” *Journal of Agricultural and Environmental Ethics*, vol. 23, 2010, p. 43, p. 56.

⑩Erle Ellis, “The Planet of No Return: Human Resilience on an Artificial Earth,” *Breakthrough Journal*, no. 2, 2011, p. 44.

⑪John Asafu-Adjaye, Linus Blomqvist, Stewart Brand, Barry Brook, Ruth de Fries, Erle Ellis, Christopher Foreman, David Keith, Martin Lewis, Mark Lynas, Ted Nordhaus, Roger Pielke Jr., Rachel Pritzker, Joyashree Roy, Mark Sagoff, Michael Shellenberger, Robert Stone and Peter Teague, “An Ecomodernist Manifesto,” 2015, <http://www.ecomodernism.org/manifesto>.

些生态主义者希望拥有一个“具有生态活力的星球”。<sup>①</sup>这种现代的人文主义看似一定会珍视生态系统服务,然而事实并不尽然。生态现代主义者们预测到了他们所谓的“解耦”：“人类科技……使人类减少了对许多曾经供给其唯一食物来源的生态系统的依赖。”<sup>②</sup>是的,技术可以是把“双刃剑”。<sup>③</sup>就气候变化或污染而言,环境恶化的威胁十分严重,但未来的人类可以解决这些人为造成的问题。

随着农业工业化和农业产量的提高,人们已经无法预测粮食生产的极限。人们现在可以在城市自由地生活,也更愿意生活在城市中,并且更倾向于少生孩子,这就释放了很多不再被需要的地貌。所以,如果人类越自由,就越能将曾经被选择利用的自然区域恢复自由,野地和森林也将会恢复勃勃生机。当然,人类经常想在这些区域进行娱乐消遣,如

果有这样的机会,他们将会更加自在。人类与原初自然的相遇可能“对他们的心理和精神健康都十分重要”。<sup>④</sup>

“综合来看,这些趋势意味着人类对环境的总体影响,包括土地使用的变化、过度开发和污染,都可能在本世纪达到峰值并开始下降。通过理解并推动这些新出现的过程,人类有机会使地球重新野化和恢复绿色生机——即便在发展中国家达到现代生活水平、物质贫困终结的状态下。”<sup>⑤</sup>这种解耦(decoupling)使得人类和自然都有了更多的自由。“解耦增加了一种可能性,即人类社会可能在不进一步侵入相对未受影响地区的情况下达到人类影响的峰值。未加以利用的自然幸免的自然。”<sup>⑥</sup>

因此,我们需要越来越高超的技术来拯救自然。最有优势的希望在于“大加速”。<sup>⑦</sup>英国著名的

①John Asafu-Adjaye, Linus Blomqvist, Stewart Brand, Barry Brook, Ruth de Fries, Erle Ellis, Christopher Foreman, David Keith, Martin Lewis, Mark Lynas, Ted Nordhaus, Roger Pielke Jr., Rachel Pritzker, Joyashree Roy, Mark Sagoff, Michael Shellenberger, Robert Stone and Peter Teague, “An Ecomodernist Manifesto,” 2015, <http://www.ecomodernism.org/manifesto>, p. 31.

②John Asafu-Adjaye, Linus Blomqvist, Stewart Brand, Barry Brook, Ruth de Fries, Erle Ellis, Christopher Foreman, David Keith, Martin Lewis, Mark Lynas, Ted Nordhaus, Roger Pielke Jr., Rachel Pritzker, Joyashree Roy, Mark Sagoff, Michael Shellenberger, Robert Stone and Peter Teague, “An Ecomodernist Manifesto,” 2015, <http://www.ecomodernism.org/manifesto>, p. 9.

③John Asafu-Adjaye, Linus Blomqvist, Stewart Brand, Barry Brook, Ruth de Fries, Erle Ellis, Christopher Foreman, David Keith, Martin Lewis, Mark Lynas, Ted Nordhaus, Roger Pielke Jr., Rachel Pritzker, Joyashree Roy, Mark Sagoff, Michael Shellenberger, Robert Stone and Peter Teague, “An Ecomodernist Manifesto,” 2015, <http://www.ecomodernism.org/manifesto>, p. 17.

④John Asafu-Adjaye, Linus Blomqvist, Stewart Brand, Barry Brook, Ruth de Fries, Erle Ellis, Christopher Foreman, David Keith, Martin Lewis, Mark Lynas, Ted Nordhaus, Roger Pielke Jr., Rachel Pritzker, Joyashree Roy, Mark Sagoff, Michael Shellenberger, Robert Stone and Peter Teague, “An Ecomodernist Manifesto,” 2015, <http://www.ecomodernism.org/manifesto>, p. 25.

⑤John Asafu-Adjaye, Linus Blomqvist, Stewart Brand, Barry Brook, Ruth de Fries, Erle Ellis, Christopher Foreman, David Keith, Martin Lewis, Mark Lynas, Ted Nordhaus, Roger Pielke Jr., Rachel Pritzker, Joyashree Roy, Mark Sagoff, Michael Shellenberger, Robert Stone and Peter Teague, “An Ecomodernist Manifesto,” 2015, <http://www.ecomodernism.org/manifesto>, p. 15.

⑥John Asafu-Adjaye, Linus Blomqvist, Stewart Brand, Barry Brook, Ruth de Fries, Erle Ellis, Christopher Foreman, David Keith, Martin Lewis, Mark Lynas, Ted Nordhaus, Roger Pielke Jr., Rachel Pritzker, Joyashree Roy, Mark Sagoff, Michael Shellenberger, Robert Stone and Peter Teague, “An Ecomodernist Manifesto,” 2015, <http://www.ecomodernism.org/manifesto>, p. 19.

⑦Will Steffen, et al., “The Trajectory of the Anthropocene: The Great Acceleration,” *The Anthropocene Review*, vol. 2, no. 1, 2015, pp. 81-89.

《自然》(Nature)杂志对这一宣言表示欢迎:“这篇文章描绘了一幅充满希望的技术进步图景,同时强调了迄今为止人类崛起的特征——密集发展……人类的聪明才智有许多形式,而我们也许会让自己惊讶不已。”<sup>①</sup>爱德华多·波特(Eduardo Porter)也在《纽约时报》上对其大加赞许。<sup>②</sup>环境伦理学的创始人之一马克·萨戈夫(Mark Sagoff)签署了这份宣言。

然而,我们担心,当人类的进步逐渐扩大至顶峰,从而管理一个精心设计的星球时,保护生态系统服务的重要性就会降低。这里没有什么自然与技术共生,也没有什么相互依赖,只有与高科技的解耦。18位生态经济学家发表的长文对此进行了反驳:“生态现代主义者既没有为未来的发展战略提供非常鼓舞人心的蓝图,也没有为我们的环境和能源困境提供更多的解决方案。”<sup>③</sup>

### 三、气候变化:棘手难题

人类可能无法应对全球变暖问题。全球暖化首先关乎气候方面,其次关乎经济和政治方面,最后是道德方面。全球变暖是“一场完美的道德风暴”,一个极致的道德困境。<sup>④</sup>其中所包含的复杂性,自然与技术层面的不确定性,全球和地方的相互作用,以及科学、伦理、政治和社会上的艰难选择,正前所未有地汇聚在一起。其中有代际问题,有分配问题,有对价值、正义和仁慈的关切,也有关于自愿和非自愿的风险问题。这会有一个长达几十年到几百年的滞后时间,但可以肯定的是,本土的“善”会逐渐累积成全球的“恶”。

否认、拖延、自欺欺人、伪善、搭便车、欺骗和腐败都有可能发生。全球变暖是一个正在发生的“公地悲剧”,<sup>⑤</sup>是一个“恶意的”问题。不完整的、自相矛盾的、相互交织和变化多端的需求通常很难辨识或加以管理。人们往往会挖东墙补西墙,从而顾此失彼,取悦这方、得罪那方,这些通常都是无法预测的。早些时候,我们可能会说这个问题是“乱成一团的”“笨拙不堪的”“无定形的”“毫无秩序的”,或者我们只能“蒙混过关”。称其为“恶意的”,说明它是事态严重的、要求苛刻的、迫在眉睫的,如果我们迟延,问题就会更加糟糕,甚至是恶性的。

全球变暖可能会令地球上的一切变得都不自然。扰乱气候意味着扰乱一切,包括空气、水、土壤、森林、动植物、洋流、海岸线、农业、财产价值、国际关系等,因为这是对地球上基本要素的一种系统性破坏。极地冰盖和冰川正在消融,导致海平面上升,海岸线即将被淹没。融化的海洋冰盖将会导致更多的水域暴露出来,从而使人吸收空气中更多的二氧化碳。目前海洋酸化的速度是5000万年以来最快的,这也对珊瑚、牡蛎、龙虾和其他贝壳类动物的生存构成了严重挑战。极地地区尤其脆弱,因为那里目前的化学状态接近极端酸化的边缘。渔业受到严重的负面影响,正如在阿拉斯加所发生的那样。<sup>⑥</sup>伴随着细菌携带者向南北方向进一步传播,热带病正在蔓延。反常的天气事件以及更加强烈的风暴和干旱,正变得更为司空见惯。

人们的态度也莫衷一是。将近70亿人都在不同程度上造成我们的共同资源(大气层)的退化,在

①“Decoupled Ideals: ‘Ecomodernist Manifesto’ Reframes,” *Nature*, vol. 520, 23 April 2015, pp. 407–408.

②Eduardo Porter, “A Call to Look Past Sustainable Development,” *The New York Times*, April 14, 2015, [https://www.nytimes.com/2015/04/15/business/an-environmentalist-call-to-look-past-sustainable-development.html?\\_r=1](https://www.nytimes.com/2015/04/15/business/an-environmentalist-call-to-look-past-sustainable-development.html?_r=1).

③Jeremy Caradonna, et al., *A Degrowth Response to an Ecomodernist Manifesto*, Resilience, May 6, 2015.

④Stephen M. Gardiner, *A Perfect Moral Storm: The Ethical Tragedy of Climate Change*, New York: Oxford University Press, 2011.

⑤Garrett Hardin, “The Tragedy of the Commons,” *Science*, vol. 162, December 13, 1968, pp. 1243–1248.

⑥Victoria J. Fabry, et al., “Ocean Acidification at High Latitudes: The Bellwether,” *Oceanography*, vol. 22, no. 4, 2009, pp. 160–171.



权力和脆弱性方面存在着严重的不对称性。<sup>①</sup>即使在强大的国家中,也存在一种无力感。制度的、企业的和政治的机构对造成环境破坏行为(如汽车的高使用率)的体系施压,但与此同时,个人支持和需要这些体系,将其看作他们美好生活的来源(他们喜欢自己的 SUV)。

由于其他原因(譬如文化多样性、民族遗产、自决的自由等),国际政府可能不受欢迎。在没有国际政府的世界里,全球性使得有效反应变得困难重重。有时,国际协议服务于国家利益。但损害必须是显而易见的,其结果才会立竿见影(例如过度捕捞、捕鲸等损害行为与《海洋法》《濒危野生动植物种国际贸易公约》的制定,或关于消耗臭氧层碳氢化合物的《蒙特利尔议定书》的签订)。

全球变暖的范围太广,无法成为这样的焦点。成本效益的分析并不可靠。把终极公地(我们每个人都呼吸的大气及生活其中的气候)分派到私人单位(你拥有污染 3 吨二氧化碳的权利)有点反常,甚至“全球变暖”这个词都具有误导性,更恰当的说法是“气候变化”,甚至是“气候破坏”。大气过程相当复杂,可能会有更严重的干旱或更强烈的飓风。极端气候有可能会被放大,导致冬天更冷、夏天更热。谁是赢家、谁是输家、谁能做什么、会有何后果?我们无从知晓。

一般来说,发达国家应对全球变暖负责,因为大部分的二氧化碳是它们排放的。尽管全球变暖同时影响富国和穷国,但总体而言,穷国可能受到的影响会更大。这些国家可能有半干旱的地貌或低海岸线,那里农民的生活可能会更直接地与周围地貌紧密相连。由于贫穷的缘故,他们是最没有能力进行自我保护的群体。他们无法迫使发达国家作出有

效的应对。没有一个国家能免受气候变化的影响,但发展中国家所承受的影响将首当其冲:将占据预估总损失的 75%—80%。<sup>②</sup>

如果有可能采取缓解措施(即限制排放),那么当前这代人可能要承担成本,而收益则由后代人获得。推迟行动将把更沉重的成本推给后代,未雨绸缪总比亡羊补牢代价要小。气候变化的防护者和那些必须清理整顿环境的人生活于不同的时代。传统上,父母和祖父母确实关心他们留给子女和孙辈的东西,但这种代际遗传相当分散。美国人收获在当下。那么将由谁在什么时候偿还什么代价,却无人知道。

“气候疲劳”(climate fatigue)开始粉墨登场了。可怕的警告发出的鼓点声让人疲惫不堪。<sup>③</sup>坏消息变得不合时宜,即使它千真万确。与此同时,我们还忽视未来,并且无所谓地耸耸肩:我们必须为自己着想,未来的人也会如此。自古以来情况概莫如是。与此同时,在我们意识到之前,损害业已酿成,并且或多或少变得不可逆转。请注意,到 2050 年,当这些负面影响发生时,今天生活在地球上的 70% 的人仍存活于世,包括目前大多数的在校大学生。也许这将为他们敲响一记警钟,促使他们试图解决这个棘手难解的问题。

#### 四、人工合成的地球

热衷于提升人类力量的人们主张,人类可以而且应该根据自己的利益来管理地球,为增加人类的利益而智慧地设计地球;人类应该利用自己的聪明才智,不断加强对自然界的统治。在这种情绪的主导之下,“人类世”的狂热分子和生态现代主义者都热衷于变革。《科学美国人》特辑“管理地球”的编辑

①Paul G. Harris, ed., *A Research Agenda for Climate Justice*, Cheltenham, UK: Edward Elgar, 2019.

②World Bank, “World Development Report: Development and Climate Change,” 2010, [https://openknowledge.worldbank.org/bitstream/handle/10986/4387/9780821379875\\_overview.pdf](https://openknowledge.worldbank.org/bitstream/handle/10986/4387/9780821379875_overview.pdf).

③Richard A. Kerr, “Amid Worrisome Signs of Warming, ‘Climate Fatigue’ Sets in,” *Science*, vol. 326, 2009, pp. 926–928.

们问道:“我们想要什么样的星球?我们能得到什么样的星球?”<sup>①</sup>

答案是寻找到重新分配降雨、阻止飓风和海啸、防止地震、改变洋流发生的方向、给海洋渔业施肥、管理海平面、改变地貌以改善粮食生产以及总体上让大自然变得更加友好的方法。爱德华·由克森(Edward Yoxen)说:“现在的生活世界可被视为一个巨大的乐高有机组件,通过一个预先设计的过程,欢迎人们去组合、混合及不断重建。”<sup>②</sup>我们生活在“人为制造的生物群落”中。<sup>③</sup>

地球工程是“对环境有意进行的大规模操控”。<sup>④</sup>气候科学家保罗·克鲁岑(Paul Crutzen)将“人类世”这个术语加以戏剧化处理。他认为,考虑到任何其他解决方案的黯淡前景,“地球工程”<sup>⑤</sup>应该予以开发。“是时候认真对待它了。地球工程可以为地球提供一个有用的防御——一个应急的盾牌。如果极其恶劣的气候变化将至关重要的生态系统和数十亿人置于危险之中,它就可以被部署起来”。<sup>⑥</sup>向高空大气发射反射粒子或气溶胶或薄的折射圆盘云;或反射气球,使地球冷却,就像过去火山爆发时所做的那样;或者给海洋施肥以增加浮游生物的数量,

从而让它们吸收更多的碳;或者向云层喷射海水细雾,使云层更加明亮,反射更多的阳光;这些做法存在技术上的挑战。“这样的计划充满了不确定性和潜在的负面影响”。<sup>⑦</sup>

以上这些听起来都不像是人类在“人类世”时代聪明地重新设计地球,反倒更像地球上的大恐慌。工程师们意识到事情搞砸了,发现事态几乎无法掌控。人类比以往任何时候都聪明,有些聪明过头了。<sup>⑧</sup>我们作出改变的能力超过了预测结果的能力,甚至超过了我们控制那些可预见其不利结果的能力。我们“生活在自然的尽头”。<sup>⑨</sup>自然就此终结了。

打造一个我们管理或试图管理的星球,目的只是为我们自己获得越来越多的利润和商品,这显示了一种剥削的心态。我们塑造自己的世界观,然后世界观又反过来塑造我们。我们担心人类已经成为地球上强大的捕食者。根据许多经典的看法,傲慢与狂妄自大是人类的原罪。“你们便如神一样。”(Genesis 3)《科学美国人》的能源与环境编辑大卫·比埃洛(David Biello)就发出惊呼:“这不是世界末日。这只是我们所理解的世界末日!”<sup>⑩</sup>

根据伦敦皇家学会的说法,我们必须推动的是

①W. C. Clark, “Managing Planet Earth,” *Scientific American*, vol. 261, no. 3, September 1989, pp. 46-54.

②E. Yoxen, *The Gene Business: Who Should Control Biotechnology?* New York: Harper and Row, 1983, p 15.

③Erle Ellis and Navin Ramankutty, “Putting People in the Map: Anthropogenic Biomes of the World,” *Frontiers in Ecology and the Environment*, vol. 6, no. 8, 2008, pp. 439-447.

④D. W. Keith, “Geoengineering the Climate: History and Prospect,” *Annual Review of Energy and the Environment*, vol. 25, 2000, p. 245.

⑤Paul J. Crutzen, “Albedo Enhancement by Stratospheric Sulfur Injections: A Contribution to Resolve a Policy Dilemma?” *Climatic Change*, no. 77, 2006, p. 212.

⑥D. G. Victor, M. G. Morgan, J. Apt, J. Steinbumer and K. Ricke, “The Geoengineering Option. A Last Resort against Global Warming?” *Foreign Affairs*, vol. 88, no. 2, March/April 2009, p. 66; B. Launder and J. Thompson, *Geoengineering Climate Change: Environmental Necessity or Pandora’s Box?* Cambridge: Cambridge University Press, 2010.

⑦J. J. Blackstock and J. C. S. Long, “The Politics of Geoengineering,” *Science*, vol. 327, 29 January, 2010, p. 527.

⑧Craig Dilworth, *Too Smart for our own Good: The Ecological Predicament of Humankind*, Cambridge: Cambridge University Press, 2010.

⑨Paul Wapner, *Living through the End of Nature: The Future of American Environmentalism*, Cambridge, MA: MIT Press, 2010.

⑩David Biello, *The Unnatural World: The Race to Remake Civilization in Earth’s Newest Age*, New York: Simon and Schuster, Scribner, 2016, p. 7-8.

“可持续的集约化”，以收获开发地球的好处。<sup>①</sup>这个世界上最古老的科学学会难道不该扪心自问：到底该如何保护古老而持续的生物多样性？如何缩减我们的足迹？善待地球是否比加强帝国主义剥削更明智？如果我们要在正确的地方解决问题，就必须学会自我管理，如同我们管理地球一样。

人类中心主义的狂热分子声称，这种力量理应受到道德上的欢迎。在整个人类历史上，我们一直在尝试突破极限。特别是在西方，我们生活在一种根深蒂固的信念中，即一个人应该憧憬富足的生活，并为此付出努力。经济学家称这种行为是“理性的”。伦理学家会同意这样的说法：我们有自我发展和自我实现的权利。

人类世的支持者们可能占据了道德高地：传统的自然保护“在社会上是不公平的。”<sup>②</sup>“保护充满活力和复原力的大自然，保护近在咫尺而非远在天边的大自然，保护维系着人类社区的大自然——这是现在前进的道路。”<sup>③</sup>“与其为了生物多样性而追求保护生物多样性，不如制订一项新的保护方针，加强那些使最广泛人群尤其是穷人受益的自然系统”。<sup>④</sup>这在一个更加人道、更加公平的世界里将是一件好事。

但我们担忧的是，尽管这样的意图听起来很高尚，却拖着不道德的尾巴。“为了我和我的同类前进！”“是为人类保护自然，而不是从人类手中拯救自然。”这可能既是问题，也是答案。从本质上说，这让我们成为第一个（如果不是唯一的话）与道德相关的存在。所谓正义，就是“我们即正义”（Justice is just us）。这就是人类世，对非人类而言非常糟糕。人

类世的支持者们关心的是，要喂饱人类，即使这样做会导致老虎和蝴蝶的灭绝。卡列夫（P. Kareiva）与马尔维耶（M. Marvier）敦促我们“从几乎只关注生物多样性”转向更多关注“人类福祉”，“从根本上说，保护自然是人类价值的体现……今天，我们需要一种更综合的方法，人类的中心地位得到认可”，“我们认为，考虑到自然和健康的生态系统为人类所提供的东西，大自然值得保护，这是非常实际和更以自我为中心的原因”。<sup>④</sup>

尽管发出了警告，但对非人类存在的伦理担忧很快就遭到削弱。我们可能会被告知，曾经数量众多的物种——野牛、栗子树、旅鸽、渡渡鸟、老虎和蝴蝶——会消失，但不会对人类造成不良影响。以人类为中心重建地球，或者甚至是只要对我们有利，就保护生态系统、服务生态系统，这听起来似乎不再占据道德上的高地。自然只有在支持人类事业的情况下才有价值，这会使整个星球只为一个物种服务——这是一种不自然的状况。如果在这种新的人文主义优越感中，我们关心的是穷人，那么为什么不强调环境正义，在发达国家的土地上更公平地分配财富，而不是通过减少野生自然来造福穷人呢？

在未来的地球上，我们很难想象一个不再继续发展的世界——一个没有引擎和齿轮，没有电力，没有汽车、手机、电脑的世界。我们期望高科技不断升级换代。自我实现的欲望使我们痴迷陶醉，我们对欲望上瘾了。在被越来越坚定的自我利益削弱弱的情况下，我们、我们的孩子以及我们孩子的孩子可能永远不会知道我们最繁荣时期是怎样的景象。

①Royal Society of London, “Reaping the Benefits: Science and the Sustainable Intensification of Global Agriculture,” 2009, <http://royalsociety.org/Reapingthebenefits>.

②Peter Kareiva and Michelle Marvier, “What Is Conservation Science?” *BioScience*, vol. 62, 2012, pp. 962-969.

③R. Lalasz, P. Kareiva and M. Marvier, “Conservation in the Anthropocene: Beyond Solitude and Fragility,” *Breakthrough Journal*, vol. 2, 2011, pp. 36-37.

④P. Kareiva and M. Marvier, *Conservation Science: Balancing the Needs of People and Nature*, Roberts and Company, Greenwood Village, Colorado, 2012, p. 965.

“很有可能,这个自我意识如此强大的时代,将被称为大错乱时代。”<sup>①</sup>地球工程师们可能会发现,大多数地球居民都在困惑:难道我们与自然的唯一关系难道就是把它改造设计得更好(以服务于我们)吗?

现在,艾伦·汤普森(Allen Thompson)和杰里米·本迪克·基默(Jeremy Bendik-Keymer)都开始退让了,他们更倾向于对生态系统的基本过程进行研究,而不是对其加以修改。“与目前的地球工程热潮相去甚远的是,这种反应将展示出谦逊的美德”。<sup>②</sup>我们不想让地球变成一件人工制品。然而,克里斯托弗·普雷斯頓(Christopher Preston)设想了一个“惊人的合成未来”,在这个未来中,我们先进的技术“承诺重塑自然世界”。<sup>③</sup>“人工合成时代为人类提供了一个机会,可以显著改善其所继承的生物与生态世界。”<sup>④</sup>

人类是一个随机应变的物种,在“一个不再像其基因为他们准备好去发现的世界”中寻找生存之道。<sup>⑤</sup>但普雷斯頓也担心人类会成为“后人类”,担心这些“重塑我们的发明”<sup>⑥</sup>所带来的风险会随着承诺而升级。

## 五、神经科学、社会科学和环境行为学

神经科学在最近几十年有了长足发展。我们可能会被告知,我们的行为是冲动型潜意识神经结构的结果。“研究继续阐明了我们如何作出选择的潜在神经过程。我们对这些大脑机制的充分了解表明,决策的作出在很大程度上受到未必到达意识层

面的内在过程的影响……这表明,决策过程在许多重要方面依赖于调节体内平衡、情绪和感觉的神经基质。”<sup>⑦</sup>或者,我们可能会被告知,我们可以激活并加强我们的神经禀赋,以更有效地满足我们所选择的欲望。

类似地,在社会科学中,在心理学之外的社会学中,我们被社会化以倾向于某些行为,这也可能涉及选择适当的环境来发展这些技能。我们可能会将他人置于类似的环境中,以使其行为符合我们的期望。社会学家的发现对于帮助这类问题的解决非常重要。

社会学家可能会推荐“引导”(nudging)。他们用这个词来表示试图影响个人和群体的动机、激励和决策的间接方式。想想孩子们在学校自助餐厅的食物。食物健康吗?在自助餐厅流水线的哪些地方都有哪些食物?你可能会发现,健康的肉类和蔬菜恰恰被安排在食物流水线的最前面。孩子们会首先抓取一些胡萝卜。很甜的食物则放在队伍的最后,放在他们难以够得着的地方。社会学家声称,这种“引导”如果不是更有效的话,至少也和直接指导、规则或教师命令一样有效。也许你以后会吃得更健康。

我们的一些政府领导人说,巧妙的引导可能比新的法律更有效。或者至少,如果有一些引导,新法律更有可能被遵守。例如,鼓励人们缴纳养老金的一个好方法是:在与雇主签订的合同中,将支付金额设定为“系统默认值”,这样他们的养老金就会自动从工资中予以扣除。要改变这一点,员工必须主

①Amitav Ghosh, *The Great Derangement: Climate Change and the Unthinkable*, Chicago: University of Chicago Press, 2016, p. 11.

②A. Thompson and J. Bendik-Keymer, eds., *Ethical Adaptation to Climate Change: Human Virtues of the Future*, Cambridge, MA: The MIT Press, 2012, p. 15.

③Christopher J. Preston, *The Synthetic Age*, Cambridge, MA: The MIT Press, 2018, p. xii.

④Christopher J. Preston, *The Synthetic Age*, Cambridge, MA: The MIT Press, 2018, p. 80.

⑤Christopher J. Preston, *The Synthetic Age*, Cambridge, MA: The MIT Press, 2018, p. 110.

⑥Christopher J. Preston, *The Synthetic Age*, Cambridge, MA: The MIT Press, 2018, p. 162.

⑦Kelly Burns and Antoine Bechara, “Decision Making and Free Will: A Neuroscience Perspective,” *Behavioral Science and the Law*, vol. 25, 2007, pp. 263-280.



动取消勾选框。与主动勾选养老金选框相比,自动勾选会让更多的人拥有充足的养老金。

什么样的社会能够产生出最有创造力的科学家?当然是那些为学生提供他们负担得起的优质教育的社会,是为他们提供拥有所需资源的实验室的社会,也就是具有 STEM(科学/技术/工程/数学)课程的学校。但事情总是变得复杂起来。是让有前途的年轻科学家自由探索其想要研究的领域(可能会有意想不到的发现),还是让他们专注于已经有进展且有前途的研究中(取得预料之中的成果)?什么样的引导最有可能培养出更能创造性地拯救野生动物和濒危物种的科学家?

人类的确是聪明的物种(智人),但可叹的是,人类仍然保留着“更新世”(Pleistocene)的胃口。我们喜欢甜食和脂肪,这些是在“更新世”时期人类很少能大快朵颐的。但现在我们吃得太多,以至于体态臃肿起来。我们对性很感兴趣,是因为在“更新世”时期,在那个儿童夭亡率高的时代,一对夫妇即便尽可能多地繁衍后代,也很难有达到生育年龄的后代来取代自己。而如今,我们已经人口过剩了。

一般而言,这是整个过度消费问题的一个例子。没错,我们是聪明的物种,我们在地球上的力量证明了这一点。没有任何其他物种像人类一样对地球构成威胁。人类还没有做好准备以应对我们目前面临的全球性问题。科技(医药、发动机、电力、化肥、拖拉机、卡车)使得人口不断增长,胃口不断变大(更好的住房、汽车、更多的食物、电视、手机和小玩意)成为可能。从利用人或马的血肉之躯,转变为利用发动机和齿轮,人类改变世界的的能力发生了许多数量级的变化。数以亿计的新新人类有着同样的欲望,满足这些欲望的能力也大大增强。

我们可能拥有动力和齿轮,但我们仍然有肉体的欲望。对于我们积累和消费的欲望,几乎没有什么生物性手段加以控制。对于大多数人而言,想要得到足够的东西总是费力不己(事实上,对许多人来说仍然如此)。当我们有消费能力时,我们喜欢消

费,并且过度消费。消费资本主义将一度健康的需求模式,转变为暴饮暴食和贪得无厌。在追求利润的市场驱动下,人们的消费机会不断增多,因此我们需要更加自律,而不是任其自然。

想想我们旅行的能力吧。现在我们拥有高科技的推土机,建造一个迅速发展的道路网络,以获取资源、林产、矿产,并带来广泛的辐射性副作用——发展建设失控、生态系统服务缺失、碳封存受损、土壤流失、野生物种消失、入侵物种涌现、污染物增加。或者再想想我们飞行的能力。我们曾经徒步而行。几千年来我们使用过马或骆驼,它们是血肉之躯。帆船增加了风力。一个世纪以前,我们制造出了火车和汽车。今天,我们可以在几小时以内穿越一片大洲,每天有超过 10 万次的航班在地球上空来回穿梭,至少在新冠疫情之前的情况是这样。

然后呢?我们是否应该继续进行高科技生殖细胞编辑,并按照重新规划的人类欲望修改我们的基因组,使之成为一种更适合于人类世时代生活的人类本性?即使我们能在特定的少数人群中做到这一点,在未来的任何范围内,修改 80 亿人生殖细胞的前景都是无处可寻的。人类是否足够明智,能够在全球范围内采取长远的、对环境负责的行动?传统的机构,如家庭、村庄、部落、国家、农业、工业、法律、医学,甚至学校,通常还有教堂,其视野都比较短浅。遥远的后代和遥远的种族对我们没有太多的“生物性影响”,然而我们的行为却会严重伤害他们。纵观人类进化的历史,我们的行为对那些在时空上远离我们的人影响甚微,而自然选择只是塑造了那些离我们较近的人的行为。全球威胁要求我们采取大规模的协调行动,而我们却无能为力。若果真如此,人类可能会在自己身上携带自我毁灭的种子。更直白地或者更科学地说:我们的基因,曾经使我们能够适应环境,但在未来的千年里可能会被证明是不适应环境的,并终将导致自我毁灭。

人类已经证明具备了远古时代人们做梦也想不到的高级技能——驾驶喷气式飞机、建立互联

网、解码自己的基因组列以及指定世界生物圈保护区。如果我们让“更新世”遗留下来的欲望成为我们继续过度消费的有用借口,那将会是一场悲剧。智人能够而且应该比这更聪明。

## 六、可持续发展和可持续的生物圈

1992 年在巴西里约热内卢举行的联合国环境与发展会议(UNCED)堪称是有史以来为解决某一个问题而聚集世界领袖最多的会议(仅在 2010 年被哥本哈根气候峰会超越)。这次会议吸引了 118 位国家元首和政府首脑、178 个国家的代表团、7000 名外交官员、3 万名环保人士和 7000 名记者参加。会议将其关切与“可持续发展”结合起来。

“可持续发展是指既满足当代人的需要,又不损害后代人满足其自身需要的能力的发展”。<sup>①</sup>“可持续”加上“发展”意味着持续增长,但不会降低未来的机会。联合国环境与发展会议打算将此理念运用于农业、林业、用水、污染程度、工业、资源开采、都市化、国家环境政策和战略。超过 150 个国家支持可持续发展。世界可持续发展商业理事会(UNCED)囊括 200 多家世界上最大的公司,它在这方面的责任似乎是一贯的、明确的、紧迫的。唯其如此,这种美好的生活才能持续下去。没有人想要不可持续的发展。“持续”就像“生存”一样,没有人会反对它。

但如果你支持,那你支持的什么?你支持的是“与基本生态支持系统保持平衡”的经济,罗伯特·

斯蒂弗斯(Robert Stivers)十多年前就曾论及。<sup>②</sup>生态学家一直在谈论“承载能力”,并认为“增长是存在限度的”。<sup>③</sup>一些有先见之明的经济学家提倡“稳态经济学”。<sup>④</sup>但无论是在第一世界还是第三世界,开发者们都不希望听到限制或稳定状态,所以他们立即热情地接受了“可持续发展”的理念。

“可持续发展”已经成为口头禅,一个全世界都能听到的短语。联合国 2005 年《世界峰会成果文件》(World Summit Outcome Document)提到“可持续发展的三个组成部分——经济发展、社会发展和环境保护——是相互依存和相辅相成的支柱”。<sup>⑤</sup>一个经常出现的担忧是,发达国家可能欢迎为可持续发展制定长期规划,但发展中国家则必须面对更加紧迫的需求,无论它们能否预见未来收成的情况。的确,第三世界国家可能会争辩说:与发展相去甚远的是,富裕国家需要缩减发展的规模,这样贫穷国家才能获得增长的机遇。与此同时,总体的方向似乎是广泛共享和长期的持续繁荣。

世界可持续发展工商理事会(WBCSD)认为,企业必须从生态效率的角度考虑问题。“生态效率的达成,需要提供具有价格竞争力的货品与服务,以满足人类需求且能带来高质量生活。与此同时,需要将对环境的影响和资源使用强度逐步减少,至少应达到与地球承载能力相一致的水平,并贯穿于企业的整个生命周期。”<sup>⑥</sup>所有这些都对“按老路子做生意”,对可持续发展忧心忡忡的心态提出了挑战。联合国呼吁所有国家寻求他们制定的 17 个发

①United Nations World Commission on Environment and Development, *Our Common Future*, New York: Oxford University Press, 1987, p. 43.

②Robert L. Stivers, *The Sustainable Society: Ethics and Economic Growth*, Philadelphia: Westminster, 1976, p. 18.

③Donella H. Meadows, *The Limits to Growth: A Report for the Club of Rome's Project on the Predicament of Mankind*, New York: Universe Books, 1972.

④Herman E. Daly, ed., *Toward a Steady State Economy*, San Francisco: W. H. Freeman, 1973.

⑤United Nations World Summit, "World Summit Outcome Document," 2005, <https://www.un.org/News/Press/docs/2005/200509/20050926.unsummit.pdf>, p. 12.

⑥Livio D. DeSimone and Frank Popoff, *Eco-efficiency: The Business Link to Sustainable Development*, Cambridge, MA: The MIT Press, 1997, p. 47.

展目标。<sup>①</sup>那些或做生意,或管理大学,或竞选政治职位的人——至少为了维护公共关系——会以某种形式支持可持续发展。

然而,一种更为激进的环境伦理观认为,这未能认可与全球相关的生存单元:地球及其生物圈。发展的底线是一个可持续的生物圈,这是跨文化的和不可协商的。“我们和我们的可持续资源”这一观点并非对正在发生的事情进行系统分析。地球是一个自组织的生物圈,它产生并继续支持所有与地球有关的价值。地球是价值的来源,因此是有价值的,并能够创造价值本身。这种繁殖(generativity)是“自然”这个词最基本的意义,即“生育”。难道人类有时重视地球的生命维持系统不是因为它们有价值,而是恰恰相反吗?

美国生态学会倡导一种可达成“可持续的生物圈”的研究和政策。“实现可持续的生物圈是当今人类所面临的最重要的任务。”<sup>②</sup>任何可持续发展的发展伦理都需要被置于可持续生物圈的伦理之下。最根本的问题在于,这类产品的任何生产在生态上都需要是可持续的。发展问题需要像关注人的需求一样去关注自然支持系统。狂热的开发商会说,要拯救人类就必须破坏自然。人们不得不牺牲自然来获取食物、住所、燃料,并以此建立他们的文化。但生态学家可能会问,我们是否可以更好地扭转这一局面,使之成为一个令人细思极恐的问题:如果我们破坏了自然,那我们还能拯救人类吗?因为同样是这个群体,需要土壤、森林、水、空气、鱼类、蚯蚓、昆虫传粉者、微生物分解者、稳定的气候、生态系统服务、可持续的生物圈资源;假如没有这些,该群体形成的人类社会就将面临退化和灭亡。

最近一个连接可持续发展和可持续生物圈的

方案是考虑建立一个“人类的安全操作空间”。约翰·罗克斯特伦(Johan Rockström)(运用科学数据)提出,人类赖以生存的行星系统共有9个,这些可以通过分析看出来,即:化学污染;气候变化;海洋酸化;平流层臭氧损耗;生物地球化学氮磷循环;全球淡水利用;改变土地利用;生物多样性丧失;大气气溶胶加载。在至少一万年(地质学家称之为“全新世”)中,这些系统一直保持稳定。但自工业革命以来,在上述用斜体显示的三个系统中,界限已经被超越。<sup>③</sup>人类在无知和权力的混合中,制造了某种我们只知其部分结果且有时无法预测的变化。我们预料到一些可预见的变化,但不可能知道所有不可预见的变化,而且我们常常发现自己甚至无法应对那些不利的可预见的变化——全球变暖就是证据。

当然,采取明智的预防措施既是理性的,也是合乎道德的,这通常被称为预防原则。如果某些被提议的活动对人类健康和安全构成威胁,那么即便因果关系尚未完全确定,也应采取预防措施。这可能包括暂停下来,有待进一步研究,或禁止要么是特别高风险的项目,要么是可能造成难以逆转的环境退化的项目,要么是波及全球的项目。这可能需要将举证和担责的重任转移给那些提出改变的人。<sup>④</sup>与此同时,我们确实需要认识到有些风险是合理的:一个人也许会过于谨小慎微。当然,不单单要维持发展,更要维护整个生物圈的健康,这才符合人类的利益。如果这太过于棘手而无法处理,如果这不是设计合成地球的重中之重,如果这不是环境神经科学和社会科学的首要任务,那么我们未来的地球确实看起来黯淡无光。这还有希望吗?

①“17 Goals to Transform Our World,” 2019, <https://www.un.org/sustainabledevelopment>.

②Paul G. Risser, Jane Lubchenco and Samuel A. Levin, “Biological Research Priorities—A Sustainable Biosphere,” *BioScience*, vol. 47, 1991, pp. 625–627.

③Johan Rockström, “A Safe Operating Space for Humanity,” *Nature*, vol. 461, 24 Sept., 2009, pp. 472–475.

④Neil A. Manson, “Formulating the Precautionary Principle,” *Environmental Ethics*, vol. 24, 2002, pp. 263–274.



## 七、未来地球：下一个千年

我们需要面对一项由联合国发起、涉及近 100 个国家的 1300 多名专家的大规模千年生态系统评估。“这项评估的核心是一个严峻的警告。目前人类活动正对地球的自然功能造成如此之大的压力，以至于我们不能再对地球生态系统维持后代的能力视作理所当然。”<sup>①</sup>2020 年 8 月，来自 26 个国家的 63 名科学家在蒙特利尔会面，评估 2020 年后全球生物多样性框架的科学证据。他们得出结论：“全球生物多样性政策正处于十字路口。最近对自然界和气候的全球评估显示出恶化的趋势和迅速缩小的行动窗口。2010 年设定的 20 个爱知生物多样性目标 (Aichi Biodiversity Goals) 无一完全实现，只有 6 个部分实现。只有在制定每个目标和以综合方式实施所有目标方面具备最高级别的雄心壮志，才有可能在 2050 年前停止并开始逆转生物多样性丧失的趋势。”<sup>②</sup>

几十亿年创造性劳动的成果，数百万种丰富多彩的生命种类，已经移交给人类这个迟来的物种。在人类这个物种中，思想绽放，道德涌现。难道这唯一的物种不应该做一些不那么自私自利的事情，而非把进化的生态系统提供的所有物产当成估价和重新设计的资源，只是一味贪图它们带来的利益？这样的态度在生物意义上似乎不够明智，在伦理意义上更不恰当，其逻辑对于道德人性而言过于狭隘了。

人类与其他 500 万—1000 万物种共同栖息在地球上，我们和它们的生存都依赖于周围的生物群

落。无论是在公地还是在私人领地上，自然都存在多个维度。即使是在人们长期定居的地方，也有备受一代代的主人们珍爱的天然林地。那是可能有原生林地，里面通常有相当古老的树木；有次生林地，里面有 50—100 年的树木；还有新近恢复的林地，有湿地、旷野、灌木篱墙、山脉，比如阿尔卑斯山或苏格兰凯恩戈姆山。<sup>③</sup>美国森林生态学家格雷戈里·阿勒特 (Gregory Aplet) 将 12 种地貌放置在一条轴线上加以区分：从受人类“控制”型到自主“任性”型，到“原始”型，再到“新奇”型。<sup>④</sup>但与其努力推进对地球的完全管理，为什么不声称存在并且应该存在不同程度的保留—保护—合成—人类世的范围区间呢？

如果对地貌进行分区，我们该在哪里投入多少人力管理？哪些是城市用地，哪些用于劳作，哪些属于乡村地貌或专用于多种用途的地貌？如果我们关心未来地球上人类存在的规模，这个“合理规划”的政策问题，似乎比我们实际给出的答案需要更加具体一些。荒野是最濒危的地貌，面积最小，储备也最为短缺。尽一切所能来保护吧。合理规划农业地貌吧，不需要重新设计天气、气候和土壤地质，而是要通过调整人口规模以适应其支持的农村社区的生态系统服务。技术可以克服一些限制（化石燃料、氮肥），但仅限于生态系统限制（全球变暖、氮污染的水域）。合理规划城市吧，通过支持农业和生态系统来保持城市的可持续发展。合理规划人类吧，让他们好好生活在自己的星球上吧。

《蒙特利尔议定书》(Montreal Protocol) 经过 5 次修订，得到 197 个国家的广泛批准和执行，是迄

① Millennium Ecosystem Assessment, *Living Beyond our Means: Natural Assets and Human Well-Being: Statement from the Board*, Washington, DC: World Resources Institute, 2005, p. 5.

② Sandra Diaz, Noelia Zafra-Calvo and Andy Purvis, et al., “Set Ambitious Goals for Biodiversity and Sustainability,” *Science*, vol. 370, 2020, pp. 411–413.

③ George F. Peterken, *Natural Woodland: Ecology and Conservation in Northern Temperate Regions*, Cambridge: Cambridge University Press, 1996.

④ Gregory H. Aplet, “On the Nature of Wilderness: Exploring What Wilderness Really Protects,” *University of Denver Law Review*, vol. 76, 1999, pp. 347–367.



今为止最成功的国际协议。182个国家通过了《濒危野生动植物物种国际贸易公约》(CITES)。在联合国登记的直接处理环境问题的国际协定(公约、条约、议定书等)就超过150项。<sup>①</sup>

如今我已经垂垂老矣。在我青春年少之时,美国还没有被专门指定的荒野地,但现在已经超过了800个。在我年轻时,如果你说会有黑人被选为美国总统,我会说:你疯了吧;如果你说会有黑人妇女当选副总统,我也会说:你疯了。如果你说有一天吸烟将在大多数的大学校园里遭禁,我会觉得这真不切实际,简直是痴人说梦。别跟我说,我们在有生之年看不到巨大改变。我会对此不以为然,因为我在自己的有生之年里就曾看到过。这就是我们的命运。我这辈子可能无法亲眼目睹,但我知道终有一天它会到来。人类将歌颂并保护他们的地球,这颗奇幻的星球。

尽管火箭专家们无限热爱他们神奇的高科技装备,但他们仍然不吝赞美我们这个有机的、充满活力的星球。宇航员埃德加·米切尔(Edgar Mitchell)在月球上观看地球升起时,当时就被眼前出现的景

象迷住了:

在经历了漫长而舒缓的无数庄严瞬间之后,突然之间,从月球的边缘背后,一颗闪闪发光的由蓝色和白色构成的宝石悄然现身了。那是一颗轻盈、精致的天蓝色球体,通体缠绕着缓缓飘逸的白色纱带,逐渐地向上升起,宛如黑色神秘的深邃大海里一颗玲珑的珍珠。需要多费点时间才能缓缓回过神来,完全意识到这是地球……我们的家园。<sup>②</sup>

我们最大的希望,是在太空中这颗熠熠生辉的宝石上呈现文化价值和自然价值的完美交织。保持自然与人类的和谐共生吧。保留城市、乡村和荒野吧。我们的未来应该是“半人类世”的,即保持基本的自然状态——在自然的基本条件和限度之内——在对人类和自然都充分关怀的情况下,人类小心翼翼地进入这个奇妙的星球家园。我们可不想在一个非自然的星球上过一种非自然的生活。

责任编辑:胡颖峰

<sup>①</sup>Iwona Rummel-Bulska and Seth Osafo, ed., *Selected Multilateral Treaties in the Field of the Environment Volume 2*, Cambridge: Grotius Publications Ltd, 1991, p. xi, p. 527.

<sup>②</sup>quoted in Kevin W. Kelley, ed. *The Home Planet*, Reading, MA: Addison-Wesley, 1988, pp. 263-280.

## ABSTRACTS

### Paul Burkett's Defense of the Ecological Dimension in Marx's Labor Theory of Value

◎Wei Jia & Li Xiaochun

As one of the representatives of ecological Marxism in North America, Paul Burkett has published many works to refute and demonstrate the deconstruction of Marx's labor theory of value by some ecological economists. He returned to Marx's work itself, reiterated the importance of Marx's natural status in the labor process, interpreted the basic concepts of Marx's labor theory of value, and clarified the ecological background of Marx's political economy. Burkett's defense of the ecological dimension in Marx's labor theory of value has defended the mainstream position of Marxism, and helped people understand Marxist theory from a more comprehensive perspective.

### A Review of Research on the Socialist View of Ecological Civilization in the New Era

◎Ye Jinhua

The "socialist view of ecological civilization" proposed at the 19th National Congress of the Communist Party of China is general and fundamental in its emphasis on the relationship between man and nature in the socialist system with Chinese characteristics. At present, there are fruitful academic research achievements concerning the socialist view of ecological civilization in the new era, and they mainly focus on the following three aspects: first, the connotation of the socialist view of ecological civilization; second, the development of the socialist view of ecological civilization; and third, Xi Jinping's ecological civilization thought. The current research is characteristic of combining grand narrative with micro analysis, integrating practice and theory, and taking multidisciplinary perspectives. The future research is going to be done in the following aspects: to further promote multidisciplinary collaborative research, to make a scientific and rational interpretation of the concepts in the latest discourse, to improve the research on the subject of socialist ecological civilization construction, to actively expand the global influence of the socialist view of ecological civilization, and to avoid excessive interpretation.

### Biodiversity and the Anthropocene Earth: Challenges, Threats, and Hope

◎Holmes Rolston III, trans., Zhan Jingqiu, revised, Ke Ying

The scientific and technological development brought about by the enhancement of human subjects' ability has endowed human beings with great power to change the earth, thus leading to increasingly prominent Anthropocene Epoch, and biodiversity is faced up with many challenges. In this regard, ecological modernists put forward the concept of "decoupling from nature", believing that human beings can use technological development to solve these man-made problems and make the earth restore green vitality. As a thorny "tragedy of the Commons", global warming has become too hot to handle because of conflicting interests. The proponents of a synthetic earth argue that humans can geoengineering the earth to defend it; In addition, neurosciences, social science and environmental behavior, and "sustainable biosphere" are exploring the challenges of the Anthropocene Epoch in their respective fields. In the face of the above exploration and difficulties, human beings, as the only moral species on earth, should make changes and strive to present the perfect interweaving of cultural values and natural values on this beautiful

planet, and this is not a far-fetched daydream that cannot be reached.

### **Adequate Wilderness Protection is the Sign of the Maturity of Ecological Civilization: An Interview with World-famous Ecological Ethicist Holmes Rolston III**

◎Ke Jinhua & Holmes Rolston III

Holmes Rolston III is a world-famous philosopher who claims himself to be “a philosopher going toward the wilderness”. He has a deep love for the wilderness and his wilderness complex runs through his thought and life. He is one of the philosophers who have advanced the most in-depth discussion on the wilderness issue in the world. This interview focused on the concept of wilderness and wilderness protection. In this interview, Rolston emphasized the following points: wilderness is the part of Nature that can maintain its spontaneity and its process of natural evolution; wilderness is “the root of the world of life”, which breeds and supports all life, including human beings; wilderness is an originating source of value; wilderness is the other of human beings, which shapes human body and mind and enriches human soul and spiritual world; even highly developed human civilization needs to rely on wild Nature for support and maintenance. Rolston has always been committed to advocating a new ethics to guide the practice of wilderness protection. This new ethics proposes an inclusive love, disapproves of only viewing nature as a resource for human to make use of, and advocates that human beings, as the only moral agent in the world, should shoulder the responsibility and obligation of wilderness protection because wilderness protection is not only for the human’s ecological well-being and sustainable development, but also for the goodness of the non-human life while the greater goal of wilderness preservation is to protect a sustainable biosphere. Wilderness is essential for the ecological civilization, and adequate wilderness protection is the sign of the maturity of ecological civilization. We hope that more people will pay attention to the wilderness and make “Wild China” an essential support for “beautiful China”.

### **On the Role of Digitalization in the Innovation of Waste Classification and Treatment: A Case Study of “Huge Recycling” in Zhejiang Province**

◎Sun Xuyou

With the policy advocacy and practical innovation of waste classification, digital technology has generally penetrated into the process of urban waste classification and resource utilization, and has become an innovation engine to boost waste classification and treatment. The case study of “Huge Recycling” in Zhejiang Province found that digital technology intervenes in the waste classification process, realizes the optimization of “waste” flow process and the reconstruction of “subject” interest relationship through the “chain” of governance mechanism, the “structurization” of the governance subject relationship and the “multiple integration” of governance objectives, and promotes the modernization of waste classification governance system and governance capacity. In order to ensure the sustainability of digital promotion of waste classification and treatment innovation, it is necessary to consolidate the social foundation such as residents’ environmental protection participation and community organization network.

### **The Governance Effectiveness, Difficulties and Countermeasures of Garbage Exchange Supermarket from the Perspective of Modern Environmental Governance System: A Study Based on a Survey in S County, Anhui Province**

◎Wang Linyang & Wu Jinfang

Constructing a modern environmental governance system is the basic guarantee for perfecting waste classification while giving full play to the role of corporate entities in waste recycling is a key step. The garbage exchange supermarket in S County, Anhui Province has obvious advantages in improving the ef-



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## Biodiversity and the Anthropocene Earth: Challenges, Threats, and Hope

Holmes Rolston III

### 1. The Anthropocene Epoch

By recent accounts human dominance is so extensive that Earth has entered a new age, the Anthropocene Epoch (Crutzen, 2006a). The mental activity of humans reshaping their agentive capacities has produced technological developments giving humans vast powers for transforming their planet through agriculture, industry, and technology. We have entered the first century in the 45 million centuries of life on Earth in which one species can aspire to manage the planet's future.

What is the empirical evidence? Anthropocene enthusiasts say: Just look, anywhere, everywhere. Human-dominated ecosystems cover more of Earth's land surface than do wild ecosystems (McCloskey and Spalding, 1989; Foley et al., 2005). Human agriculture, construction, and mining move more earth than do the natural processes of rock uplift and erosion (Wilkinson and McElroy, 2007). "Human activities have become so pervasive and profound that they rival the great forces of Nature and are pushing the Earth into planetary terra incognita" (Steffen et al, 2007, p. 614). The International Commission on Stratigraphy has a working group that has recommended Anthropocene as a geological unit (Waters et al, 2016).

Beyond the geology, "Anthropocene" has become an "elevator word," and put to use philosophically. *The Economist* has a cover story: "Welcome to the Anthropocene." "A Man-Made World." "The challenge of the Anthropocene is to use human ingenuity to set things up so that the planet can accomplish its 21st century task." They foresee "10 billion reasonably rich people" on a geo-engineered, genetically synthetic Earth, re-built with humans in center focus (*Economist*, 2011, p. 11, p. 81). The Anthropocene is "humanity's defining moment," according to the American Geosciences Institute (Seielstad, 2012). "Humans are the ultimate ecosystem engineers" (Ellis and Ramankutty, 2009). We are "the God species" (Lynas, 2011).

Since Galileo, Earth seemed a minor planet, lost in the stars. Since Darwin, humans have come late and last on this lonely planet. Today, on our home planet at least, we are putting these once de-centered humans back at the center. We have entered the era of the imperial human domain. "What we call 'saving the Earth' will, in practice, require creating and re-creating it again and again for as long as humans inhabit it" (Shellenberger and Nordhaus, 2011, p. 61). Humans are now "too big for nature." "Let us embrace the challenge to gain mastery over human engagement with the earth" (Ellis, 2015). Enter the designer World.

This is illustrated in how human changes to the planet are producing global warming. Humans do not need ever again to face Ice Ages, as they did in the Pleistocene. Allen Thompson, an environmental philosopher, with a "radical hope for living well in a warmer world," urges us to find a significantly "diminished place for valuing naturalness" replacing it with a new kind of "environmental goodness ... distinct from nature's autonomy" (Thompson, 2010, p. 43, p. 56). Erle Ellis, celebrating what he calls the "Planet of No Return: Human Resilience on an Artificial Earth," celebrates "the beginning of a new geological epoch ripe with human-directed opportunity" (Ellis, 2011, p. 44).

### 2. Ecomodernism: Decoupling from Nature

A more considered future is celebrated in *An Ecomodernist Manifesto*, advocated by a dozen and a half international environmental leaders (Asafu-Adjaye et al, 2015). These ecomodernists hope for "an ecologically vibrant planet" (p. 31). Surely this modern humanism will treasure ecosystem services. But no. These

ecomodernists anticipate what they call "decoupling." "Human technologies ... have made humans less reliant upon the many ecosystems that once provided their only sustenance" (p. 9). Yes, technology can be "double-edged" (p. 17); there is serious threat of environmental deterioration, as with climate change or pollution, but future humans can fix these human-caused problems.

With increasing industrial agriculture and rising harvest yields, there are no foreseeable limits to producing food. People now are free to and prefer to live in cities, and they will prefer fewer children. This frees up landscapes no longer needed. So the freer humans are, the more they can let selected natural areas go free, wildlands, restored forests. Humans will, of course, often want to recreate in such areas; they are even freer if they have such opportunity. Humans encountering original nature can be "important for their psychological and spiritual well-being" (p. 25).

"Taken together, these trends mean that the total human impact on the environment, including land-use change, overexploitation, and pollution, can peak and decline this century. By understanding and promoting these emergent processes, humans have the opportunity to re-wild and re-green the Earth – even as developing countries achieve modern living standards, and material poverty ends" (p.15). Such decoupling results in more freedom for humans and more freedom for nature. "Decoupling raises the possibility that societies might achieve peak human impact without intruding much further on relatively untouched areas. Nature unused is nature spared" (p. 19).

By this account, we need to be increasingly high tech to save nature. The dominant hope is "The Great Acceleration" (Steffen et al, 2015). The eminent British journal *Nature* welcomed the manifesto: "The essay paints a hopeful picture of technological progress while placing importance on the kind of intensive development that has characterized humanity's rise so far. ... Human ingenuity takes many forms, and we may yet surprise ourselves" (*Nature*, 23 April 2015). In *The New York Times* Eduardo Porter, wrote of it with approval (Porter, 2015). Mark Sagoff, one of the founders of environmental ethics, signed the manifesto.

Still, we worry that when human progress is progressively upscaled, peaked out, managing an engineered planet, the importance of conserving ecosystem services is downscaled. There is nothing here of nature in symbiosis with technology, nothing of interdependence, only high-tech decoupling. Eighteen ecological economists published a long rejoinder: "The ecomodernists provide neither a very inspiring blueprint for future development strategies nor much in the way of solutions to our environmental and energy woes" (Caradonna, et al., 2015).

### 3. Climate Change: Too Hot to Handle

Humans may be unable to deal with global warming. The heat is first climatological, but secondly economic and political, and in the end moral. Global warming is "a perfect moral storm," a consummate moral quandary (Gardiner, 2011). There is an unprecedented convergence of complexities, natural and technological uncertainties, global and local interactions, difficult choices scientifically, ethically, politically, socially. There are intergenerational issues, distributional issues, concerns about merit, justice, benevolence, about voluntary and involuntary risk. There is a long lag time, from decades to hundreds of years. Surely but gradually, local *goods* cumulate into global *bads*.

There are opportunities for denial, procrastination, self-deception, hypocrisy, free-riding, cheating, and corruption. Global warming is a "tragedy of the commons," now taken at the pitch (Hardin, 1968). Global warming is a "wicked problem." Incomplete, contradictory, interacting, and changing requirements are often difficult to recognize or manage. Trying to fix it here shifts what is going on over there, displeases them, and further yonder, in dozens of other places people are upset or helped, often unpredictably. Earlier we might have said that the problem was "messy," "unwieldy," "amorphous," "disorderly," or that all we could do was to "muddle through." Naming the problem "wicked" adds that the issue is serious, demanding, urgent, and gets worse, even malignant, if we procrastinate.

Global warming might make everything on Earth unnatural. Upsetting the climate upsets everything: air, water, soils, forests, fauna and flora, ocean currents, shorelines, agriculture, property values, international relations, because it is a systemic upset to the elemental givens on Earth. Polar ice caps and glaciers are melting, raising sea levels, flooding coastlines. Melting the ocean's icecaps exposes more water to take up more carbon dioxide from the atmosphere. Ocean acidification is the fastest in 50 million years, challenging the corals, oysters, lobsters and other shell-building animals. The polar regions are especially vulnerable because their current chemical states are close to tipping over the edge into extremes of acidification. Fishing is adversely affected, as has happened around Alaska (Fabry, 2009). Tropical diseases are spreading as their vectors travel further north and south. Freak weather events, more intense storms and droughts, are more common.

There is fragmented agency; nearly seven billion persons differentially contribute to degrading a common resource (the atmosphere). There is serious asymmetry in power and vulnerability (Harris, 2019). Even in the powerful nations, there is a sense of powerlessness. Institutional, corporate, and political structures force

frameworks of environmentally disruptive behavior (such as high use of cars), and yet at the same time individuals support and demand these frameworks as sources of their good life (they love their SUV's).

The global character makes an effective response difficult in a world without international government, where, for other reasons (such as cultural diversity, national heritages, freedom of self-determination), such government may be undesirable. Sometimes international agreements serve national interests. But the damage needs to be evident; the results in immediate prospect (such as with over-fishing, whaling, the Law of the Sea, the Convention on Trade in Endangered Species, or the Montreal Protocol on ozone depleting hydrocarbons).

Global warming is too diffuse to get into such focus. Cost-benefit analyses are unreliable. There is something anomalous about taking the ultimate commons (the atmosphere we all breathe, the climates in which we live) and parceling this out in private units (your right to pollute three tons of CO<sub>2</sub>). Even the term "global warming" is misleading; better to speak of "climate change," or even "climate disruption." Atmospheric processes are quite complex; there may be more intensive droughts or more intense hurricanes. The climate extremes may be amplified; some winters colder, some summers hotter. Who wins, who loses, who can do what, with what result?

Generally the developed nations are responsible for global warming, since they have emitted most of the carbon dioxide. Although global warming affects rich and poor, generally the poorer nations are likely to suffer the most. These nations may have semi-arid landscapes or low shorelines. Their citizen farmers may live more directly tied to their immediate landscapes. Being poor, they are the least able to protect themselves. They are in no position to force the developed nations to make effective response. No country is immune to climate change, but the developing world will bear the brunt of the effects: some 75-80% of the costs of anticipated damages (World Bank, 2010).

Where mitigating action is possible (limiting emissions), the present generation may bear costs, the benefits are gained by future generations. Postponing action will push much heavier costs onto those future generations; prevention is nearly always cheaper than cleanup. The preventers live in a different generation from those who must clean-up. Classically, parents and grandparents do care about what they leave to children and grandchildren. But this intergenerational inheritance is rather diffuse. Americans gain today. Who pays what costs when, nobody knows.

Climate fatigue sets in. The drumbeat of dire warnings wears people out (Kerr, 2009). The bad news gets old even if it is true. Meanwhile we discount the future and shrug our shoulders: we have to look out for ourselves and the future will too. That's the way it has always been. Meanwhile too, the damage is done before we know it and is more or less irreversible. Notice that by 2050, when many of these adverse effects will be taking place, 70% of all persons living on Earth today will still be alive, including most students now in colleges and universities. Maybe that will alarm them to try to fix this problem that is too hot to handle.

#### 4. The Synthetic Earth

Enthusiasts for increasing human powers advocate that humans can and ought to manage their planet in their self-interest, engineering Earth resourcefully for increasing human benefits. We should use human ingenuity for ever-increasing human domination of the landscape. In this mood, the Anthropocene enthusiasts and ecomodernists are gung-ho for change. The editors of a *Scientific American* special issue, Managing Planet Earth, ask "What kind of planet do we want? What kind of planet can we get?" (Clark, 1989).

Find ways to redistribute rainfall, stop hurricanes and tsunamis, prevent earthquakes, redirect ocean currents, fertilize marine fisheries, manage sea-levels, alter landscapes for better food production, and generally make nature more user-friendly. Edward Yoxen urges: "The living world can now be viewed as a vast organic Lego kit inviting combination, hybridisation, and continual rebuilding ... through a process of design" (Yoxen, 1983, p. 15). We live in "anthropogenic biomes" (Ellis and Ramankutty, 2008).

Geoengineering is "the intentional large-scale manipulation of the environment" (Keith, 2000, p. 245). Paul Crutzen, the climate scientist who has dramatized the term "Anthropocene," argues that geoengineering "should be explored," given the dismal prospects of any other solution (Crutzen 2006b, p. 212). "The time has come to take it seriously. Geoengineering could provide a useful defense for the planet—an emergency shield that could be deployed if surprisingly nasty climatic shifts put vital ecosystems and billions of people at risk" (Victor et al., 2009, p. 66; Launder and Thompson, 2010). Launch reflective particles into the upper atmosphere, or aerosols, or a cloud of thin refracting disks; or reflective balloons, thereby cooling the Earth, as volcanic eruptions have done in the past. Or fertilize the ocean so as to increase plankton, which absorb more carbon. Or spray fine ocean water mist into the clouds to make them brighter, reflecting more sunlight. There are technological challenges. "Such schemes are fraught with uncertainties and potential negative effects" (Blackstock and Long, 2010).

None of this sounds like humans intelligently re-engineering the planet in an Anthropocene age. It sounds more like panic on a planet that the engineers are realizing that they have messed up, in ways they find almost

beyond their control. Humans are smarter than ever, so smart that we are faced with overshoot (Dilworth, 2010). Our power to make changes exceeds our power to predict the results, exceeds our power to control even those adverse results we may foresee. We are "living through the end of nature" (Wapner, 2010). Nature is over.

A planet we manage, or attempt to manage, only to secure more and more profits and commodities for ourselves reveals an exploitive frame of mind. We shape our worldviews, and then our worldviews shape us. We fear that humans have become Earth's juggernaut predator. An overweening pride, hubris, is by many classical accounts, the original human sin. "You shall be as gods" (Genesis 3). David Biello, *Scientific American's* energy and environment editor, exclaims: "This is not the end of the world. This is just the end of the world as we have known it" (Biello, 2016, pp. 7-8).

What we must push for, according to the Royal Society of London, is "sustainable intensification" of reaping the benefits of exploiting the Earth (Royal Society, 2009). Would not the world's oldest scientific society be as well advised to ask about protecting ancient and ongoing biodiversity, about how we might shrink our footprint, whether treading softly is wiser than ever intensifying our imperial exploitation? If we are to fix the problem in the right place, we must learn to manage ourselves as much as the planet.

Anthropocentric enthusiasts claim that such power is to be welcomed ethically. For all of human history, we have been pushing back limits. Especially in the West, we have lived with a deep-seated belief that one should hope for abundance and work toward obtaining it. Economists call such behavior "rational." Ethicists can agree: We have a right to self-development, to self-realization.

Anthropocene proponents may take the moral high ground: Classical conservation has been "socially unjust" (Kareiva and Marvier, 2012, p. 965). "Protecting nature that is dynamic and resilient, that is in our midst rather than far away, and that sustains human communities—these are the ways forward now." "Instead of pursuing the protection of biodiversity for biodiversity's sake, a new conservation should seek to enhance those natural systems that benefit the widest number of people, especially the poor" (Kareiva, Lalasz, and Marvier, 2011, pp. 36-37). This will be a blessing in a more humane, equitable world.

But we worry that, though the intentions sound high, they have an immoral trailer. "Forward for me and my kind!" "Save nature for people, not from people." That could be as much the problem as the answer. Essentially this puts us as the first, if not the only, location of moral relevance. Justice is just-us. This is the Anthropocene, and too bad for the non-anthropoc. Anthropocene proponents are concerned to get people fed, even if doing so drives tigers and butterflies into extinction. Kareiva and Marvier urge us to shift "from a focus almost exclusively on biodiversity" to more attention to "human well-being. ... Conservation is fundamentally an expression of human values. ... Today we need a more integrative approach in which the centrality of humans is recognized." "We argue that nature also merits conservation for very practical and more self-centered reasons concerning what nature and healthy ecosystems provide to humanity" (Kareiva and Marvier, 2012, pp. 963-965).

Despite the caveat, ethical concern for non-humans is soon undermined. We may be told that once-abundant species can vanish with no ill effects on humans—the bison, the chestnut, the passenger pigeon, the dodo, the tigers and butterflies. Rebuilding the planet with humans at the center, or even protecting ecosystem services so long as these benefit us, no longer sounds like the high moral ground. Nature is of value only if and so far as it supports human enterprises. This puts the whole planet in the service of only one species—an unnatural condition. If our concern is for the poor in this new humanist excellence, then why not emphasize environmental justice, more equitable distribution of wealth between rich and poor on developed lands, rather than diminishing wild nature to benefit the poor.

On future Earth, it is hard to imagine a world without ongoing development—without engines and gears, without electricity, without cars, cell phones, computers. We expect ever escalating high technology. Self-fulfilling desires intoxicate us; we grow addicted to them. We, our children, our children's children may never know our highest flourishing, dumbed down by our ever more assertive self-interests. "Quite possibly, then, this era, which so congratulates itself on its self-awareness, will come to be known as the time of the Great Derangement" (Ghosh, 2016, p. 11). The geoengineers may find a majority of Earth's residents wondering: Is our only relationship to nature one of engineering it for the better?

Now Allen Thompson, joined by Jeremy Bendik-Keymer, backs off, more inclined to work with, rather than revise, the basic processes in ecosystems. "Far from the current rush toward geo-engineering, this kind of response would exhibit the virtue of humility" (Thompson and Bendik-Keymer, 2012, p. 15). We do not want Earth transformed into an artifact. Nevertheless, Christopher Preston envisions a "startling synthetic future" in which our advancing technologies "promise to remake the natural world" (Preston, 2018, p. xii). "The Synthetic Age presents an opportunity for humans to dramatically improve the biological and ecological world they inherited" (p. 80). Humans are a flexible species, figuring out ways to live "in a world that no longer resembles the one their genes



prepared them to find” (p. 110) . But Preston too worries about becoming “posthuman,” whether the perils of these “inventions that reinvent us” (p. 162) escalate with the promises.

#### 5. Neuroscience, Social Science, and Environmental Behavior

Neuroscience has greatly expanded in recent decades. We may be told that our actions are the outcome of impulsive subconscious neural configurations. “Research continues to elucidate the neural processes underlying how we make our choices, and much of what we know already about these brain mechanisms indicates that decision-making is greatly influenced by implicit processes that do not necessarily reach consciousness. ... It suggests that the process of decision making depends in many important ways on neural substrates that regulate homeostasis, emotion and feeling” (Burns and Bechera, 2007). Alternatively, we may be told that we can enable and strengthen our neural endowments to achieve more effectively what we have chosen to desire.

Similarly in the social sciences, sociology beyond psychology, we can be socialized to prefer certain behaviors, and this too may involve the choice of appropriate environments in which these skills are developed. And we may situate others in similar environments so as to bring their behaviors in line with our desires. What sociologists discover can be important in helping to solve such problems.

Sociologists may recommend “nudging.” By this they mean indirect ways to try to influence the motives, incentives and decision making of individuals and groups. Consider the food in a child’s school cafeteria. Is it healthy? What food is where in the cafeteria line? You may find that the healthy meats and veggies are right there at the front of the food line. Children grab some carrots. The really sweet foods are at the end of the line and placed so that they are rather hard to reach. Sociologists claim that such nudging is at least as effective, if not more effective, than direct instruction, rules, or teacher commands. Maybe you will eat better the rest of your life.

Some of our leaders in government have said that clever nudging can be more effective than new laws. Or at least that new laws are more likely to be obeyed if there is also some nudging. A good way to encourage people pay into their pensions, for example, is to set payment as a “default” in the contracts they sign with their employer. Then their pension is automatically withdrawn from their paycheck. To change this, the employee has to actively untick the box. This results in more people having good pensions than if they have directly themselves to tick the box.

What kind of society produces the most creative scientists? Those societies that offer excellent education that students can afford, and laboratories with needed resources, of course. STEM schools. But matters as usual get complex. Does this leave promising young scientists free to explore what they wish (with perhaps unexpected discoveries), or should this focus young scientists on already developing and promising research (with expected discoveries)? What kind of nudging is most likely to produce scientists more inclined creatively to save wildlife and endangered species?

Humans are the wise species (*Homo sapiens*), yes, but, alas, they still have Pleistocene appetites. We love sweets and fats, of which in Pleistocene times humans could seldom get enough. But now we overeat and grow fat. We love sex, because in Pleistocene times, a couple reproducing as often as they could, in those days of infant and child mortality, would hardly replace themselves with offspring who reached reproductive age. Today we over-populate.

Generally, that is a model for the whole overconsumption problem. True, we are a smart species. Our global powers prove that. No other species threatens Earth as do humans. Humans are not well equipped to deal with the sorts of global level problems we now face. Technology (medicine, engines, electricity, fertilizers, tractors, trucks) makes possible escalating populations with escalating appetites (better homes, cars, more food, television, cell phones, widgets). The transition from muscle and blood, whether of humans or of horses, to engines and gears shifts by many orders of magnitude the capacity of humans to transform their world. The billions of new people have the same appetites with greatly increased power to satisfy these desires.

We may have engines and gears, but we still have muscle and blood appetites. There are few biological controls on our desires to amass goods, to consume; for most people it has always been a struggle to get enough (indeed for many it still is). When we can consume, we love it, and over-consume. Consumer capitalism transmutes a once-healthy pattern of desires into gluttony and avarice. With escalating opportunities for consumption, driven by markets in search of profits, we need more self-discipline than comes naturally.

Consider our power to travel. We now have high tech bulldozers building a burgeoning road network to gain access to resources, forests, minerals, with extensive radiating side effects--uncontrolled development build out, loss of ecosystem services, loss of carbon sequestration, loss of soil, wildlife, arriving invasive species, pollutants (Haddan, 2015). Or consider our power to fly. Once we walked on foot. For thousands of years we used horses or camels, still muscle and blood. Sailboats added wind power. A century back we engineered trains and cars.

Today, we can cross a continent in a few hours. There are over 100,000 air flights per day—at least there were before the Corona virus.

What then? Should we proceed to high-tech germline editing and revise our genome with redesigned human desires, a human nature better suited for life in the Anthropocene Epoch? Even if we could do this in a select few, the prospects of revising the germ lines of eight billion persons is nowhere on any future horizon. Are humans wise enough to act globally on long-term, environmentally responsible scales? The classical institutions—family, village, tribe, nation, agriculture, industry, law, medicine, even school and often church—have shorter horizons. Far-off descendants and distant races do not have much "biological hold" on us, yet our actions can gravely harm them. Across the era of human evolution, little in our behavior affected those remote from us in time or in space, and natural selection shaped only our conduct toward those closer. Global threats require us to act in massive concert of which we are incapable. If so, humans may bear within themselves the seeds of their own destruction. More bluntly, more scientifically put: our genes, once enabling our adaptive fit, may in the next millennium prove mal-adaptive and destroy us.

Humans have proved capable of advanced skills never dreamed of in our ancient past—flying jet planes, building the internet, decoding their own genome, and designating world biosphere reserves. It would be tragic in the future if we let our left-over Pleistocene appetites become a useful alibi for continuing our excesses. *Homo sapiens* can and ought to be wiser than that.

## 6. Sustainability, Sustainable Biosphere

The United Nations Conference on Environment and Development (UNCED) in 1992 in Rio de Janeiro brought together the largest number of world leaders that had ever assembled to address any one issue (surpassed only in 2010, by the Copenhagen Climate Summit). The UNCED Summit drew 118 heads of state and government, delegations from 178 nations, 7,000 diplomatic bureaucrats, 30,000 advocates of environmental causes, and 7,000 journalists. That Conference entwined its concerns into "sustainable development."

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (United Nations World Commission on Environment and Development, 1987, p. 43). "Sustainable" coupled with "development" expects continued growth but not such as degrades future opportunities. UNCED intended this to apply to agriculture, forestry, water use, pollution levels, industry, resource extraction, urbanization, national environmental policies and strategies. Over 150 nations have endorsed sustainable development. The World Business Council on Sustainable Development includes over 200 of the world's largest corporations. The duty seems unanimous, plain, and urgent. Only so can this good life continue. No one wants unsustainable development. "Sustaining" is about like "surviving," and nobody can be against it.

But if you are for it, what are you for? You are for an economy "in equilibrium with basic ecological support systems," Robert Stivers had said over a decade before (Stivers, 1976, p. 187). Ecologists had long been talking about "carrying capacity." There are "limits to growth" (Meadows, 1972). A few prophetic economists were advocating "steady-state economics" (Daly, 1973). But neither in the First or Third Worlds did developers wish to hear about limits or steady-states, so they immediately and enthusiastically accepted "sustainable development."

The idea has become a mantra, a phrase heard around the world. The United Nations *2005 World Summit Outcome Document* refers to the "three components of sustainable development—economic development, social development, and environmental protection—as interdependent and mutually reinforcing pillars" (United Nations World Summit, 2005, p. 12). A frequent worry has been that the developed countries can welcome long-term planning for sustainability, but the developing countries have to face more immediate needs, whether or not they can see beyond the next harvest. Indeed, third world nations may argue that, far from developing, the rich need to shrink so that the poor can grow. Meanwhile, the general orienting vision seems to be one of ongoing prosperity that is widely shared and long-term.

The World Business Council for Sustainable Development (WBCSD) argues that business has to think in terms of eco-efficiency. "Eco-efficiency is reached by the delivery of competitively priced goods and services that satisfy human needs and bring quality of life, while progressively reducing environmental impacts and resource intensity throughout the life cycle to a level at least in line with the earth's carrying capacity" (DeSimone and Popoff, 1997, p. 47). All this has challenged the "business as usual" mentality with alarms about sustainability. The United Nations calls for all nations to seek 17 development goals that they develop (United Nations, 2019). Those who do business, or run a university, or run for political office will—at least for public relations—endorse sustainability in some form or other.

A more radical environmental ethic finds, however, that this fails to recognize the globally relevant survival unit: **Earth and its biosphere**. The bottom line, transcultural and non-negotiable, is a sustainable biosphere. The us-and-our-sustainable-resources view is not a systemic analysis of what is taking place. The planet is a self-

organizing biosphere, which has produced and continues to support all the Earthbound values. Earth is the source of value, and therefore value-able, able to produce value itself. This generativity is the most fundamental meaning of the term "nature," "to give birth." Do not humans sometimes value Earth's life-supporting systems because they are valuable, and not always the other way round?

The Ecological Society of America advocates research and policy that will result in a "sustainable biosphere." "Achieving a sustainable biosphere is the single most important task facing humankind today" (Risser, Lubchenco, and Levin, 1991). Any sustain-economic-development ethic needs to be brought under a sustainable biosphere ethic. The fundamental concern is that any production of such goods be ecologically sustainable. Development concerns need to focus on natural support systems as much as they do people's needs. The enthusiastic developers will say: To save humanity, we must destroy nature. People have got to sacrifice nature to get food, shelter, fuel, to build their cultures. But ecologists may ask whether we might better turn that around, making it into a fearful question. If we destroy nature, can we save humanity? Those same people need soil, forests, water, air, fish, earthworms, insect pollinators, microbial decomposers, stable climates, ecosystem services, sustainable biospheric resources, without which their human societies will degrade and perish.

A recent way of bridging sustainable development and a sustainable biosphere is to think of a "safe operating space for humanity." Johan Rockström argues (using scientific data) that there are nine planetary systems on which humans depend. These can be seen by analysis of: chemical pollution; *climate change*; ocean acidification; stratospheric ozone depletion; *biogeochemical nitrogen-phosphorus cycles*; global freshwater use; changing land use; *biodiversity loss*; atmospheric aerosol loading. For at least 10,000 years (what geologists call Holocene times) these systems have remained stable. But since the Industrial Revolution, in the three of these systems italicized the boundaries have already been exceeded (Rockström, 2009). Humans, in a mixture of ignorance and power, produce changes the results of which we only partially know and sometimes cannot predict. We anticipate some foreseen changes, but we cannot know all the unforeseen changes, and often also we find ourselves unable to deal with even those adverse foreseen changes as evidenced by global warming.

Surely it is both rational and ethical to take intelligent precautions. This is often expressed as the precautionary principle. If some proposed activity poses threats to human health and safety, precautionary measures ought to be taken, even if the causal connections are not yet fully established. This can include a moratorium pending further research, or bans on especially high-risk undertakings, or on those that may produce environmental degradation difficult to reverse, or on those of global scale. It may require shifting burdens of proof and liability to those proposing the changes (Manson, 2002). At the same time, we do need to recognize that some risks are justified; one can be overly precautionous. Certainly it is in human interests to sustain not simply development but the biosphere. If this is too hot to handle, if this is not first priority for engineering any synthetic Earth, for any environmental neuroscience and social science, then our future Earth looks bleak indeed. Is there any hope?

## 7. Future Earth: The Next Millennium

We need to confront a massive Millennium Ecosystem Assessment, sponsored by the United Nations, involving over 1,300 experts from almost 100 nations: "At the heart of this assessment is a stark warning. Human activity is putting such strain on the natural functions of Earth that the ability of the planet's ecosystems to sustain future generations can no longer be taken for granted" (Millennium Ecosystem Assessment, 2005, p. 5). Meeting in Montreal in August 2002, 63 scientists from 26 countries assessing the scientific evidence for the post-2020 Global Framework on Biodiversity concluded: "Global biodiversity policy is at a crossroads. Recent global assessments of living nature and climate show worsening trends and a rapidly narrowing window for action. ... None of the 20 Aichi targets for biodiversity it set in 2010 has been reached and only six have been partially achieved. ... Only the highest level of ambition in setting each goal, and implementing all goals in an integrated manner, will give a realistic chance of stopping and beginning to reverse biodiversity loss by 2050 (Diaz, Zafra-Calvo, Purvis, et al, 2020).

Several billion years' worth of creative toil, several million species of teeming life, have been handed over to the care of this late-coming species in which mind has flowered and morals have emerged. Ought not those of this sole moral species do something less self-interested than count all the produce of an evolutionary ecosystem resources to be valued and re-engineered only for the benefits they bring? Such an attitude hardly seems biologically informed, much less ethically adequate. Its logic is too provincial for moral humanity.

Humans coinhabit Earth with five to ten million other species, and we and they depend on surrounding biotic communities. There are multiple dimensions of naturalness, on both public and private lands. George

Peterken, British ecologist, has an eight-point scale. Even on long-settled landscapes there can be natural woodlands, treasured by owners over centuries. There may be native woodlands, often with quite old trees, secondary woodlands with trees fifty to a hundred years old, recently restored woodlands, wetlands, moors, hedgerows, mountains, such as the Alps or the Scottish Cairngorms (Peterken, 1996). Gregory Aplet, a U. S. forest ecologist, distinguishes twelve landscape zones, placed on axes of human "controlled" to autonomously "self-willed" and "pristine" to "novel" (Aplet, 1999). Rather than seeking to press onward toward totally managed Earth, why not claim that there are and ought to be various degrees of the preservation-conservation-synthetic-Anthropocene spectrum?

Zoning the landscape, how much human management do we apply where? Which are urban lands? Which are working landscapes, rural or dedicated to multiple use? This "right-sizing" policy question seems to demand a more specific answer than we actually need to give, if we are concerned with sizing the human presence on future Earth. Wilderness is the most endangered landscape, the least-sized, the one in shortest supply. Save all you can. Right-size agricultural landscapes not by re-engineering weather, climate, and soil geologies but by sizing human populations as adapted fits in their supporting rural communities with ecosystem services. Technology can overcome some constraints (fossil fuels, nitrogen fertilizers) but only within ecosystem constraints (global warming, nitrogen polluted waters). Right-size cities by keeping them sustainable on their supporting agricultures and ecosystems. Right-size humans by keeping them at home on their planet.

The Montreal Protocol, with its five revisions, widely ratified (197 nations) and implemented is the most successful international agreement yet. The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) has been adopted by 182 nations. There are over 150 international agreements (conventions, treaties, protocols, etc.) registered with the United Nations that deal directly with environmental problems (United Nations Environment Programme 1997; Rummel-Bulcka and Osafo 1991).

I am a senior citizen. When I was a young man, we had no designated wilderness areas in the United States; now we have over 800. When I was a young man, if you had said that a black man will be elected president of the United States, I would have said: You are out of your mind. If you had said that a black woman will be elected vice-president: You are out of your mind. If you had said that the day is coming when no one can smoke cigarettes on most college and university campuses, I would have thought: what a fancy and unrealistic dream. Don't tell me that we can't see big changes in our lifetimes. I know differently, because I have seen them in mine. This is our destiny, which I may not see in my lifetime. But I know it is coming. Humans will celebrate and preserve their Earth, the wonderland planet.

Rocket scientists, loving their marvelous, high-tech machines, are still concerned to celebrate our organic, vital planet. Viewing Earthrise from the moon, the astronaut Edgar Mitchell, was entranced:

Suddenly from behind the rim of the moon, in long, slow-motion moments of immense majesty, there emerges a sparkling blue and white jewel, a light, delicate sky-blue sphere laced with slowly swirling veils of white, rising gradually like a small pearl in a thick sea of black mystery. It takes more than a moment to fully realize this is Earth ... home. (Mitchell, quoted in Kelley, 1988, at photographs 42-45)

Our best hope is for a tapestry of cultural and natural values, on this sparkling jewel in space. Keep nature in symbiosis with humans. Keep the urban, rural, and wild. Our future ought to be the Semi-Anthropocene, kept basically natural within the natural basics and limits entered carefully, full of cares for both humans and nature on this marvelous home planet. We do not want a de-natured life on a de-natured planet.

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