



# Artificial Intelligence, Responsible Innovation, and the Future of Humanity with Andrew Maynard

Carmen Richardson<sup>1</sup> · Nicole Oster<sup>1</sup> · Danah Henriksen<sup>1</sup> · Punya Mishra<sup>1</sup>

Accepted: 4 December 2023  
© Association for Educational Communications & Technology 2023

**Keywords** Creativity · Technology · Education · Artificial intelligence · ChatGPT · Generative AI · Responsible innovation · Futures thinking · Future

“The power of ChatGPT is in the conversations, just like the power of human interactions in learning is in the conversations.”—Andrew Maynard

“The future depends on what we do in the present.”—Mahatma Gandhi

## Introduction

In our most recent articles in this *Tech Trends* series, we have connected with engaging thought leaders to explore Artificial Intelligence (AI) and creativity from varied angles. Our AI focus within the series began with seasoned educational technologist Chris Dede, who situated the emergence of AI in a historical context and emphasized approaching AI development with a critical lens (Warr et al., 2023). Then, innovator and scholar Ethan Mollick advocated for educators to widely adopt generative AI and adapt to this new addition to our educational ecosystem (Henriksen et al., 2023). Most recently, educational leader and researcher Kyle Jensen explored the relationship between writing processes, pedagogies, values, and emerging technologies (Woo et al., 2023). All these insightful scholars emphasized the

importance of looking ahead to the potential impact of AI on learning futures. Our discussion in this piece, with Dr. Andrew Maynard, also underscores the importance of taking a long-term view when thinking of AI, education, and creativity.

Dr. Andrew Maynard is a professor of *Advanced Technology Transitions* at *Arizona State University's School for the Future of Innovation in Society*. His interdisciplinary work centers on technology transitions and the ethical and socially beneficial development and use of transformative emerging technologies. He is the founder of ASU's *Future of Being Human* initiative and the author of the books, *Films from the Future: The Technology and Morality of Sci-Fi Movies* and *Future Rising: A Journey from the Past to the Edge of Tomorrow*. Dr. Maynard engaged us in a nuanced discussion of the role AI can and does play in our society and left us feeling more optimistic about our collective ability to use technology for responsible innovation, in ways that positively shape our future. Dr. Maynard is a recognized public intellectual in the space of AI, technology futures, and learning—with a Substack that explores the future of humanity, and an eye to the current and coming AI revolution.

Dr. Maynard began his career as a physicist after receiving a PhD in physics from the University of Cambridge. As he shared, “I was appalling at English. I nearly flunked English in high school. I couldn't do languages. Chemistry was too much to learn. Biology was too messy. Physics was where I excelled.” After spending his early career studying nanoparticles, Dr. Maynard entered a quickly expanding field as governments around the world began looking at the environmental health impacts of nanoparticles. He became the co-director of a cross-agency US initiative where he was able to make valuable contributions to society by leading work that directly influenced policy makers. The experience led to other positions that spanned public and private sectors where Dr. Maynard was able to think critically and

---

✉ Carmen Richardson  
carmen.richardson@asu.edu

Nicole Oster  
njakubcz@asu.edu

Danah Henriksen  
danah.henriksen@asu.edu

Punya Mishra  
punya.mishra@asu.edu

<sup>1</sup> Mary Lou Fulton Teachers College, Arizona State University, Tempe, AZ, USA

practically about responsible nanotechnology. In 2005, Dr. Maynard became a science advisor to the Project on Emerging Nanotechnologies at the Woodrow Wilson International Center for Scholars, which required speaking to politicians, journalists, advocacy groups, the public, industry, and more. He is an elected Fellow of the American Association for the Advancement of Science, has served on many National Academies of Sciences committees, and has testified before congressional committees on several occasions. According to Dr. Maynard:

I had to be an expert in everything, and I had to be able to build bridges fast. I had to be able to pick up the phone and talk to journalists about almost anything to do with Nanotech. I discovered this passion for working through how we develop emerging technologies in socially beneficial ways. I discovered there is both a delight and a real importance in being able to work with different stakeholders to ask really big questions about what could possibly go wrong, and how we can get it right.

Dr. Maynard then joined the *University of Michigan School of Public Health* where he was later appointed Chair of the *Department of Environmental Health Sciences*. While there his work focused on risk assessment. Following that, he was offered an opportunity to engage in scholarly work on technology innovation and the future at *Arizona State University*. At ASU, he brings together his “physicist mindset, understanding of risk, innovation around how we think differently about risk, and love of engaging with people from different disciplines and areas of expertise and experience.” ASU has allowed him to live in the intersection of technology, society, innovation, and the future.

This unique journey through physics, government work, stakeholder engagement, and higher education has led to Dr. Maynard jokingly calling himself an un-disciplinarian. As he said, “I’ve no idea what my discipline is these days. I am very un-disciplinary in what I do and how I do it.”

This theme of being un-disciplinary, in-disciplinary, and even trans-disciplinary strikes a unique chord with the foundations of our work and this column in relation to creativity, education, and technology (Mishra et al., 2012). The articles in this series throughout 2014–2015 described specific domain crossing skills that are fundamental to human ingenuity and innovation; perceiving, patterning, abstracting, embodied thinking, modeling, play, and synthesis. In an edited volume that subsumed this work (Henriksen, 2018), we showed that the human creativity that has led to great advances in our society has been a result of thinking that goes beyond traditional definitions of disciplines. Dr. Maynard described this as not becoming “stove-piped” into one’s area of expertise. If one does that, it’s like “putting the blinkers on. You have an inability to see beyond that expertise. In

a world that’s changing incredibly rapidly, where we must be agile and entrepreneurial, being stuck in your discipline is actually an impediment.” Creativity and innovation are products of purposefully reaching beyond the boundaries of any single discipline.

### **Creativity and Innovation, Building Blocks of the Future**

Innovation is at the core of Dr. Maynard’s work, and because of that, he speaks very specifically about the way he conceptualizes innovation and the role that creativity plays. He shared:

I think it's too easy to think of innovation as just doing something different. Innovation is using creativity, putting ideas together in novel ways that lead to a product that other people are willing to invest in. They may be investing their time, their emotions, or something else. It goes beyond just doing stuff differently, towards doing something differently that someone else sees the value in... That means that you've got to find some way of stimulating or catalyzing the ability to think differently, to see things differently, to do things differently.

This relationship between creativity and innovation is clearly seen in tech startup companies. Leaders in the tech industry find a niche, approach it with creativity, and create innovative products. For this innovative productivity to occur, Dr. Maynard notes the value of exposure to novel ideas. People must intentionally open themselves to a breadth of ideas to create an opportunity for “something to click that didn't click before.” The moment of creative insight is a result of sustained and purposeful experimentation and exploration (Sawyer, 2011).

In this important role that creativity plays in leading to innovation, there is a critical element of thinking and reflection that lays the foundation for creative activity. This reflective attitude or mindset is, according to Dr. Maynard, “absolutely essential.” For Dr. Maynard, the core of this creativity mindset is wonder and delight. As he shared:

When I was studying physics, we were taught to think intuitively. Yes, the rigor and the math were important, but physics is all about the sheer delight of putting ideas together in different ways and then seeing in new ways. I've never lost that delight. The way we teach science these days, it actually destroys my soul because so often, we teach science as a process or a method. Science is a love language between us and the universe, where we can be awed and delighted and amazed.

Dr. Maynard explained how this explorer’s mindset sustains his creativity, “When I discover I’m wrong or when I

discover something that I didn't know existed or when the world is different from how I thought, I find it amazing, and that becomes fuel to my creativity." These moments of wonder, awe, and curiosity are the building blocks of creativity. Indeed, this form of play with the world around us is an essential component of school and work for people of all ages (Henriksen et al., 2015). Numerous breakthroughs in science, math, art, and music, have been a result of curiosity—wondering about and playing with content and ideas. In that sense, play leads to creativity which leads to innovation (Mehta et al., 2020). To ensure that the world is filled with the creative thinkers and innovators that will build a better future, education must support the building blocks of creativity and innovation: a wonder, deep curiosity, and joy about the world around us (Mehta et al., 2019).

Dr. Maynard emphasized the unique opportunity that we have to imagine futures that are different from the present and to "actually build a pathway between where we are and the future that we aspire to... We have this ability to imagine something that doesn't exist and actually start building it." Once we understand that humankind has this unique power to create a desired future, it becomes essential to think about how we equip ourselves to be able to do that through formal and informal education. As Dr. Maynard explained:

We must develop an environment where people can develop the skills and insights that allow them to be builders of the future. This creates an incredible impetus for anybody in any organization that is in the business of facilitating learning. We are creating builders of the future, and we want to make sure that they're building the sort of future we want to inhabit.

All learners need skills that will prepare them to navigate rapid-paced societal transitions, like critical thinking, creativity, and ethical reasoning. Leaders of educational institutions should have this at the forefront of their thinking as they plan for a future that will be more and more reliant on human creativity and innovative technology.

### **Artificial Intelligence, Human Collaboration, and the Transformation of Education**

As technology evolves, it will play a more intricate and integrated role in our design and creation of the future. Artificial Intelligence has exploded in use, popularity, and criticism in recent years. While Dr. Maynard has his share of reservations and critiques about AI, he remains optimistic and excited about the possibilities emerging because of AI, especially regarding the generative collaboration *between* humans and artificial intelligence:

Imagine we're using an AI image generator like DALL-E, or Midjourney. These tools can churn out

images with a prompt, but those might not be particularly interesting. What *is* interesting is if we prompt the system again and we get different images back. And they depict that idea in a way that I never imagined. Through several iterations, we now begin to get a series of images that capture the essence of how we're thinking or how we're trying to explain and capture our ideas in a way that we never thought was possible. *That*, to me, is generative. We flip that generative part of generative AI. This is not just the computer being generative. It's the computer-human collaboration being generative. That is groundbreaking.

This generative collaboration also happens with text-based AI like ChatGPT. Dr. Maynard views interactions with ChatGPT as conversations that can help generate ideas and inspire our curiosity and creativity. We still approach the information with a critical eye, but we are open to the generative conversation and the ideas that arise through it.

One of the most visible examples of this, which has received much popular attention, was when Dr. Maynard created and taught a course on Basic Prompt Engineering that he designed through an iterative collaboration with ChatGPT. Dr. Maynard jokingly shared his mindset before designing the course, "I thought it was a really clever idea to have ChatGPT create and grade it...I could sit back and do nothing. Boy, was I so wrong. It has been so much work!" Dr. Maynard's idea to create the course came from thinking about how students could learn to use the technology responsibly and effectively. He noted that the collaborative, generative sessions with ChatGPT resulted in a strong syllabus and pedagogical plan. The course is based on a series of activities where students are required to use their critical and creative thinking skills to use AI to develop their understanding of how to get the most out of the very sophisticated platform. Dr. Maynard explained:

One of the first misconceptions that we blew out of the water was that using ChatGPT is just about crafting the perfect prompt, putting one prompt in, and getting a response. Like, write me an essay on X, Y, and Z. The power of ChatGPT is in the conversations, just like the power of human interactions in learning is in the conversations. In those conversations, students had to look at what ChatGPT said, then think about what comes next in the conversation, and critically assess what had been said in the context of the conversation; they were forced to be creative and imaginative, and to engage critical thinking.

ChatGPT and other AI tools have been both praised and criticized by educators and educational scholars who debate the impact of these tools on educational settings (Herman, 2022; Marche, 2022). There has been mounting

hype surrounding the prospect of AI integration in education. For instance, intelligent assistants are “touted as having the capacity to take on the more mundane administrative responsibilities of teachers, such as tracking attendance, and developing lesson plans and classroom activities, thereby freeing up teachers’ time to do other things” (Nemorin et al., 2023, p. 38–39). At the same time, criticisms also abound. Notably, there are significant ethical risks and concerns surrounding personal data and learner autonomy (Nguyen et al., 2023). Moreover, there are concerns that a growing incursion of AI in education may “supplant teachers or reduce them to a functional role” (Holmes et al., 2023, p. 621). Although this could help address vacancies in teaching positions, it simultaneously devalues educators’ “unique skills and experiences, as well as learners’ needs for social learning and guidance” (Holmes et al., 2023, p. 622). There are also major concerns around bias and perpetuation of systems of oppression by AI. As some argue, “at the heart of these AI tools and principles are how Western ideas are being superimposed on countries in the Global South evidenced by the aggressive policies and strategies being adopted to expand geopolitical dominance through AI” (Nemorin et al., 2023, p. 49).

Despite these criticisms, Dr. Maynard espouses a more optimistic view of AI in education. He believes that our use of AI is only limited by our own creativity. He provided examples of how AI is being used to “flatten” the distribution of teaching and abilities. In a traditional classroom model with 30, 50 or even 100 students and one instructor, the instructor cannot differentiate for each student’s abilities or interests. Thus, instructors teach to the average student. AI, however, can flatten the distribution, and meet the needs of more students. Having the ability to make learning more accessible to all students is one of the most important implications of the use of technology in education. Dr. Maynard provided an example a student shared with him that illustrates the power of this for the learner:

A student was in a physics lecture where they were learning about vector calculations. And the student was listening to the instructor, thinking, ‘I understand nothing here - I have no idea what’s going on in this class.’ So, he opened his computer and started typing into ChatGPT. He literally typed, ‘I’m in this class learning about vectors. I have no idea what’s going on. This is what the instructor just said... I don’t know what it means. Please help.’ He did that through the rest of that class, working with ChatGPT and listening to the instructor. At the end of the class, he had a really strong grasp of what was being taught. That is augmented learning, which is deeply personalized and can be transformative.

This illustrates how anyone could use ChatGPT and similar tools to engage in interactions that furthers their learning, helps reconcile misconceptions, and allows them to become active designers of their own learning with technology as a collaborator. “And this,” Dr. Maynard shared, “is barely scratching the surface.” We will continue to discover new ways of enhancing human creativity and critical thinking, using AI to spark ideas and conversations.

## Responsible Innovation

As we move forward in a time of unparalleled technological advancement, Dr. Maynard highlights the pressure to ethically create and use technology. With emerging technologies, “we no longer have the luxury of making mistakes.” If we think back 100–500 years ago, there wasn’t this much risk. If people made a mistake, they could fix it and build again. However, “we are now at a point with technology innovation...that we’re going to make mistakes that we can’t back up from.” According to Dr. Maynard, this is where responsible innovation becomes critical. It is integral to think about the possible consequences of our innovation, whether we are researchers, developers, policymakers, etc.—particularly, when it comes to innovations that have a significant impact on human society. It boils down to asking ourselves how we can engage in future building and innovating in more and more responsible ways as individuals, organizations, and communities.

Dr. Maynard is cautiously optimistic about how communities will work together to build the future. He described his vision:

We live in a world where individuals have incredible power, but most of us don’t realize it. We have incredible power because we are part of communities, not only physically local communities, but also online communities where we can pull together ideas and have influence, which is larger than you might think within those communities. But in order to wield that influence, we must understand the influence we have, and we’ve got to be grounded in how we make sense of the responsibility that comes with that influence. We’ve got to understand how to mobilize that and how to cooperatively build the future we want together.

Education is vital to building this cooperative, ethical design for our future. According to Dr. Maynard, our future relies in part on the ability of education settings to help people understand that they are a part of building the future. If people don’t see themselves as having a powerful role, then “we’ll end up having a future where the few people that have that power and that understanding craft the future that they want.” Dr. Maynard shared an example of what this might look like with the evolution of artificial intelligence:

Currently, most of the conversations are driven by white guys who head up tech companies. It seems like these are the people that are deciding what the AI future is going to be like. And yet there's nothing to stop ordinary citizens coming together, either individually or as communities, or working through civil society groups to say, 'Hey, we like this AI thing. But we've got a completely different vision for the future. This is what we want it to look like. We are going to both lobby these companies to do things in ways that we think are more responsible, and we're not going to support them doing things that we think are irresponsible.' But to do that, people must be empowered. You can't do that without helping them develop that technical literacy through education and learning.

Who will benefit from future innovation? Perhaps the biggest enemy to a community-driven future is complacency. As Dr. Maynard described, if most people are willing to let others make decisions, then the people already in power will continue to be the ones making the decisions. This could harm us and harm society. This is why Dr. Maynard is such a strong advocate for promoting wider understanding of advanced technology transitions. As he expressed:

We know we're undergoing a profound advanced technology transition right now with artificial intelligence. It is shaking up our world. And people are making decisions about what the technology looks like and where it's going that seem to be out of the grasp of a lot of us. But we can't work out how to course correct because we don't have theories of advanced technology transitions. We don't have a body of knowledge that helps us understand how to actually navigate this successfully.

This is why the field needs new knowledge, insights, and models informed by individuals who are a part of the decision-making. People need to be aware of the dangers of technological disparity and need to design the future in ways that "allow us to see pathways forward where we can reduce those iniquities while still ensuring the broad benefits of the technology we're developing." Dr. Maynard believes that we have the capacity to develop these needed understandings and practices, "but the first step still needs to be taken in acknowledging that we need a whole new way of thinking about our connection between us, the future, and the technology that connects us." Technological disparities can be overcome by empowering diverse voices in shaping the future, but the rapid pace of change with AI creates a sense of urgency that cannot be ignored.

## Challenges Ahead

As we move into a future that is highly technology-centric and inherently unpredictable, our ability to communicate the need for collective future building is important. This also presents a challenge because it is not a message that is easy to communicate broadly. Moving forward, we must communicate these ideas to practitioners, scholars, policymakers, and the public. Dr. Maynard stressed some key understandings that he has developed over the years as he has engaged in this work, "One is the realization that most people are reasonably smart." It is both easy and dangerous to assume that people aren't capable. However, Dr. Maynard notes that people *are* capable, and effective communication involves respecting other people's ability to learn and understand in their particular context. He elucidated:

Take a very contentious issue: climate change. If you are trying to bring about changes in behavior around climate change, and you preach to people—you tell them that they're wrong, you try to blind them with science—with long, obfuscating words and make them feel like an idiot, you're not going to get anywhere. If you meet them where they're at with respect and help, and understand what is important to them, what is of value to them, and work out how you can work with them to protect or grow that value at the same time as showing them pathways forward, where they can actually live a life which is good for the planet. In this case you have got the essence of positive and effective communication.

Dr. Maynard believes that we can engage in positive and effective communication in almost any circumstance. This centers around building bridges to help people understand how to be part of creating a better future for all of us. Dr. Maynard stresses the need for the communicator to diminish themselves and their ego, remarking that the best form of communication is when someone hears an idea that truly transforms their thinking, and thus leads to change in action.

The fact that predicting future trends and advancements is so difficult places more onus on the need to communicate positively and in collectively beneficial ways. We asked Dr. Maynard to share some of the trends that he thinks might happen in the future. He noted that we will likely see a period soon where AI tools will just become normal parts of everyday life. The tools will be so normalized that people will forget what was transformative or special about them. But, underneath that societal normalization, we will:

Have a continuation of the transformative developments in the underlying models, the large language models, and very complex, multi-layered foundation models. I would guess that somewhere between the next six months and

three years, you'll see a sudden outburst of new capabilities that are transcendent compared to what we have with ChatGPT at present, and I'm not quite sure what those will look like. Of course, we're going to augment text-based artificial intelligence with audio-based artificial intelligence. We're already seeing that move happening now.

A natural continuation of this will involve AI personal assistants that are always available to answer questions and perform tasks. Dr. Maynard suggests this will become normalized very quickly—but it will be an important step in the integration of artificial intelligence into our everyday lives. The thought of being reliant on AI throughout one's day might be sobering. When we are so reliant on AI, what will that mean for how knowledge is learned, built, and shared? What will we lose control of? What biases, prejudices, or propensities will we not even be aware of? We asked Dr. Maynard his thoughts on these, and he brought us back to discussions of risk, responsible innovation, and developing an awareness of the way that AI tools might persuade and manipulate humans.

We turned our discussion toward the dystopian to inquire about any negative future possibilities that we should be wary of. In his book *Films from the Future*, Dr. Maynard discussed the relationship between humans and artificial intelligence, including human manipulation, through film. He analyzes the movie *Ex Machina* and the manipulation of humans by technology that occurs, which is possible because the machine “intimately understands human cognitive biases.” Human bias is what makes us susceptible to manipulation. Humans manipulate each other all the time, but “we're all on the same playing field—all trying to manipulate one another.” However, if you have a computer that is an excellent manipulator and that cannot be manipulated back, then “it's like throwing a virus into an unprotected community.” In that case AI is not only artificial, but also alien. It knows us better than we know ourselves which opens a Pandora's box that we might never recover from. Dr. Maynard shared that we are already seeing AI that is deeply persuasive and combatting this will be one of our biggest challenges in the future.

Dr. Maynard is convinced that we are at a tipping point in our evolution, “the likes of which we haven't seen for at least 200 years, maybe even a thousand years.” In the next 20–30 years, “everything is going to change.” He finds this incredibly exciting, and also just a little worrying.

## Conclusion

Perhaps we are doomed to live in interesting times (as the oft-repeated, yet ultimately fabricated Chinese quote goes). Our future relies on the work we do now. Responsible innovation; ethical technological development; supporting

creativity, curiosity, and critical thinking; building communities that care—these are some of the essential tasks of our time. Technology will continue to transform our society in predictable and unpredictable, and ultimately immeasurable ways, and people must be empowered to shape this future. Dr. Maynard's discussion of the promise and perils of technological advancement provides a view of the future that is both intimidating and exciting.

## References

- Henriksen, D. (2018). The 7 transdisciplinary cognitive skills for creative education. *Springer Briefs in Educational Communications and Technology*. Springer. <https://doi.org/10.1007/978-3-319-90272-2>
- Henriksen, D., Keenan, S., Richardson, C., Mishra, P., the Deep-Play Research Group. (2015). Play as a foundational thinking skill and trans-disciplinary habit of mind. *TechTrends*, 59(3), 17–23. <https://doi.org/10.1007/s11528-015-0842-5>
- Henriksen, D., Woo, L., & Mishra, P. (2023). Creative uses of ChatGPT for education: A conversation with Ethan Mollick. *TechTrends*. Advance online publication. <https://doi.org/10.1007/s11528-023-00862-w>
- Herman, D. (2022). The end of high-school English. *The Atlantic*. <https://www.theatlantic.com/technology/archive/2022/12/openai-ChatGPT-writing-high-school-english-essay/672412/>
- Holmes, W., Bialik, M., & Fadel, C. (2023). Artificial intelligence in education. In C. Stückelberger & P. Duggal (Eds.), *Data ethics: Building trust: How digital technologies can serve humanity* (621–653). Globethics Publications. <https://doi.org/10.58863/20.500.12424/4276068>
- Marche, S. (2022). The college essay is dead. *The Atlantic*. <https://www.theatlantic.com/technology/archive/2022/12/ChatGPT-ai-writing-college-student-essays/672371>
- Mehta, R., Henriksen, D., & Mishra, P. (2020). “Let children play!”: Connecting evolutionary psychology and creativity with Peter Gray. *TechTrends*, 64(5), 684–689. <https://doi.org/10.1007/s11528-020-00535-y>
- Mehta, R., Keenan, S., Henriksen, D., & Mishra, P. (2019). Developing a rhetoric of aesthetics: The (often) forgotten link between art and STEM. In M. Khine & S. Areepattamannil (Eds.), *STEAM education: Theory, research and practice* (pp. 117–141). Springer International Publishing. [https://doi.org/10.1007/978-3-030-04003-1\\_7](https://doi.org/10.1007/978-3-030-04003-1_7)
- Mishra, P., Henriksen, D., The Deep-Play Research Group. (2012). On being (in)disciplined. *TechTrends*, 56(6), 18–21. <https://doi.org/10.1007/s11528-012-0600-z>
- Nemorin, S., Vlachidis, A., Ayerakwa, H. M., & Andriotis, P. (2023). AI hyped? A horizon scan of discourse on artificial intelligence in education (AIED) and development. *Learning, Media and Technology*, 48(1), 38–51. <https://doi.org/10.1080/17439884.2022.2095568>
- Nguyen, A., Ngo, H. N., Hong, Y., Dang, B., & Nguyen, B.-P.T. (2023). Ethical principles for artificial intelligence in education. *Education and Information Technologies*, 28(4), 4221–4241. <https://doi.org/10.1007/s10639-022-11316-w>
- Sawyer, R. K. (2011). *Explaining creativity: The science of human innovation*. Oxford University Press.
- Warr, M., Mishra, P., Henriksen, D., & Woo, L. J. (2023). A chat about GPT3 (and other forms of alien intelligence) with Chris Dede. *TechTrends*. Advance online publication. <https://doi.org/10.1007/s11528-023-00843-z>

Woo, L., Henriksen, D., & Mishra, P. (2023). Literacy as a technology: A conversation with Kyle Jensen about AI, writing and more. *TechTrends*. Advance online publication. <https://doi.org/10.1007/s11528-023-00888-0>

**Publisher's Note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Springer Nature or its licensor (e.g. a society or other partner) holds exclusive rights to this article under a publishing agreement with the author(s) or other rightsholder(s); author self-archiving of the accepted manuscript version of this article is solely governed by the terms of such publishing agreement and applicable law.