

# Can the Thought of Teilhard de Chardin Carry Us Past Current Contentious Discussions of Gene Editing Technologies?

MÁRIA ŠULEKOVÁ and KEVIN T. FITZGERALD

**Abstract:** The advent of CRISPR-Cas9 technology has increased attention, and contention, regarding the use and regulation of genome editing technologies. Public discussions continue to give evidence of this debate falling back into the previous polarized positions of technological enthusiasts versus those who are more cautious in their approach. One response to this contentious relapse could be to view this promising and problematic new technology from a radically different perspective that embraces both the excitement of this technological advance and the prudence necessary to use it well. The thought of Teilhard de Chardin provides this desired perspective, and some insights that may help carry forward public discussions to achieve widely accepted uses and regulations.

**Keywords:** CRISPR-Cas9; gene editing; genetic engineering; ethics; Pierre Teilhard de Chardin; evolution; responsibility; biosphere stability; genetic diversity; common good; transhumanism

CRISPR has greatly increased interest in applying genome editing to plants, animals, and humans. In addition, it has also increased tensions surrounding the public debates about how to use this rapidly improving technology. Current tension between bioenthusiasts and bioconservatives results in significant gridlock in public discussions. Deliberations about genome editing are falling into old patterns of polarization and conflict. There is a lack of real, substantive discussion about the issue. “We can’t get sufficient dialog going,” stated Arthur Caplan in the June issue of *Nature* this year, calling for a greater variety of forums for this discussion.<sup>1</sup> There is an increasing need to review the situation and look at it from a different perspective, one more amenable to substantive dialogue and a better interchange of ideas and values. It is necessary to gather “information from dispersed sources, bringing to the fore perspectives that are often overlooked and promoting exchange across disciplinary and cultural divides,”<sup>2</sup> claim the proposers of a global observatory for gene editing, Sheila Jasanoff and J. Benjamin Hurlbut. This new institution is being created to foster different perspectives and bring them into the larger discussion, where “approaches currently taken for granted can be tested and recalibrated in the light of alternative . . . perspectives.”<sup>3</sup>

Historically, we have examples of how alternative perspectives to dominant ethical theories have benefited the overall philosophical discussion of difficult issues. It is indisputable that one such effort was the “ethics of care.” The ethics of care is a feminist-oriented philosophical perspective that represents a relational and context-bound approach to morality. The perspective of the ethics of care contrasts with ethical theories that depend on principles or formulas to determine

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moral actions, such as Kantian deontology, utilitarianism, and justice theory. Also, this perspective does not intend to be absolute and incontrovertible.<sup>4,5</sup> The ethics of care has inspired various projects that applied its innovative mindset. The National Society of Genetic Counselors, for example, used an ethics of care approach to frame their Code of Ethics.<sup>6</sup>

When discussing bioethical issues today, those at the forefront of research too often look for simple and restricted frameworks to understand and evaluate these issues. This limited approach, however, comes at a cost. One example of this situation is the case of the reduction of ethical questions regarding germ line genome editing merely to physical safety, where only the technical assessment of specific biological endpoints (for instance, off-target effects) is proposed as adequate for an ethical evaluation. This perspective avoids the fundamental question of how to care for and value human life as individuals, as a society, and in relation to other forms of life.<sup>7</sup>

To address the deficiencies and gridlock in public deliberation described above, the authors of this article suggest that taking a different approach, that of Teilhard de Chardin, may help everyone engaged in the discussion about genome editing to see the current problems from a perspective that helps depolarize the discussion and facilitate substantive dialogue and the interchange of ideas and values. A comparison of the current two main perspectives regarding CRISPR technology with the approach of Teilhard will help elucidate the benefits a Teilhardian perspective could bring to the deliberations regarding the use and regulation of genome editing technology.

## **Two Main Approaches Related to Emergent Technologies of Gene Editing**

Two main approaches to the use of CRISPR/Cas genome editing can be found in the literature: enthusiasm-based and caution-based. Enthusiasm generally refers positively to the application of gene editing to agriculture, animal breeding, and biomedicine. Cautions are related to a safety-efficacy balance, unforeseen consequences, impact on the environment and biodiversity, and applications in humans. The use of these emergent techniques in human germ line and embryo research, and applications in therapeutic and nontherapeutic use, represent particularly sensitive questions for both groups. Moreover, the use of CRISPR/Cas gene editing technique for human enhancement purposes raises even greater concerns.

The contention and gridlock found in the larger gene editing discussion is reflected clearly in the debates surrounding genetically modified foods (GMO). The two different perspectives can be seen in regulatory frameworks at the international level. Although Europeans apply a mostly precautionary principle approach regarding GMOs in their jurisdictions, the approach of the United States is more permissive: unless there is evidence for harm, use is allowed. In addition, most European countries ratified the Oviedo Convention on Human Rights and Biomedicine,<sup>8</sup> which prohibits human germ line genome modification. In contrast, the National Academies of Sciences, Engineering and Medicine hosted an International Summit on Human Gene Editing in 2015 that concluded that the clinical use of germ line editing could proceed under regulatory oversight if safety and efficacy issues are solved and broad societal consensus is obtained.<sup>9</sup> Consequently, calls for the reevaluation of the Oviedo Convention's ban have intensified.<sup>10</sup>

In the literature, the enthusiasm-based approach related to CRISPR is well represented by John Harris,<sup>11</sup> who argues that CRISPR should be pursued through research until it is safe enough for use in humans. He criticizes “panic concerning,” and the “hostility and suspicion” that the new emerging genetic technologies have recently encountered. He compares the hostility to the use of CRISPR/Cas9 for editing genes in *in vitro*-fertilized zygotes, and mitochondrial replacement therapy, to the fears associated with *in vitro* fertilization and other reproductive technologies and cloning. He considers these fears as baseless since, according to him, the use of both *in vitro* fertilization and cloning has proved to be highly beneficial to humanity under effective regulation and control. Similar to Harris, Julian Savulescu et al.,<sup>12</sup> speak about the moral imperative to continue gene editing research on human embryos. At the same time, voices against gene editing of the human germ line and human embryos are raised because “genome editing in human embryos using current technologies could have unpredictable effects on future generations,” making it dangerous and ethically unacceptable, according to Edward Lanphier et al.<sup>13</sup> Many from this more cautious perspective are calling for a moratorium on such gene editing research.

In many aspects, the current debate about gene editing is an extension of the discussion about genetic engineering and human genetic modification in the past. Current CRISPR supporters and critics recall ideas of Ronald Dworkin on the one hand, and Francis Fukuyama and Jürgen Habermas on the other. Dworkin argued that “morality requires society to allow parents to genetically enhance their children so that they may have broader choices and greater chances of succeeding in life.”<sup>14</sup> In contrast, Fukuyama warned that human genetic engineering raises “the ability to change human nature” and the advancements in this field “challenge dearly held notions of human equality and the capacity for moral choice.”<sup>15</sup> Habermas wrote that eugenic interventions in the early stage of human development aiming at enhancement reduce ethical freedom of the person, “barring him from the spontaneous self-perception of being the undivided author of his own life.”<sup>16</sup>

This ongoing dispute points out the “classical” controversy between technological conservatives and technological enthusiasts regarding genetic modification. This conservatives versus enthusiasts debate has been labelled as a controversy between creatures and creators, or between those who watch the world through tragic or comic lenses. “Enthusiasts tend to emphasize that we are by nature creators and that we are true to ourselves when we use technology to transform our selves. Conservatives, on the other hand, emphasize that we are by nature creatures and that by eschewing technological self-transformation, by affirming the way we were thrown into the world, we are true to ourselves.”<sup>17</sup> As Erik Parens<sup>18</sup> interestingly notes when describing these two opposite positions, we should speak about a “gratitude” stance on the one hand and a “creativity” stance on the other, instead of using emotionally charged terms. Moreover, he suggests that both groups could move toward a more binocular thinking about these novel technologies by claiming that “nobody’s against true enhancement.”<sup>19</sup>

Extending Parens’ insight, another possible approach to addressing these two polarized positions is to focus on frameworks that try to identify and valorize what is worthy in both perspectives. Pierre Teilhard de Chardin’s philosophical-ethical ideas create a perspective able to avoid uncritical and poorly defined hopes as well as unbalanced, paralyzing fears, and, hence facilitate the integration of both the vision of the enthusiasts and the concern of the cautious to promote a path forward both sides can walk more comfortably together.

## **Pierre Teilhard de Chardin's Thought as a Path for Pursuing Gene Editing Technology**

Pierre Teilhard de Chardin never worked out a comprehensive synthesis of his ethical thought. However, as his commentator Joseph A. Grau concluded, Teilhard was concerned in his early writings about morality and "his moral concern continued to deepen, and, particularly during the last two decades of his life, came to focus with particular emphasis on the critical problems of human unification on a global scale, which he saw generating so much turmoil and confusion about him."<sup>20</sup> Thus, it is possible to retrace his reflections on morality by bringing together his different insights about moral matters in conjunction with some of the fundamental concepts of his general theory of creation. Going further, Teilhard reflects how science and technological progress can play a transformative role in human and planetary life. Indeed, he saw that transformations of humankind brought about by technological progress profoundly changed human action, and opened up new responsibilities<sup>21</sup> for employing those technologies.

### *Teilhard's Evolutionary Perspective*

Teilhard understood evolution in a different way than Charles Darwin and thought that different mechanisms operate in evolution.<sup>22</sup> The key mechanisms could only be discovered working on a macro scale. Mechanisms that are focused on the level of populations are not helpful or adequate to explain evolution at this larger scale. Instead, one needs to employ a global approach to evolution to observe the aspects that are indiscernible at the level of populations. Teilhard's definition of biology was the science of the infinitely complex. Hence, Teilhard took the difference between micro and macro evolution and connected it to the issue of complexity in biology.

Teilhard considered evolution as a *moving toward* complexity based on his scientific research (e.g., the evolution of Siphnaeidae). The evolution of the universe, matter, and life is described by a *moving towards* complexity, and in animals towards cerebralization in different branches. We can only understand his process of *moving towards* by using a holistic or systemic approach. From this perspective, harmonious or coordinate evolution is the sufficiency and preservation of natural equilibria and stability at the level of ecosystems, and it is because of connections between the ecosystems and their different species that these natural equilibria are preserved and are stable. Hence, for Teilhard, continuous evolution and stability are intrinsically interrelated.

### *Moving Towards*

From the perspective of Teilhard de Chardin, the evolutionary design of the Earth unfolds from the prelife or inorganic world to the organic world, that in its development constitutes the biosphere. Today, the concept of biosphere is widely used in environmental and ecological discussions. Teilhard de Chardin was one of the first advocates of the concept. The term was first defined by the Austrian scientist Eduard Suess in 1875. Inspired by Suess's definition, Teilhard de Chardin noted that a "frail but superactive film of highly complex, self-reproducing matter spread around the world."<sup>23</sup>

The biosphere gave rise to the noosphere. This was caused by an ongoing process of the *movement toward a complexity*. The noosphere is defined by Teilhard as “the psychically reflexive human surface.”<sup>24</sup> The noosphere is related to the human “self-conscious” type of consciousness.<sup>25</sup> Teilhard recognized the immensity of both the earth and its human inhabitants, as well as their shared origin and destiny. He proposed that the biological, societal, and cultural dimensions of evolution are interwoven as implied by his idea of the organic evolution of life that unfolds into the reflective effort of human thinking.<sup>26</sup>

The term noosphere comes from a Greek word *nous*, commonly translated as “mind” or “intellect.” For Teilhard, the noosphere represents an integrating reality and points to the “layer of mind, thought and spirit within the layer of life covering the earth.”<sup>27</sup> The noosphere is profoundly connected to the organic layers of the biosphere and represents its further development. It cannot be understood merely as a sphere of knowledge or inventiveness. Teilhard sees it as a sphere of human thought, will, love, action, and interaction and considers all these as closely interconnected. When Teilhard talks about the origin of the noosphere, he describes it as the “biological interpretation of human history.”<sup>28</sup> Furthermore, Teilhard proposed the idea that humans are the ultimate outcomes of the general laws of biosphere evolution, but with the condition that the general laws of the biosphere are linked to the preservation of equilibria.<sup>29</sup>

Teilhard de Chardin often voiced his concern for *building the Earth* and cultivating *the spirit of one Earth* that emphasizes seeing the whole world and all its people as one. He expressed this perspective of the Earth as “the passionate sense of common destiny that draws the thinking fraction of life ever further forward.”<sup>30</sup> Teilhard further expounded about “the evolution of a greater consciousness,” by which human thought “introduces a new era in the history of nature.”<sup>31</sup> He sees the Earth as a New Earth that needs to be constructed.<sup>32</sup> The construction, according to Teilhard, does not imply our rule over nature, but denotes the responsible construction of a future for humanity. Teilhard was not formally an ethicist, but according to Grau, his way of understanding moral dimensions can be labeled as a *morality of movement*.<sup>33</sup>

### *Role of Responsibility*

*Movement towards a New Earth* requires a new future-oriented ethics. Teilhard’s *ethics for the future*<sup>34</sup> is based on a hopeful and positive image of the world, and needed to be developed if there is to be a future for humankind in this world. Its main characteristic is the essential role of responsibility.<sup>35</sup> Humankind should be responsible for its own future, and this future should be developed considering all forms of life and all of nature.<sup>36</sup> Teilhard claims that with humans evolution “becomes free to dispose to itself—it can give itself or refuse itself. Not only do we read in our slightest acts the secret of its proceedings; but for an elementary part *we hold it in our hands*, responsible for its past to its future.”<sup>37</sup>

For Teilhard, freedom is a continually expanding condition that correlates with growing consciousness. Through reflection, humanity expands its freedom. At the same time, with the growing consciousness comes responsibility to take part in the expanded vision. Hence, humans need to align their actions to a purpose and goal.<sup>38</sup> If humankind wants to achieve the “higher plane of humanity,” it’s necessary to profoundly change people’s “fundamental way of valuation and action.”<sup>39</sup>

The required internal conditions are related to the authentic exercise of freedom, that is “a know-how to do” to evade traps and dead ends, and, most importantly, “a will to do,” so as not to be deterred by fears or adversity.<sup>40</sup>

Teilhard’s vision of the Earth is to build it as *mutual home* for all living beings, both human and nonhuman. This goal requires responsibility to preserve this home. The preservation of this common home means the survival of humankind as well.<sup>41</sup> Teilhard understood the world as evolutionary and becoming aware of its responsibility to direct the development of humankind toward complete fulfillment. Moreover, he claims that responsibility cannot be developed in human beings without allowing, to some extent, the development of other beings around them.<sup>42</sup> Responsibility is deeply connected to the unity of the biosphere and to universal human solidarity.

#### *Common Aspiration—Advance Human Unity*

Teilhard was worried about the future of humankind and of all life as he perceived a transformation within humankind on planet earth. He wrote that “the whole future of the Earth [...] seems to me to depend on the awakening of our faith in the future.”<sup>43</sup> Faith in the future means faith in the potential further development of human beings, faith in peace, and faith in the greater unity and collaboration among the people on a global level. Teilhard readily declared his own faith in the intellectual, moral, and spiritual development of humankind.<sup>44</sup>

Teilhard raised the question that “a profound common aspiration arising out of the very shape of the modern world—is not this specifically what is most to be desired, what we most need to offset the growing forces of dissolution and dispersal at work among us?”<sup>45</sup> Indeed, he saw the hopes and desires of people and the need for the unity of humankind as steadily growing, as well as the need for mutual help and encouragement. Teilhard described “the well-ordered integration” of the individual “with the unified group in which Mankind must eventually culminate, both organically and spiritually,” and of the “two processes of collectivization and personalization” as interdependent.<sup>46</sup>

Teilhard de Chardin talks about a new threshold in the development of human consciousness and organization. He suggests that human beings should make every effort to create a higher form of life represented by a more unified humanity instead of trying to live longer or just surviving.<sup>47</sup> “The more scientifically I regard the world, the less can I see any possible biological future for it except the active consciousness of its unity.”<sup>48</sup>

Teilhard sought the “miracle of common soul.” He saw it as a convergence and union of the diverse elements of humanity. It is impossible to accomplish this union without love and compassion, and without developing the *Spirit of Earth*, that might be understood as the openness to the presence of the Spirit. The Spirit of Earth and human unity look currently more like dreams than reality, but Teilhard felt that they were “in process of formation.”<sup>49</sup> It is “the irresistible pressure which unites people at a given moment in a passion they share.”<sup>50</sup> This pressure generates a progress towards human convergence and union through a new form of love exercised by “interlinking.” Teilhard thinks that “a superabundance of love” may be produced by the active *forward movement* of the noosphere.<sup>51</sup>

Teilhard emphasized the necessity of solidarity among peoples. “At no moment in history has man been found, as he is today, so bound, actively and passively,

in the depth of his being, to the value and perfection of everyone around him."<sup>52</sup> The person cannot be perfected without an authentic encounter with others. The human future lies in the direction of a deliberately, individually chosen, communal life.<sup>53</sup>

### *Facing Technology*

Teilhard included a role for technology in the construction of the New Earth. For him, technology is an instrument that would be used in the progress toward the future of humankind. He had a fundamentally positive, optimistic, and enthusiastic attitude to technological developments.<sup>54</sup> Spearheading the growth of the noosphere is "a systematic organization and exploration of our universe." For Teilhard, research is "the highest of human functions," and not an accessory, an eccentricity, or a danger.<sup>55</sup>

This assertion can appear to be overly optimistic and careless, considering concerns about the potential applications of modern scientific research.<sup>56</sup> However, Teilhard recognized both this potential crisis and the burden that is connected with acting in a technological age. The urgency to act grows proportionately with the increase of knowledge and power, because now people can see with more clarity what the consequences of acting or not acting are. With the power in their hands people understand that they cannot blame God, chance, or fate if this power is not directed at human flourishing.<sup>57</sup> Teilhard lamented, "Our plan as to build a *big house*, larger but similar in design to our good old dwelling places. And now we have been led by the higher logic of progress which is in us, to collect components that are too big for the use we intended to make of them."<sup>58</sup> Overall, Teilhard interpreted these various issues as a "crisis of birth," a process of moving the structure of life *to a new stage*.<sup>59</sup> In recalling the analogy of "building," Teilhard stated that research should be directed responsibly toward building the earth and enriching human life.<sup>60</sup>

### *Using Emerging Technologies in Biosphere*

Teilhard does not interpret progress as an absolute value. According to him, progress is the *movement toward* the future and preservation of life, and requires certain responsibilities.<sup>61</sup> Ludovico Galleni shows that Teilhard demands the examination of the laws of the biosphere, and its fundamental mechanisms, in order that biosphere stability may be achieved.<sup>62</sup> To continue moving towards the future, we do not need to discourage technological progress, but we should obtain the knowledge of the processes related to biosphere stability and use technology so that this stability is preserved. *Moving toward* represents openness to the future shaped, at least in part, by technological progress, but it also represents the protection of the existing stability of the biosphere.<sup>63</sup>

It appears self-evident that not all technologies are suitable to be used in the construction of the New Earth. According to Anto Čartolovni, a suitable technology for Teilhard must fulfill the following criteria: irreversibility, proportionality, and foreseeability.<sup>64</sup> However, a question arises concerning the issue: must every irreversible change be considered inherently bad? Teilhard's understanding of the importance of the stability of the biosphere provides some clarity and helps in determining which changes would be desirable. According to Teilhard, only the

irreversible changes that damage the stability of biosphere are inherently bad. Since, as mentioned previously, stability and evolution towards complexity are interrelated, one can conclude that an application of a technology could be considered unsuitable if it reduced overall biosphere or noosphere complexity or prevented its continued development. This assessment would also have to include the social conditions of humankind and, hence, the level of care for all human beings and the environment. From this perspective, Čartolovni<sup>65</sup> concludes that in the case of using CRISPR to create gene drives to remove certain species, such as malaria-spreading mosquitos, humankind would first have to obtain sufficient understanding of the potential consequences of gene drive technology before being able to decide whether or not to use it, and at the moment, we do not have that level of understanding.

### *Using Emerging Technologies in Noosphere*

Humankind continuously expands its presence over the earth, and through culture it intensifies that presence. Socialization strengthens the personal growth of individuals and acts as an incubus for the formation of a global awareness and ability to act. Globalization has expanded the capacities of human awareness and inter-relatedness in the domain of culture, and has also increased the power of human action. We have obtained complex knowledge, and with it a growing power to affect the process of evolution. The discourse is no longer about how evolution has formed us over the ages, but about what we can now do to transform the biology that took millions of years to evolve to this point in time and space. As Teilhard realized, evolution is nowadays not about where we have come from, but about where we're heading.<sup>66</sup>

### **Teilhard and the Transhumanist Movement**

According to Eric Steinhart,<sup>67</sup> Teilhard is one of the first to articulate transhumanist themes, and his thought has influenced several important transhumanists. Teilhard argues for the ethical use of technology "in order to advance humanity beyond the limitations of natural biology," including the use of both biotechnologies and intelligence technologies. In addition, he formed preliminary thoughts about other themes often found in transhumanist writings, e.g., related to the concept of a singularity in which human intelligence will become superintelligence.<sup>68</sup> However, Ilija Delio<sup>69</sup> argues that Teilhard did not seek to transcend biological limits through technology, and that he was not a forerunner to the currently promoted ideas of transhumanism. He was a scientist and visionary who saw technology as a positive step in the whole evolutionary process. However, his concept of noosphere, the next step in evolution, was perceived as a level of global consciousness that leads not to transhumanism, but to an ultrahumanism, that was instead "a deepening of human life through technologically-mediated collective consciousness."<sup>70</sup> Moreover, "the evolution of humanity is not only an evolution of consciousness; it is also a new phase of life in the universe moving toward unification of mind by which cosmic evolution progresses toward greater unity."<sup>71</sup> Teilhard indicated that ultimate knowing is love that draws together and unites in such a way that a new complexified being transcends mere individual being. Hence, integral to the noosphere is the necessity of love of others, and living for others, instead

of only for oneself. In this sense, one can easily conclude that Teilhard's thought is far different from the oft purported transhumanist goals of individual perfection and the creation of a separate posthuman techno sapiens species.

### **Novel Technologies, Responsibility, and the Goal of Human Unity**

In his writings, Teilhard focused on convergence within the noosphere and on interconnection between thinking beings. That is why some see him as the first internet and social networking visionary. It is also true that in Teilhard we do not encounter any paralyzing fear of technology. On the contrary, technology is part of his "moving toward," and is a critical part of the evolutionary process we are now holding in our hands through that technology. It is also true that Teilhard can be seen as a member of the group of "enthusiasts" or "creators," rather than belonging to the group of "cautious" or "grateful," regarding the new methods of genetic engineering. For Teilhard, the rapid development of technology does not trigger a sense of fear or anxiety for the future. On the contrary, he perceives the advance of technology as the opportunity to realize the story of the Earth, that began to be written billions of years ago, and the continuation of that story depends on our understanding of the deeper meaning of the purpose of the story.

However, for Teilhard, enthusiasm and courage in the face of technological advance is intrinsically linked to human responsibility for all human action. Moreover, evolution itself is now put into the hands of human freedom, and this makes all of humankind responsible for the future of evolutionary processes. Hence, this responsibility is for all nonliving, living, and human entities. Humans are not only essential to the development of the New Creation—humankind is responsible for it also. Thus, Teilhard can also be seen as a member of the group of "cautious" or "grateful," who consider themselves to be creatures rather than creators, pointing to the importance of restraint and careful discernment in the assessment of the new technologies of gene engineering.

For Teilhard, according to his commentators, this responsibility manifests itself in the protection of biosphere stability—and in the assessment of the proportionality, predictability, and irreversibility of applying genome editing technologies to organisms in the environment. In relation to the noosphere the issue can be more complicated, but responsibility still obliges us to carefully delineate the goals, and the means, that we pursue in using genetic editing technology on humans. The common aspiration of humankind for Teilhard is to "enhance" the unity of humankind in love and care, not the technological "enhancing" of individuals in pursuit of a singular superhuman.

### **Respecting Human Genetic Diversity**

The common aspiration of gradual human unification does not mean that the value of individuality and diversity is denied or diminished. Teilhard thought that even in a global project, diversity must be protected. He talks about diversity in terms of culture: its evolution and value. When the noosphere began to grow and develop, a new kind of evolution, where cultural attributes were passed on, was introduced by the increase and diffusion of thinking creatures. The result was a new and special form of evolution that was identified by the establishment of different cultures. This development of cultures highlights the biological unity of humankind.<sup>72</sup>

We can find a connection between the biosphere and the noosphere here. The significance of biodiversity is one of the main points of the theory of evolution of the biosphere. Stability is another key feature, according to James Lovelock's theory,<sup>73</sup> in which stability is sustained by biodiversity. This relationship means that global stability is connected to local diversity. Hence, if there are feedback links between the global and local levels that sustain overall stability, then when local diversity is rich there will be a larger number of those links and the global stability is increased. Similarly, in the noosphere, diversity produces stability. The noosphere embodies cultural diversity that needs to be preserved in order to support and increase stability.<sup>74</sup>

This preservation of cultural diversity can serve as a source of insight for the evaluation of CRISPR genetic editing applications in humans. We are to value individual diversity. This goal cannot be achieved if gene editing techniques are used to reduce the genetic diversification of the human family, either by intent or inadvertently. This reduction in diversity could happen, for instance, if there is a preference for instilling certain genetic traits in a society, or strong pressures on parental choices in the field of reproductive medicine. Obviously, genetic identity does not exhaust personal identity, but since it is fundamental to it and to both social and species health, genetic diversity should be respected in individuals and considered a source of enrichment for the society.

### Considering Common Good

What does it mean to follow Teilhard's goal of common unity in gene editing research and application? We showed how this does not mean a pursuit of "super-humanity" in the transhumanist sense. At the same time, Teilhard presents an enthusiasm for research and technological progress. The rhetoric of the common good as a common goal is often used in the context of genetic research.<sup>75</sup> The promotion of this goal refers to research progress and public health benefits. What does it mean to follow the common good and link it with an authentic Teilhardian progress in gene editing applications?

Building upon the comments of Ludovico Galleni and Francesco Scalfari,<sup>76</sup> Teilhard foresees maintaining noosphere stability as a common effort of all humankind. In one of Teilhard's last writings, collected in *The Future of Man*, he clearly posed the problem of the stability of the noosphere: "If a real power of love does not indeed arise at the earth of evolution, stronger than all individual egotisms and passions, how can the noosphere even be stabilized?"<sup>77</sup> Galleni and Scalfari try to find a parallel between the biosphere and the noosphere by exploring which ethical parameters correspond to the actual physical parameters that, at the level of the biosphere, allow for the survival of life. They conclude that these cultural and ethical parameters are in accord with the rights described in the Declaration of Human Rights of the United Nations Charter.<sup>78</sup> When these rights are fully recognized, we will then have the necessary protections for a diversity which promotes and preserves global stability. "Although difficult, this is the only way to preserve cultural diversity and its advantages for the survival of the noosphere."<sup>79</sup> Human rights are a fundamental result of the "real power of love" as articulated by Teilhard. Hence, we can conclude that human rights are pragmatic examples of the movement toward human unity, and these rights represent a common ground for pursuing both individual and common goods.

As presented above, if we want to stabilize the world of the noosphere, solidarity and care must be practiced and promoted. This goal requires a special care for marginalized people and people in need. When CRISPR technology is used, the questions of social justice will need to be addressed. Who will have access to gene editing techniques? Who will decide who has the access? How can these techniques be used for the good of all people, not only for a select few? Moreover, the question of solidarity cannot be reduced simply to the issue of access, control, and distribution. All peoples must be integrated into the decision-making processes surrounding the development and applications of genome editing technologies. Teilhard points to the importance of love and care for the maintenance of human community. Today, the concept of love is widely simplified and corrupted, despite its historically rich philosophical tradition. The challenge today is for people to recover a more traditional concept of love and see how it can be applied in a normative sense for the evaluation the use of gene editing technologies by all peoples, in particular the most vulnerable and in need.

### **Obtaining Knowledge of Complex Reality**

Teilhard encourages us to move toward the construction of the New Earth through the discovery and application of new technologies. At the same time, the criterion of responsibility must be respected and developed further. As previously presented, the maintenance of biosphere stability serves as a fundamental criterion of assessment regarding the application of novel technologies in the environment, such as the gene drive release. In referring to the global human community, Teilhard is concerned about noosphere survival and development that is indissolubly linked to the maintenance of biosphere stability and development. This linkage is a concern that he shares with Hans Jonas,<sup>80</sup> and it is about the environment as a requirement for the survival of future generations. We argued above that it is necessary to obtain a reasonable understanding of processes related to biosphere stability in order to evaluate well any genetic editing applications in the environment. It is the same situation regarding the case of noosphere stability. The problem is that the noosphere is characterized by complexity: Teilhard speaks of the progressive growth toward higher states of complexity. According to Lovelock, stability is attained as a result of diversification and the increase of complexity.<sup>81</sup> Hence, obtaining adequate understanding before genome editing applications in humans should be seen in the broader sense of understanding these complexities at the anthropological, ethical, and social levels, as well as genetic and physiological levels. Thus, a condition of sufficient understanding of CRISPR phenomena for use in humans will require the integration of knowledge from various disciplines, including philosophical, legal, social, and religious perspectives. The human reality is characterized by complexity, and we cannot afford to ignore that complexity by reducing our deliberations to scientific dimensions only.

### **Conclusion: Searching for the Dynamic-Stability Approach**

Maintenance of biosphere and noosphere stability cannot be understood in a static sense. There is a continuous moving forward within the process of biosphere and

noosphere preservation. Thus, the permanent process of *movement toward* is essential for the preservation of the stability of both the sphere of all living beings and sphere of human beings—and, at the same time, this stability is necessary for the continuous *movement toward*.

In the CRISPR debate, there is currently a call for constructive dialogue and alternative approaches. Employing different types of frameworks capable of considering both enthusiastic and cautious approaches regarding the use of gene editing is required. We believe that Teilhard de Chardin's perspective represents a valuable contribution to the effort to find inclusive frameworks. The possibility of gene editing in the living world and in humans can be seen as another step of evolution—a sign of continuous moving forward. Moreover, in the Teilhardian school of thought, a permanent movement forward is considered necessary for maintenance of the world and, indeed, the entire universe. From this perspective, technology enthusiasts can feel fully engaged in the discussion. At the same time, the process of moving toward is an intrinsic part of the natural equilibrium and stability of the Earth and the universe. Application of CRISPR technologies should respect and foster this stability. This perspective will encourage technology-cautious people to contribute much to the discussion. In the biosphere, the concept of stability can serve as a fulcrum balancing these often opposing perspectives of enthusiasm and caution. In the noosphere, the movement forward is put in the hands of humans through their freedom and responsibility for both humans and all other living forms. It is on this level of reflection that the movement forward becomes the *movement toward*, because humans act intentionally. In the context of the CRISPR debate, the crucial task will be to decide what goal(s) we are willing to pursue as individuals, as societies, and as a species when we speak about the use of gene editing. Teilhard does not provide that specific answer, not having had knowledge of this genetic technology, but he can provide a better way to think about how we might find that answer together.

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