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Passion for the Art of Morally Responsible Technology Development

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Abstract
In this article, we discuss the importance of emotions for ethical reflection on technological developments, as well as the role that art can play in this. We review literature that argues that emotions can and should play an important role in the assessment and acceptance of technological risk and in designing morally responsible technologies. We then investigate how technologically engaged *art* can contribute to critical, emotional-moral reflection on technological risks. The role of art that engages with technology is unexplored territory and gives rise to many fascinating philosophical questions that have not yet been sufficiently addressed in the literature.

1. Introduction

Technological developments concerning e.g. biotechnology, robotics and energy production are taking place at a rapid pace and can profoundly affect society, by changing our ways of life in often unpredictable ways and by introducing new and unprecedented risks. Debates about technological risks are often heated and end in stalemates, partly due to their scientific, technological and moral complexities. This requires ethical reflection and public deliberation where moral values need to be critically scrutinized. Where the predominant view is that emotions hinder such critical reflection, an alternative approach is that emotions are actually important for this, as they can point to what morally matters to people.[1]

We will first review literature that argues that emotions are crucial in deliberating about technological risk and in assessing the impact of technologies on values. After that, we will investigate how technologically engaged *art* can contribute to critical, emotional-moral reflection on technological risks. We will argue that by prompting emotions, this 'techno-art' can help to make ethical aspects of risky and controversial technologies concrete, explore new scenarios, challenge the imagination, and broaden people's viewpoints. Along the

[1] S. Roeser, *Risk, technology, and moral emotions* (New York: Routledge, 2018).

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way we give examples of artists and writers that critically engage with technologies. Furthermore, we will zoom in on the relationship between aesthetic and reflective merit of artworks, and how ethicists, artists and technology developers can learn from each other and together contribute to deliberation on morally responsible innovation.

2. Emotions, Values and Technology

Risk ethicists have argued that the potential impact of new technologies requires ethical reflection and public deliberation.[2] However, debates about the risks of novel and emerging technologies can be very intense and sometimes end in deadlocks.[3] Such developments are at least partly due to the complexities and intricacies inherent in such debates, as they involve scientific information and uncertainties,[4] as well as ethical considerations[5] and emotional responses.[6] The dominant approaches in the academic literature on risk consider emotions to be in conflict with rationality and as a threat to decision-making.[7]

[2] K.S. Shrader-Frechette, 'Risk and rationality: Philosophical foundations for populist reforms' (Berkeley, CA etc.: University of California Press, 1991); Sven Ove Hansson, 'Dimensions of Risk', *Risk Analysis* 9 (1989): 107–112; Sven Ove Hansson, 'A Panorama of the Philosophy of Risk', in Sabine Roeser, Rafaela Hillerbrand, Martin Peterson and Per Sandin (eds), *Handbook of Risk Theory* (Springer, 2012), 27–54; Sabine Roeser, 'Ethical Intuitions about Risks', *Safety Science Monitor* 11 (2007), 1–30; S. Roeser, *Risk, technology, and moral emotions* (New York: Routledge, 2018); Lotte Asveld and Sabine Roeser (eds), *The Ethics of Technological Risk* (London: Routledge / Earthscan, 2009); Sabine Roeser, Rafaela Hillerbrand, Martin Peterson and Per Sandin, *Handbook of Risk Theory* (Dordrecht: Springer, 2012).

[3] Michael Siegrist and Heinz Gutscher (eds), *Trust in Risk Management: Uncertainty and Scepticism in the Public Mind* (Routledge, 2010); Sheila Jasanoff, *Science and Public Reason* (Routledge / Earthscan, 2012).

[4] Paul Slovic, *The Perception of Risk* (London: Earthscan, 2000); Gabriele Bammer and Michael Smithson (eds), *Uncertainty and Risk: Multidisciplinary Perspectives* (Earthscan / Routledge, 2008).

[5] L. Asveld and S. Roeser (eds), *The Ethics of Technological Risk* (London: Routledge, 2009).

[6] Paul Slovic, *The Feeling of Risk* (London: Earthscan, 2010); Sabine Roeser (ed.), *Emotions and Risky Technologies* (Dordrecht: Springer, 2010).

[7] Cass R. Sunstein, *Laws of Fear* (Cambridge University Press, 2005); Cass R. Sunstein, 'Moral Heuristics and Risk' in Sabine Roeser (ed.),

However, based on cognitive theories of emotions[8] and on work on political emotions,[9] one can argue that emotions can be an important source of practical rationality and moral wisdom.[10] In what follows we will review approaches that focus on the role of emotions in the ethical assessment and responsible design and development of technology.

2a. The Role of Emotions for the Assessment and Acceptability of Technological Innovations

i. Acceptability

Technologies are typically developed because they are expected to improve our well-being. However, all technologies have possible negative side-effects or risk. Policy makers and engineers use statistical methods such as risk-cost-benefit analysis to assess technologies. However, the public does not always *accept* the results of these assessments. There are a number of factors for why a risky technology is accepted or not accepted by a group or individual. The standard view is that people oppose a technology because they are ill informed about

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Emotions and Risky Technologies (Dordrecht: Springer, 2010), 3–16; On Dual Process Theory see Daniel Kahneman, *Thinking Fast and Slow* (New York: Farrar, Straus and Giroux, 2011).

[8] N. H. Frijda, *The Emotions* (Cambridge: Cambridge University Press, 1986); R. S. Lazarus, *Emotion and Adaptation* (New York: Oxford University Press, 1991); Martha Nussbaum, *Upheavals of Thought* (Cambridge: Cambridge University Press, 2001); R. C. Roberts, *Emotions: An Essay in Aid of Moral Psychology* (Cambridge: Cambridge University Press, 2003).

[9] Cheryl Hall, *The Trouble with Passion: Political Theory Beyond the Reign of Reason* (New York: Routledge, 2005); Rebecca Kingston, *Public Passion: Rethinking the Grounds for Political Justice* (McGill-Queen's University Press, 2011); Janet Staiger, Ann Cvetkovich, Ann Reynolds (eds), *Political Emotions* (Routledge, 2010); Martha Nussbaum, *Political Emotions: Why Love Matters for Justice* (Cambridge (MA): Harvard University Press, 2013).

[10] Sabine Roeser, 'The Role of Emotions in Judging the Moral Acceptability of Risks', *Safety Science* 44 (2006): 689–700; Sabine Roeser, 'The Relation between Cognition and Affect in Moral Judgments about Risk', in Asveld and Roeser (eds), *The Ethics of Technological Risk* (London: Earthscan, 2009), 182–201; S. Roeser, 'Emotions and risky technologies' (2010); S. Roeser, *Risk, Technology, and Moral Emotions,* (London: Routledge, 2018).

its exact characteristics or because they do not understand its complexities or statistical information about it.[11] However, people may also oppose a technology because they do not trust the institutions that are in charge.[12] Furthermore, people may oppose technological innovations because important moral issues have been overlooked, for example, autonomy, available alternatives or a fair distribution of risks and benefits. The literature on risk ethics gives ample considerations to issues and criteria that are to be taken into account when it comes to assessing the moral *acceptability* of risky technologies, such as informed consent and a fair distribution of risks and benefits. However, these important ethical considerations are not included in conventional, quantitative approaches to risk.[13]

There is an important distinction to be drawn between *acceptance* and *acceptability*. Acceptance refers to the empirical issue of whether an individual or group in fact accepts a certain technology. Acceptability refers to the reasons (both moral and non-moral) and the ethical reflection on moral aspects regarding the implementation of a technology.[14] *Acceptance* and *acceptability* can come apart in that it is possible that someone accepts a technology or risk although ethical reflection reveals that it should not be accepted.[15] Also, a technology or risk may be morally acceptable but as a matter of fact somebody does not accept it.[16]

[11] Op. cit. note 7.

[12] Mark Alfano and Nicole Huijts, 'Trust and distrust in institutions and governance', in J. Simon (ed.), *Handbook of Trust and Philosophy*, (London: Routledge, *forthcoming*).

[13] Op. cit. note 2.

[14] For the acceptance/ acceptability distinction see Behnam Taebi, 'Bridging the Gap between Social Acceptance and Ethical Acceptability', *Risk Analysis 37* (2017), 1817–1827. Further, it is important to note here that in environmental psychology, the notion 'acceptability' is often used in the way that we introduced acceptance here. For example, see G. Perlaviciute, L. Steg, N. Contzen, S. Roeser, & N. Huijts, 'Emotional Responses to Energy Projects: Insights for Responsible Decision Making in a Sustainable Energy Transition', *Sustainability 10* (2018), 2526.

[15] Ibo van de Poel, 'Can we Design for Well-being?', in Philip Brey, Adam Briggle, Edward Spence (eds), *Good Life in a Technological Age* (Routledge, New York, 2012), 295–306.

[16] Further distinctions and fine-grained elaborations of concepts related to acceptance are possible. For example, one can distinguish between the subject and object of *acceptability*, where the *object of acceptability* can be either the technical design or the institutional design. The *subject of acceptability* is either the community, the market or the general public. For this distinction see R.Künneke, D. C. Mehos, R. Hillerbrand, and K. Hemmes,

Emotions can play a role in both the *acceptance* and *acceptability* of technology and the risks related to technology. It is well established that there is a link between emotions and technology *acceptance*. The *acceptance* of a technology is influenced by user experience, which in turn is affected by emotions. For example, in the case of computer anxiety, people dread the use of a computer. This dread in turn influences people's acceptance of computers. Furthermore, it has been shown that anticipated emotions influence the adoption and use of consumer products[17] and research found that emotions influence the resistance to and adoption of technology innovations of Irish dairy farmers.[18] There is also evidence that suggests that emotional attachment to an old technology prevents the acceptance and adoption of a novel technology.[19]

As for the issue of *acceptability*, there is a crucial connection between emotions and *moral acceptability*. As mentioned above, conventional risk assessment does not take into account important moral values, such as justice and autonomy.[20] As has been pointed out by emotion scholars, emotions are an important gateway to moral values.[21] This can shed important light on emotions in the context of the moral acceptability of technologies. Emotions, particularly moral emotions like sympathy, compassion and indignation, are a valuable source of insight regarding the moral considerations of people. Emotions can serve as a source of deliberation concerning

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'Understanding values embedded in offshore wind energy systems: Toward a purposeful institutional and technological design', *Environmental Science & Policy* 53 (2015), 118–29.

[17] D. Bettiga and L. Lamberti, 'Exploring the role of anticipated emotions in product adoption and usage', *Journal of Consumer Marketing* 35 (2018), 300–316.

[18] Alison Rieple and Sylvia Snijders, 'The role of emotions in the choice to adopt, or resist, innovations by Irish dairy farmers', *Journal of Business Research* 85 (2018), 23–31.

[19] W. Read, N. Robertson, L. McQuilken, 'A novel romance: The Technology Acceptance Model with emotional attachment', *Australasian Marketing Journal* 19 (2011), 223–229.

[20] L. Asveld and S. Roeser (eds), *The Ethics of Technological Risk* (London: Routledge, 2009); Sabine Roeser, Rafaela Hillerbrand, Martin Peterson and Per Sandin, *Handbook of Risk Theory* (Dordrecht: Springer, 2012).

[21] Op. cit. note 8.

the moral *acceptability* of technological risk.[22] The values and ethical concerns underlying emotions should be taken into consideration concerning whether a technology innovation is morally acceptable or not.[23] Empirical research lends supports to this view. The emotions that people have can be explained by the values that they hold.[24] For example, the emotion of fear may be an indicator that a technology infringes on well-being or another important concern that somebody has.

ii. Assessment

This relates to another area where the constructive role of emotions has been stressed, namely concerning the *assessment* of technology. Since technology can affect people's values, this requires that care is taken to incorporate stakeholder values in the assessment of a technology. To this end, public values need to be identified. This is addressed in approaches to participatory technology assessment or participatory risk assessment (*PRA*). *PRA*-approaches argue that the public should be included in the assessment of risky and controversial technologies, in order to make the process more democratic[25] and to lead to more 'responsible innovation'.[26] Responsible innovation should not be limited to the assessment of technology but should also look at institutions and stakeholder participation.[27]

[22] Sabine Roeser, 'The Role of Emotions in Judging the Moral Acceptability of Risks', *Safety Science* 44 (2006), 689–700; Sabine Roeser, Udo Pesch, 'An Emotional Deliberation Approach to Risk', *Science, Technology, & Human Values* 41 (2016), 274–297.

[23] S. Roeser, *Risk, Technology, and Moral Emotions* (New York: Routledge, 2018).

[24] Nicole M. A. Huijts, 'The emotional dimensions of energy projects: Anger, fear, joy and pride about the first hydrogen fuel station in the Netherlands', *Energy Research & Social Science* 44 (2018), 138–45.

[25] Marjolein van Asselt and Nicole Rijkens-Klomp 'A Look in the Mirror: Reflection on Participation in Integrated Assessment from a Methodological Perspective', *Global Environmental Change* 12 (2002), 167–184.

[26] Jeroen van den Hoven, Neelke Doorn, Tsjalling Siwerstra, Bert-Jaap Koops and Henny Rmijn (eds) *Responsible Innovation* (Dordrecht: Springer, 2014).

[27] B. Taebi, A. Correljé, E. Cuppen, M. Dignum, and U. Pesch, 'Responsible innovation as an endorsement of public values: the need for interdisciplinary research', *Journal of Responsible Innovation* 1 (2014), 118–124.

Given that an important part of technology assessment is to focus on the prospective impact of technology on the experience, well-being and values of people and because emotions are linked to these, emotions should play an important role in technology assessment. However, *PRA*-approaches do not explicitly acknowledge the role of emotions; that is why Roeser and Pesch propose to adapt *PRA*-approaches by including emotions.[28] This is what they call an 'emotional deliberation approach to risk' that specifically focuses on moral emotions and the ethical concerns underlying emotions. The emotional deliberation approach is a procedural approach that seeks to integrate emotions as a vital part of *PRA* and political decision-making concerning technological risk. When it comes to technology assessment, emotions should not be shunned. Rather, the emotional responses of people and the values and concerns that are underlying emotions should be a component of deliberation and political decision-making regarding technology.[29]

After having introduced the role of emotions in the context of technology acceptance, acceptability and assessment, we will now turn to value sensitive design.

2b. The Role of Emotions for Value Sensitive Design

The approach that has the most explicit focus on the relationship between values and technology is *value sensitive design* (*VSD*, alternatively also called 'design for values').[30] *VSD* is based on the idea that technology is not value neutral and that design decisions can either foster values or have a negative impact on them.[31] Taking this potential impact of technology on values seriously, *VSD* seeks to actively integrate values throughout all stages of the design process. Values,

[28] Sabine Roeser and Udo Pesch (2016), 'An Emotional Deliberation Approach to Risk', *Science, Technology and Human Values* 41: 274–297.

[29] Op. cit. note 1.

[30] J. van den Hoven 'ICT and value sensitive design', in P. Goujon, S. Lavelle, P. Duquenoy, K. Kimppa, and V. Laurent (eds), *The Information Society: Innovation, Legitimacy, Ethics and Democracy* (Boston: Springer, 2007); Jeroen van den Hoven, Pieter E. Vermaas, Ibo van de Poel (eds), *Handbook of Ethics, Values, and Technological Design: Sources, Theory, Values and Application Domains*, (Springer Netherlands, Dordrecht, 2015).

[31] B. Friedman, 'Value sensitive design', in W. S. Bainbridge (ed.), *Encyclopedia of Human Computer Interaction* (Berkshire: Great Barrington, 2004), 769–774.

according to proponents of *VSD*, are not something that stands apart from design but should be an integral part of technological research and design.[32]

In order to fulfill the promise to intentionally design values into technology, *VSD* deploys a particular methodology, involving conceptual, empirical and technical investigations.[33] These three components are not independent of each other, rather, they are interrelated. The three components have been described as follows. The first component, conceptual analysis, seeks to identify the crucial values in the design context at hand. Furthermore, it identifies the relevant stakeholders and the people that are most likely to be affected by the design. Empirical investigation, the second component, addresses how the stakeholders assess and experience the technology. A host of methods can be used for the empirical investigation, like interviews, focus groups, or surveys. The goal here is to find out how the design of the technology affects the values that stakeholders have. Last, but not least, the third component of the methodology of VSD, i.e., technological investigation, incorporates the results of the two other stages in the design of the technology, and those stages in turn also draw on the technological investigations. So, in a nutshell, VSD tries to identify, anticipate, and address ethical and social issues in the design of a technology. The goal is to guide the development of transformative innovations into a future that is desirable for all stakeholders and affected parties, thereby contributing to 'responsible innovation'.[34] Furthermore, the approach can help to identify possible value conflicts. Value conflicts can occur between

[32] It needs to be noted here that what values are is subject to debate and that *VSD* has been criticized for not having a developed notion of value. For this critique see Noëmi Manders-Huits, 'What Values in Design? The Challenge of Incorporating Moral Values into Design', *Science and Engineering Ethics* 17 (2011), 271–287. Suffice it to say here that values in *VSD* are commonly taken to mean things that people consider important to their live. For the notion of value in VSD see Mary L. Cummings, 'Integrating ethics in design through the value-sensitive design approach', *Science and Engineering Ethics* 12 (2006), 701–15.

[33] For the methods of VSD see B. Friedman, P.H. Kahn Jr, A. Borning, 'Value sensitive design and information systems', in P. Zhang, D. Galletta (eds), *Human-Computer Interaction in Management Information Systems: Foundations* (Armonk: M.E. Sharpe, 2006), 348–372, and also B. Friedman, P. Kahn and A. Borning, 'Value Sensitive Design: Theory and Methods', *UW Computer Science and Engineering Technical Report* (2002).

[34] J. Van den Hoven, 'Value Sensitive Design and Responsible Innovation', in R. Owen, J. Bessant and M. Heintz (eds), *Responsible*

people, who may prioritize different values, such as biospheric or hedonic values.[35] However, value conflicts can also occur within a technology, for example when a possible trade-off between safety, security, sustainability and affordability is required. *VSD* and responsible innovation approaches emphasize that such apparent value trade-offs may be overcome by innovative design solutions that optimize the initially conflicting values.[36]

Values are evidently very important for *VSD*. Given that emotions are a gateway to people's values, concerns and to what is important in their lives, it is more than sensible that *VSD* should include in its tool kit the investigation of emotions and their connection to technology. That is, technology should be designed with an understanding of human emotions. For one, it is undeniable that technology can influence people's emotions and that emotions are an important part of the user experience of technology. Emotions 'can facilitate and stimulate but also discourage or obstruct technology usage, they can, do, and should play an important role in the process of developing technology'.[37] For example, the designer can influence the pleasure of the user experience by triggering certain emotions during technology use.[38] Furthermore, the well-being of the user can be facilitated via emotional experience during use.[39] However, although use is of course an important aspect of technology, it needs to be pointed

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Innovation: Managing the Responsible Emergence of Science and Innovation in Society (Hoboken: Wiley 2013).

[35] G. Perlaviciute, L. Steg, N. Contzen, S. Roeser and N. Huijts, 'Emotional Responses to Energy Projects: Insights for Responsible Decision Making in a Sustainable Energy Transition', *Sustainability* 10 (2018), 2526.

[36] Ibo Van de Poel, 'Conflicting Values in Design for Values' in Jeroen van den Hoven, Pieter E. Vermaas, Ibo van de Poel (eds), *Handbook of Ethics, Values, and Technological Design: Sources, Theory, Values and Application Domains* (Dordrecht: Springer, 2015), 89–116.

[37] P. M. A. Desmet, and S. Roeser, 'Emotions in Design for Values', in J. van den Hoven, P. E. Vermaas, I. van de Poel (eds), *Handbook of Ethics, Values, and Technological Design*, (Dordrecht: Springer Netherlands, 2015), 208.

[38] Steven Fokkinga, Pieter Desmet, 'Darker Shades of Joy: The Role of Negative Emotion in Rich Product Experiences', *Design Issues* 28 (2012), 42–56.

[39] Deger Ozkaramanli, Pieter Desmet, 'I know I shouldn't, yet I did it again! Emotion-driven design as a means to subjective wellbeing', *International Journal of Design* 6 (2012), 27–39.

out that emotions can be evoked by merely perceiving the design of the technology or by the social implications that the technology may have.[40] Because emotions indicate the personal and moral values that users (or perceivers) have, design for values should take emotions into consideration.

Besides paying attention to the emotions of users of technology, it is also worthwhile to consider the emotions of engineers, who are the designers and developers of technology. Again, because emotions are a source of insight into values, the emotions that engineers and designers have, are indicative of the values that they hold.[41] So, paying attention to the emotions of engineers and designers can help to make explicit the values that otherwise may unwittingly influence the decision-making, knowledge acquisition and problem solving of designers. There has been little attention so far to the emotions of designers and their role in the design process. However, recently, proposals and frameworks to investigate the role of designer's emotions have been proposed.[42]

Emotions are an unavoidable part of engineering. Davis points out that emotions can make positive contributions and should have a prominent place in engineering. Emotions, like care or fear, are, at least partly, constitutive of what makes a good engineer. A good engineer, for example, should experience positive and negative emotions in the face of good and bad engineering, respectively.[43] Besides these constitutive emotions there are other emotions, according to Davis, that are good for engineers to have on particular occasions. He gives the example of anger concerning a management decision to override the engineer's judgment. According to Davis, the emotions of engineers should also play a role in managerial decision-making, in that

[40] Pieter Desmet, 'Faces of Product Pleasure: 25 Positive Emotions in Human-Product Interactions', *International Journal of Design* 6 (2012), 1–29.

[41] Sabine Roeser, 'Emotional Engineers: Toward Morally Responsible Engineering', *Science and Engineering Ethics* 18:1 (2012), 103–115.

[42] Alisa Hutchinson and Monica Tracey, 'Designers' own emotions and the practice of designing: a literature review and preliminary research agenda', *Journal of Design Research* 15 (2017), 197; Monica Biagioli, Silvia Grimaldi and Hena Ali, 'Designer's emotions in the design process', in *Design Research Society 2018: Catalyst*, 25–28 (June 2018, Limerick, Ireland).

[43] M. Davis, 'In Praise of Emotion in Engineering', in D. P. Michelfelder, B. Newberry, Q. Zhu (eds), *Philosophy and Engineering* (Cham: Springer International Publishing, 2017), 181–94.

> 'the engineer's anger would in fact help management appreciate the weight that the engineer's judgment itself deserves. All else being equal, the more serious the affront to his standards of engineering, the angrier the engineer should be ('should' here including both explanation and justification). The more serious the affront, the less likely, all else being equal, that management's reasons for overriding the engineer's judgment are adequate.'[44]

To conclude this section, we have outlined some approaches that take the connection between emotion, value and technology seriously when it comes to acceptability, design, engineering, technology assessment and participatory deliberation. More importantly, these approaches and frameworks emphasize that emotions *can* and *should* play a role, as they are an important gateway to values in the context of technology development, leading to more responsible innovations. We will now turn to the connection of art and the role that it could play in emotion-based reflection on morally responsible innovation.

3. A Role of Art for Morally Responsible Technology Development?

Although emotions are indicative of values and can play a constructive role, emotions can also be biased. Moral emotions can play a corrective role here. Moral emotions such as shame, guilt and feelings of responsibility can help us to critically reflect upon and revise our initial emotions[45]. Yet, it can be difficult to transcend one's own emotional-moral perspective. Emotions and moral views are shaped by the environment and culture in which people are raised. Emotions and moral views are often grounded in people's core values,[46] which can make critical self-reflection and public deliberation

[44] Op. cit. note 10, 190.

[45] Sabine Roeser, 'Intuitions, Emotions and Gut Feelings in Decisions about Risks: Towards a Different Interpretation of "Neuroethics"', *The Journal of Risk Research* 13 (2010), 175–190; Sabine Roeser, 'Emotional Reflection about Risks', in S. Roeser (ed.) *Emotions and Risky Technologies* (Springer, 2010), 231–244; Sabine Roeser, *Moral Emotions and Intuitions* (Basingstoke: Palgrave Macmillan, 2011).

[46] Dan Kahan, 'Cultural Cognition as a Conception of the Cultural Theory of Risk', in Sabine Roeser, Rafaela Hillerbrand, Martin Peterson and Per Sandin (eds) *Handbook of Risk Theory* (Dordrecht: Springer, 2012), 725–759; J.D. Greene, *Moral Tribes* (New York: Penguin, 2013);

difficult. This calls for novel approaches that help to overcome such obstacles in the deliberation and reflection of risky technologies. In the following sections, we will explore the role that *art* might play in this.

Philosophers have argued that art can contribute to moral reflection[47] and to politics.[48] Art can provide meaning to our experiences via emotions.[49] Furthermore, art can help us transcend our given emotional-moral perspective by appealing to our imagination and compassion. These insights give rise to the question as to whether art can meaningfully contribute to emotional-moral reflection, public deliberation and decision-making about technological risks. We will discuss this in what follows.

Artists and writers have become increasingly interested in technological developments. This is what we call 'techno-art': visual art (broadly conceived) and literature that reflect on and engage with different kinds of technologies and their promises as well as their potentially risky and controversial aspects, typically by involving emotional responses of the audience. These artworks can be based on more conventional art forms such as painting, sculpture, installations, conceptual art, and performance art, but works of techno-art often also use new technologies such as biotechnology, new media

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Jonathan Haidt, *The Righteous Mind: Why Good People Are Divided by Politics and Religion* (New York: Vintage Books, 2012).

[47] Jerrold Levinson (ed.), *Aesthetics and Ethics: Essays at the Intersection* (Cambridge: Cambridge University Press, 1998); Noel Carroll, *Beyond Aesthetics: Philosophical Essays* (Cambridge: Cambridge University Press, 2001); Martha Nussbaum, *Upheavals of Thought* (Cambridge: Cambridge University Press, 2001); Berys Gaut, *Art, Emotion and Ethics* (Oxford University Press, 2007); José Luis Bermúdez and Sebastian Gardner (eds), *Art and Morality* (London: Routledge, 2006).

[48] Theodor Adorno, Walter Benjamin, Ernst Bloch, Bertold Brecht, Georg Lukacs, *Aesthetics and Politics* (New York: Verso, 1980); Richard Rorty, *Irony, Contingency, and Solidarity* (Cambridge: Cambridge University Press, 1989); Boris Groys, *Art Power* (Cambridge MA: MIT Press, 2008); Roland Bleiker, *Aesthetics and World Politics* (Basingstoke: Palgrave Macmillan, 2009); Rebecca Kingston, *Public Passion: Rethinking the Grounds for Political Justice* (McGill-Queen's University Press, 2011); Nikolas Kompridis (ed.), *The Aesthetic Turn in Political Thought* (London: Bloomsbury Academic, 2014); Paul Macneill (ed.), *Ethics and the Arts* (Dordrecht: Springer, 2014).

[49] Scott Slovic and Paul Slovic (eds) *Numbers and Nerves: Information, Emotion, and Meaning in a World of Data* (Corvallis, Oregon: Oregon State University Press, 2015).

or robotics.[50] We refer to these various art-forms as 'visual techno-art'. Another major category of techno-art is what we call 'techno-literature': e.g., science fiction, climate literature and environmental literature that engage with the societal impact of technological developments.

There have always been visual artists and writers who engaged with science and technology, by, for example experimenting with photography, film, and installations using new media. However, merely engaging with science and technology in some form or other is not enough to make someone a techno-artist. Otherwise, almost all artists would be techno-artists. Indeed, someone might argue that all art is techno-art. For example, Alva Noë argues that all art is a way to disclose to us how we use technology and techniques to organize ourselves[51]. However, as stated in our rough characterization above, we mean to restrict the notion of techno-art to artworks that reflect on and engage with technologies and their promises as well as their potentially risky and controversial aspects. Hence, what makes someone a techno-artist is the more or less explicit intent to trigger critical thoughts regarding technology in the audience.

Here are some classic examples of what we mean by techno-art: novels such as *Frankenstein, Brave New World* and *1984* explore the risky potential of new technologies. Science fiction is a well-established genre in literature (as well as film) that articulates utopian as well as dystopian views of technology and its possible impacts on society. These novels stimulate ethical refection, also by appealing to people's emotions. In the fine arts, in the 20th century there were movements such as futurism, environmental art, and video art. Recently, there are more and more artists and writers who critically engage with different kinds of technologies, as we will illustrate with several examples related to three main domains of technology, namely 1. robotics, AI (artificial intelligence) and ICT (information and communication technology), 2. biotechnology, and 3. energy, climate and environmental technologies. In what follows we will

[50] For extensive overviews see: Ingeborg Reichle, *Art in the Age of Technoscience: Genetic Engineering, Robotics, and Artificial Life in Contemporary Art* (Vienna, New York: Springer, 2009); Stephen Wilson, *Art + Science Now: How scientific research and technological innovation are becoming key to 21st-century aesthetics* (London: Thames and Hudson, 2010); William Myers, *Bio Art: Altered Realities* (London: Thames and Hudson, 2015).

[51] Alva Noë, *Strange Tools: Art and Human Nature* (New York: Hill and Wang, 2015).

highlight paradigmatic moral complexities of these different technological domains, and how artworks may help to reflect on these.

Robotics, AI and ICT are technologies that are deeply ingrained in our contemporary societies, and specifically ICTs such as computers and smartphones are endorsed by many people due to their many conveniences. However, ICTs can also lead to massive privacy intrusions as well as to biased public debates and lopsided political decision-making, such as in the case of the recent Facebook-Cambridge Analytica-scandal. Increased automatization may change our labor markets for good, by making large parts of society obsolete on the work floor. There are concerns about artificial intelligences getting out of control and eventually taking over from humans.[52]

Artists who work with artificial intelligence, robotics and AI can play an important role in critical reflection on what it would mean for artificial intelligence to be beneficial, by exploring possibilities before they are introduced in society, but in more accessible and real-life settings than in the lab of scientists. For example, the novel *The Circle* by Dave Eggers explores the meaning and possible societal consequences of social media. There are important festivals devoted to electronic and multimedia art, e.g., the annual Ars Electronica Festival in Linz and the Transmediale in Berlin. Working on the intersection of bio-art, robotics-art and ICT-art, in 2007, performance artist Stelarc experimented with his own body by attaching a third ear to his arm by surgery and cell-cultivation, partially using his own stem cells. Stelarc explores the possibilities of stem cell research and enhancement in a way that goes beyond the ways in which contemporary scientists usually approach such developments. He does it in an imaginative, playful and provocative way, exploring the technological and scientific possibilities and their legal and ethical boundaries.[53]

Biotechnology involves genetic modification and synthetic biology. It can offer solutions to pressing societal problems, such as in medicine and agriculture, but it can also introduce new moral problems.[54]

[52] Future of Life Institute (2015) 'Research Priorities for Robust and beneficial artificial intelligence' http://futureoflife.org/ai-open-letter/

[53] A collection of essays on Stelarc can be found in Zylinska, Joanna (ed.), *The Cyborg Experiments: The Extensions of the Body in the Media Age* (Continuum, 2002).

[54] Ruth Mampuys and Sabine Roeser, 'Risk Considerations in Using GMO Viruses as Medicine; a conflict of emotions?' *Journal of Disaster Research* 6 (2011), 514–521.

The effects of biotechnology are hard to predict, which also makes ethical reflection difficult.

Bio-artists play with these ambiguities, uncertainties and uneasy feelings by developing artworks via biotechnology and by examining the boundaries between life and technology. For example, prominent novelists like Michel Houellebecq and Kazuo Ishiguro explore the ethical implications of human cloning and genetic selection. Bio-artists Adam Zaretsky and Eduardo Kac experiment with genetic modification, investigating legal and ethical boundaries. Other examples of contemporary bio-artists are Anna Dimitriu, Jalila Essaidi, and Patricia Piccinini. Piccinini has created sculptures of human-animal hybrids that give rise to mixed emotions, described by one scholar as 'monstrous cute',[55] indicating the ambiguous moral status of such creatures and giving rise to questions concerning our moral responsibility towards them.

Energy, climate and environmental technologies: Most large-scale energy technologies are controversial. CO2 producing energy sources such as coal and natural gas contribute to climate change. Renewable energy sources have an impact on the landscape, such as wind parks and solar panels. In the case of nuclear energy, the greatest worry concerns the risk of a meltdown which can lead to large-scale consequences, which provides for intense public and ethical concerns. Nevertheless, nuclear energy might be necessary if we are not willing to reduce our energy consumption. In that case, however, nuclear waste gives rise to additional pressing ethical concerns, specifically related to inter- and intragenerational justice.[56]

Artists can and already do make interesting contributions to explore these pressing ethical dilemmas. For example, there are nuclear artists, such as William Verstraeten, who designed the bright orange exterior of the building of the Dutch nuclear waste facility COVRA. He also created artworks for the interior of the building in which he explores the ambiguous interrelationships between the facility and its surrounding nature. In the US there is a competition for artists to design warning signs about nuclear waste for people who will live thousands of years after us.

[55] Anitra Goriss-Hunter, 'Slippery Mutants Perform and Wink at Maternal Insurrections: Patricia Piccinini's Monstrous Cute', *Continuum: Journal of Media & Cultural Studies* 18 (2004): 541–553.

[56] For more on this issue see the contributions in Behnam Taebi and Sabine Roeser (eds), *The Ethics of Nuclear Energy* (Cambridge University Press, 2015).

Climate science involves a lot of uncertainty. Furthermore, effects of climate change are subtle and can therefore be easily ignored. Climate engineering or geoengineering can play a role in mitigating and adapting to climate change. However, it also evokes ethical questions, for example, whether it is merely a technological fix where behavior change is required, and because it can also introduce new disadvantages, by having impact on our environment. In any case, responding to climate change requires more thorough awareness of the problems as well as societal and personal contributions.

Works of art can play a crucial role here. For example, Catherine Mobley and colleagues studied the impact of environmental literature on environmentally responsible behavior.[57] Furthermore, art can help to make climate change more salient and probe people to take actions,[58] and to let people critically reflect on the possible role of for example climate engineering. There are climate artists, such as David Buckland. The Stedelijk Museum Amsterdam recently featured a much-discussed exhibit 'Coded Nature' by Studio Drift, an artistic duo that engages in their installations with various technological developments and their impact on our perception of nature and the environment and on our self-understanding. There are new literary genres such as climate change literature and environmental literature, and there are specialized academic journals devoted to the study of these new genres. Several mainstream writers address climate change and humanities' impact on the environment in their work, such as Cormac McCarthy, Lauren Groff and Frank Schätzing. Recently, leading novelist Amitav Gosh has argued that more writers should engage with climate change, as it is one of the most pressing problems of our times, and writers can uniquely contribute to bringing these largely abstract and long-term developments closer to people's awareness, by creating narratives that appeal to our imagination.[59]

Hence, works of techno-art explore ambiguities, paradoxes and complex moral questions, thereby prompting awareness and critical

[57] Catherine Mobley, Wade Vagias, and Sarah DeWard, 'Exploring Additional Determinants of Environmentally Responsible Behavior: The Influence of Environmental Literature and Environmental Attitudes', *Environment and Behavior* 42 (2010): 420–447.

[58] Sabine Roeser (2012), 'Risk Communication, Public Engagement, and Climate Change: A Role for Emotions', Risk Analysis 32, 1033–1040

[59] Amitav Ghosh, *The Great Derangement: Climate Change and the Unthinkable* (Chicago: University of Chicago Press, 2016).

reflection.[60] Artists can explore the ultimate implications of technologies in works of art that go beyond what is at that point common practice. Images and narratives provided by artists and writers can affect people's emotions and risk perceptions and in that way have impact on public discourse and decision-making.[61] Artworks can make a powerful contribution to critical thinking about technology.[62] These artworks and novels can help people to make abstract problems concrete, explore new scenarios, challenge their imaginations, and broaden their personal perspectives through empathy, sympathy and compassion. Techno-art can contribute to emotional-moral reflection and public debates about the kind of society we might want to live in. However, despite this possible contribution to ethical reflection, techno-art has until now hardly been studied by philosophers.[63] As we will discuss in the next section, besides its promises,

[60] Robert Zwijnenberg, 'Biotechnology, Human Dignity and the Importance of Art', *Teoria: Revista di Filosofia* (2014), 131–148; Ingeborg Reichle, *Art in the Age of Technoscience: Genetic Engineering, Robotics, and Artificial Life in Contemporary Art* (Vienna, New York: Springer, 2009); George Gessert, 'Notes on the Art of Plant Breeding', in *L'Art Biotech Catalogue* (exhibition catalog, Nantes: Le Lieu Unique, 2003), 47.

[61] Susanne Sleenhoff, 'The Potential of 2.6g 329m/s for Public Engagement with Safety through Biotechnology', in Jalila Essaidi (ed.) *Bulletproof skin; Exploring Boundaries by Piercing Barriers* (Edition: 9789081995702, Publisher: Jalila Essaidi, 2012), 72–79.

[62] Sabine Roeser, Veronica Alfano & Caroline Nevejan, 'The Role of Art in Emotional-Moral Reflection on Risky and Controversial Technologies: The Case of BNCI', *Ethical Theory and Moral Practice* 21 (2018): 275–289; Sabine Roeser 'Socially extended moral deliberation about risks: a role for emotions and art', in J. Adam Carter, Andy Clark, Jesper Kallestrup, S. Orestis Palermos, and Duncan Pritchard, *Socially Extended Epistemology* (Oxford: Oxford University, Press 2018).

[63] One of the few philosophers who have published on these topics is Robert Zwijnenberg (cf. Zwijnenberg, R., 'Preface', in Reichle, Ingeborg (2009), *Art in the Age of Technoscience: Genetic Engineering, Robotics, and Artificial Life in Contemporary Art* (Vienna, New York: Springer, 2009), xiii–xxix. Scholars from other disciplines such as cultural studies and media studies have published on what we call 'techno-art', but as we argue here, this topic also requires philosophical research. These are some relevant publications from other disciplines: Da Costa, Beatriz and Kavita Philip (eds), *Tactical Biopolitics: Art, Activism, and Technoscience* (Cambridge (MA): The MIT Press, 2008); Sian Ede, (ed.), *Strange and Charmed. Science and the Contemporary Visual Arts*, preface by A.S. Byatt (London: Calouste Gulbenkian Foundation, 2000); Antonia Mehnert, *Climate Change Fictions* (Basingstoke: Palgrave Macmillan, 2016); Anna

techno-art also introduces new challenges which also deserve further philosophical investigations.

4. Challenges for Techno-Art

As discussed in the previous section, techno-art can contribute to an open dialogue by enhancing critical emotional-moral reflection, and in that way it can provide new insights into moral aspects of risks that get overlooked in conventional approaches. At the same time, there are various important issues that need to be investigated. How can techno-art contribute to emotional-moral reflection on technological risks as compared to more abstract ethical reflection? How can techno-art contribute to engaging different stakeholders in deliberation on risky technologies? How can techno-art appeal to emotions and contribute to public debates without being exploited for instrumental, commercial or strategic purposes? What is the relationship between aesthetic, affective and reflective aspects of artworks? All these questions are unexplored territory and deserve further investigation, as we will point out in what follows.

Works of art usually have a different purpose than images, objects and texts that we make use of in our daily lives as well as those provided by marketing and communication specialists. Our mundane pictures and texts primarily serve a practical purpose, such as conveying information. In contrast, there is a distance or detachment between art and our familiar practical background and everyday concerns. What's more, art problematizes this familiar background. Artworks invite us to reflect on our practical and functional relation with the world.

How does art, and techno-art specifically, achieve this critical reflection? It is uncontroversial that there is a crucial connection between emotion and art.[64] Furthermore, there is also an important link between the affective and reflective aspects of art. Art can

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Munster, *An Aesthesia of Networks: Conjunctive Experience in Art and Technology* (Cambridge MA: MIT Press, 2013); John C. Weichman (ed.), *The Aesthetics of Risk* (Zurich: JRP|Ringier books, 2008); Stephen Wilson, *Information Arts: Intersections of Art, Science, and Technology* (Cambridge MA: MIT Press, 2002).

[64] Martha Nussbaum, *Upheavals of Thought* (Cambridge: Cambridge University, 2001); Berys Gaut, *Art, Emotion and Ethics* (Oxford University Press, 2007).

induce positive and negative emotions like awe, dread, fear, joy and being moved. All of these emotions are rooted in concerns and values that people have. However, merely experiencing emotions does not seem to be enough for critical reflection. What seems to be required is that the audience examines these emotions vis-à-vis art and what moral issues these emotions hint at. Works of art can entice critical reflection by engaging us emotionally. In triggering emotions, techno-art may contribute to a reflective exploration of issues and ideas related to technology. However, there are numerous issues that need to be addressed by future research. One question is what makes an emotion a reflective emotion. Are there emotions that are more reflective than others; and if so, on account of what? For example, according to the broaden-and-built theory of positive emotions, positive emotions such as joy and interest broaden the mindset of individuals, which leads to exploration and discovery of new and creative actions and ideas.[65] According to the broaden-and-built theory, this cannot be achieved by negative emotions. Rather, negative emotions 'close' our mindset. Nevertheless, at least in the context of art (and specifically techno-art), it seems plausible that negative emotions can also trigger reflection, such as anger or disgust, or emotions that do not have a clear valence, such as puzzlement. For example, emotions such as horror or disgust could potentially inform our ethical intuitions, e.g., the disgust evoked by the sculptures by Patricia Piccinini could be a signal of the unclear moral status of human-animal hybrids.

Nevertheless, techno-art could make counter-productive contributions to the public debate, by, intentionally or unintentionally, introducing or reinforcing biased opinions. It probably depends on the specific setting whether deliberation is stimulated or suppressed, which underscores the role of makers of for example techno-art exhibitions and festivals for this. These are issues that deserve further empirical and philosophical investigation.

Furthermore, not all art emotionally engages the audience in the same degree. Some works of art clearly trigger emotions but for others there may not be much in the way of affect. For example, looking at the highly stylized, abstract works of Mondrian or at conceptual artworks, one may not feel very emotionally engaged. The engagement may be more 'cerebral' here. Then again, maybe one could make the case that good art, i.e., art that disrupts our common way of

[65] Barbara L. Fredrickson, 'The broaden-and-build theory of positive emotions', *Philosophical Transactions of the Royal Society B: Biological Sciences* 359 (2004), 1367–77.

doing and thinking, triggers at least always one emotion: curiosity. Curiosity is an emotional-motivational state that prompts us to further engage with something in order to explore and acquire new information.[66] So, in prompting curiosity, techno-art can contribute to the exploration and reflection of technology because it typically presents us with a perspective on new technological developments.

It needs to be stressed that the audience has to play an active role in the appreciation of art. Art can only unfold its full (critical) potential if the audience actively engages with it. Put differently, art needs to be interrogated; simply (passively) registering it won't do the trick. Two components are crucial for the unfolding of the critical potential of art: First, the artwork needs to be such that it triggers the urge for engagement in the audience. As Alva Noë has succinctly put it: 'Every work of art […] challenges you to see it, or to get it'[67] This formulation 'to get it' should not be understood as solving a puzzle or riddle that has a unique, correct solution. Reflection and artistic meaning is much richer and more ambiguous than that. Indeed, Noë argues that art is special in the sense that you do not immediately 'get' it, rather, art invites you to reflect further. Second, the audience needs to be willing or ready to undertake an engagement with art, which can be cognitively demanding and time consuming. Often when people want to understand a work of art they ask: 'What does the artist want to tell us?' and 'What is the artist's intention?' This seems to be a straightforward and legitimate question. After all, most (but not all) artworks are intentionally created artifacts and people make sense of other people and also the human-made world by appealing to mental states like intentions.[68] Nevertheless, appealing to the intentions of the creator or designer does not seem to exhaust the meaning and value of works of art. The appreciation and understanding of works of art need not be concerned *exclusively* with uncovering intended meaning; meaning and other artistic features are not exclusively grounded in the intention of the artist.[69]

[66] Jordan Litman, 'Curiosity and the pleasures of learning: Wanting and liking new information', *Cognition and Emotion* 19 (2005), 793–814.

[67] Alva Noë, *Strange Tools: Art and Human Nature* (New York: Hill and Wang, 2015), 102.

[68] For more on intentions in the interpretation of (technological) artifacts and the so-called design stance see P. Vermaas, M. Carrara, S. Borgo and P. Garbacz, 'The design stance and its artefacts', *Synthese* 190 (2013), 1131–1152.

[69] Stephen Davies, 'Artists' intentions and artwork meanings: Some complications', *Behavioral and Brain Sciences* 36 (2013), 138–39; Paisley Livingston, *Art and Intention: A Philosophical Study* (New York: Oxford

This gives rise to another issue, namely concerning the relationship between artistic merit and reflective or critical merit of works of techno-art. Artworks that contribute to critical debates might have less artistic merit.[70] A further complication is how to assess aesthetic, reflective and affective aspects of works of techno-art. The possible relationships between aesthetic, artistic and reflective merits of works of techno-art need to be scrutinized by conceptual philosophical analysis. Is critical merit part of the artistic value of an artwork? Let us expand on this a little here. It is customary in philosophical aesthetics to distinguish artistic value and aesthetic value.[71] Aesthetic values comprise beauty, harmony, balance and elegance, whereas artistic value is the aggregate of aesthetic value, cognitive value and historic value of a work of art.[72] Artistic value is broader than but includes aesthetic value. A strong case can be made that having critical/reflective merit is a cognitive value in certain works of art, which contributes to the overall artistic value. Matthew Kieran argues that the cognitive content of a work of art is relevant to its value as art 'when the work tries via artistic means to convey insight or get us to understand states of affairs'.[73] Accordingly, the cognitive value of techno-art plays an important role in how strong the work of art fosters critical reflection of technology. However, one thing that needs to be scrutinized, also when it comes to techno-art, is whether one can actually separate aesthetic merit and critical/reflective merit. Arguably, the aesthetic aspect of an artwork can make an additional contribution to the reflective potential of the artwork, by provoking insights and providing a depth of understanding that

University Press, 2005); Jane P. Tompkins, (ed.), *Reader-response Criticism: From Formalism to Post-structuralism* (Johns Hopkins University Press, 1980).

[70] Ingeborg Reichle, *Art in the Age of Technoscience: Genetic Engineering, Robotics, and Artificial Life in Contemporary Art* (Vienna, New York: Springer, 2009), 2.

[71] Louise Hanson, 'The Reality of (Non-Aesthetic) Artistic Value', *The Philosophical Quarterly* 63 (2013), 492–508; Dominic M. Lopes, 'The Myth of (Non-aesthetic) Artistic Value', *The Philosophical Quarterly* 61 (2011), 518–36.

[72] A. Sauchelli, 'Aesthetic Value, Artistic Value, and Morality', in D. Coady, K. Brownlee, K. Lipper-Rasmussen (eds), *Blackwell Companion to Applied Philosophy* (Malden, Oxford: Blackwell, 2016), 514–526.

[73] Mathew Kieran, 'Art, Morality and Ethics: On the (Im)Moral Character of Art Works and Inter-Relations to Artistic Value', *Philosophy Compass* 1 (2006), 129–43.

would not have been achieved in the same way by, for example, a merely propositional argument. For example, using unbalanced or disharmonious elements may enhance the urge to inspect and make sense of the piece. In the case of techno-art, the visceral nature of an artwork can make a much stronger appeal to ethical reflection than an abstract ethical argumentation.

However, art that engages with science and technology might be merely aesthetically pleasing and be used for science dissemination and to create support for a specific technology, instead of contributing to a critical public debate.[74] This points to a possible dilemma. On the one hand, artists need the freedom and independence to critically and reflectively engage with a risky technology in order to use their imaginative capacities that, in turn, can provide others with unique ways to engage in emotional-moral reflection on risky technologies. On the other hand, if techno-artists wish to make their work relevant for public debates and let it connect with technological developments, they might want to collaborate with technology developers, scientists, and policy makers and opt for formats that make their art more accessible to the public.

A possible way to address this could be by what we propose to call 'artistic parallel research', analogous to so-called 'ethical parallel research'. Ethical parallel research means that ethicists collaborate with engineering scholars, by reflecting on ethical aspects of technological innovations in an iterative and mutually engaged way.[75] This model could also be used in the case of techno-artists, by inviting them into the lab of technology developers. Indeed, there are more and more artists-in-residencies at university labs and in industry. A challenge is that this could introduce a potential bias by becoming part of the culture of engineers: where should 'embedded' artists draw boundaries and how can they preserve a critical normative stance? Here ethicists and artists can benefit from one another. The artist may help to provide for a fresh perspective by introducing new ideas and inviting the ethicist to take novel vantage points. In the other direction, ethicists can serve as corrective force that helps artists to stay critical and to retain what may be called 'critical techno-art', as opposed to a techno-art that is somewhat opportunistic. For example, ethicists (or philosophers more generally) can point

[74] Op. cit. note 62, 4.

[75] I. van de Poel and N. Doorn 'Ethical Parallel Research: A Network Approach for Moral Evaluation', in N. Doorn, D. Schuurbiers, I. van de Poel, M. Gorman (eds) *Early engagement and new technologies: Opening up the laboratory* (Dordrecht: Springer, 2013).

out and critically assess how art is entangled in an institutional framework that may not always work in favor of a genuinely critical techno-art. Furthermore, ethicists can bring to light some of the unquestioned conceptual foundations or cultural frameworks that techno-art may be based on. For example, a lot of techno-art seems to be 'western' in some sense and potentially biased towards a certain cultural framework.

5. Conclusion

In this article, we have discussed the importance of emotions for ethical reflection on technological developments, as well as the role that art can play in this. The role of art that engages with technology is uncharted territory and gives rise to many fascinating philosophical questions that have not yet been sufficiently addressed in the literature. Hopefully, this article has provided for a first glimpse on how this topic can be relevant for urgent societal and philosophical explorations. The interrelation between emotion, risk, moral emotions and technology-engaged art deserves further uptake in the field of philosophy.[76]

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