Analysis on cultural considerations in RRI and neuroethics (D9.3 – SGA3)

Figure 1: To advance in the knowledge of the brain, it is crucial to implement a multi-cultural effort which connects different geographical, social, and disciplinary traditions

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Description in GA:	In order to develop an ethically sustainable Research Infrastructure, the examination of environmental (cultural, symbolic, social) variations and their impact on research, ethical assessment, and policy needs to be undertaken. This delivery provides such an analysis, focusing on relevant considerations and offering an overview of how they can be approached and evaluated. Insights will support reflection on cultural considerations in EBRAINS and brain research more generally.
Abstract:	Deliverable D9.3 focuses on cultural considerations in implementing Responsible Research and Innovation (RRI) practices and addressing neuroethical issues. D9.3 starts by providing a broad picture of the impact of cultural diversity on scientific research, including the way its goals and activities are prioritised and how the emerging results are socially perceived and accepted. Against this background, D9.3 analyses the connection between culture and neuroethics and between culture and RRI, to conclude with some recommendations about how to account for cultural diversity in these contexts.
Keywords:	Culture, Cultural Diversity, Neuroethics, RRI
Target Users/Readers:	Consortium members, general public, neuroscientific community, neuroscientists, EBRAINS users, researchers, scientific community, students.

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History of Changes made to this Deliverable (post Submission)

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10 Jan 2022	Deliverable submitted to EC
20 May 2022	Resubmission with specified changes requested in Review Report Main changes requested: • Change 1 (extract from Review Report) WP9 produced D9.3, where cultural consideration in neuroethics and RRI are discussed. However, it is not immediately clear how the concepts and insights discussed can be applied in practice. • Change 2 (extract from Review Report) D9.3 needs further development with more directly relevant recommendations and clarifications. Regarding the future work related to WPO9.2, through M42, it is highly recommended to focus on specific topic(s) identified in collaboration with other WPs, as most relevant for the HBP-SGA3 and EBRAINS instead of engaging into too general and broad topics as indicated in D9.2
20 Jun 2022	Revised draft sent by WP to PCO. Main changes made, with indication where each change was made: • Change 1 (see Introduction; Section 2.2; Section 5) As specified in the Introduction, the D9.3 recommendations target two publics specifically: people involved in HBP research and people involved in developing and providing EBRAINS services. In Section 2.2 we distinguish two dimensions of cultural diversity: disciplinary and anthropological. We clarify that the first is more relevant to the former and actual phase of HBP (research-oriented), while the second is more relevant to its legacy (EBRAINS). Against this background, on the basis of our embedded work in the Project, we provide relevant recommendations in Section 5 • Change 2 (see Section 5; Section 6) We have revised the final recommendations starting from our experience within WP2 and WP3. Particularly, we have provided relevant illustrations from our embedded research activities, outlining the challenge and opportunities of multi-disciplinary work. On this basis, we have distinguished two specific target groups and elaborated concrete and implementable relevant recommendations. Regarding future work, we have specified that the plan is to keep working on the topics illustrated in the text in collaboration with relevant WP2 and WP3 researchers and EBRAINS.
21 Jun 2022	Revised version resubmitted to EC by PCO via SyGMa

1. Introduction

Deliverable D9.3 focuses on cultural considerations in implementing Responsible Research and Innovation (RRI) practices and addressing neuroethical issues. Starting with a working definition of culture and its differences, D9.3 provides a broad picture of the impact of cultural diversity on scientific research, and of how it shapes both the priority given to some scientific goals and activities and the social perception of emerging results. Against this background, D9.3 analyses the connection between culture and neuroethics and between culture and RRI, to conclude with some recommendations about how to account for cultural diversity in these contexts. These recommendations are specifically directed to two relevant groups: people involved in scientific and technological research, like in the Human Brain Project (HBP); people involved in providing technological services, namely EBRAINS infrastructure.

The general goal of this Deliverable is to provide guidance for improving the connection between HBP research, including its future legacy EBRAINS infrastructure, and society. To this end, this report aims to identify which dimensions of cultural diversity are particularly ethically relevant in this context, how to concretely account for them for achieving the goal, and to suggest potential indicators of success by describing some of our embedded ongoing work in WP2 and WP3.

Given the complexity and the vast range of topics involved, the analysis presented here is necessarily limited and selective. It presents only those elements of the culture's prism especially relevant to the aims presented above.

D9.3 is expected to enhance neuroethics and RRI services by facilitating the identification and design of strategies to manage potential emerging issues in the implementation and exploitation of EBRAINS. In particular, it is hoped that the overview of relevant cultural considerations provided by D9.3 will aid the development of a neuroethics 'service' that a) provides analyses of key concepts such as reliability and validity of models, methods, suggested applications and uses, b) places research results and models into a larger perspective, including cultural diversity, c) provides the level of clarity necessary for clear and convincing communication, and d) provides analyses of different policies building on the research insights.

Ultimately, D9.3 should be relevant to EBRAINS, complementing neuroethics and RRI activities that aim to: a) enrich and integrate our understanding of the relevant ethical and societal questions, b) promote a sound and ethically sustainable knowledge production, c) enhance the interfacing of neuroscience and society, and d) maximise societal impact of and benefit from neuroscience.

D9.3's intended audience are researchers internal and external to the HBP, as well as EBRAINS developers and users.

2. Culture and scientific research

2.1 Operational definition of culture

Addressing the semantic complexity of culture goes far beyond the scope of the present document which focuses instead on those aspects particularly relevant to its stated goals. For our present purposes, a technical, minimalist understanding of culture suffices. In this document, culture is understood as passing over information from one individual and/or group to another, with an implicit and/or explicit impact on their behaviour and possibly their thinking. This definition abstracts away from any explicit reference to specific sets of values, symbols, and any specifics that contribute to define a collective *Weltanschauung*, and it does not exclude other animal species which can also display this kind of cultural behaviour. Furthermore, this definition of culture is not limited to sociological and anthropological dimensions: it includes disciplinary differences, which appear to be quite relevant to the HBP, conceived and developed as multidisciplinary since its very beginning.

Thus, even if limited and minimalist[1], a cognitive account of culture as shared and socially transmitted information is a useful working definition for the present analysis.

Since the 80s, there have been several attempts to reconstruct the evolution of culture and cognition, particularly within the field of cognitive anthropology, with the final goal of developing a theoretical framework for cultural evolution.[2] [3] [4] Emerging from this anthropological research, the concept of *cultural model* as elaborated in cognitive anthropology [5] [6] is particularly relevant to this analysis. Cultural models are "mental representations shared by members of a culture"[7]. Cultural models fill in the data of our experience, either at the aware or (mostly) at the unaware level. In this way, cultural models make sense of our experiences, informing our inferences. They eventually facilitate our engagement with the world allowing us to operate smoothly "on autopilot" and to behave in a purposive and communicative way. Importantly, cultural models present both individual and cultural variations. This means that a culture can affect the individual through the variation of relevant cultural models.

Culture is characterised by the following features, some of which are intrinsic to it, while others (namely the latest two), even if not peculiar of culture, are particularly relevant to the present analysis:

- *Dynamic*: even if more or less resistant to change, culture is intrinsically historical. A number of factors, both internal and external to a culture, concur to shape its dynamics.
- *Transformative*: directly dependent on its historical nature, culture is subject to different transformations, i.e. significant changes of its identity.
- *Internally differentiated*: cultures are like a framework, i.e. they are recognisable but not fully homogeneous.
- *Ethically relevant*: cultures are intrinsically connected to ethical values, and such values inform opinions and behaviours of individual either explicitly or implicitly.
- *Epistemically relevant*: cultures provide individuals with strategies and tools for interpreting and making sense of the world.
- *Pragmatic*: cultures appear intrinsically related to a specific set of actions and behaviours considered key for individual flourishing.

Accordingly, the influence of culture on individuals extends over different dimensions with different degrees of impact. Its impact on science and on the public perception of science is relevant to our analysis here.

2.2 The impact of culture on science and the public perception of science

Science is arguably deeply embedded in culture, which exerts its influence in several ways throughout the scientific research process. To illustrate, culture influences the final choice of the

[1] For an introduction to the theoretical issues surrounding the definition of culture, including the explanatory value of information, see Sperber, D., Explaining culture: a naturalistic approach, Wiley-Blackwell, Oxford, UK ; Cambridge, Mass. 1996.
[2] Cavalli-Sforza, L.L. and M.W. Feldman, *Cultural transmission and evolution: a quantitative approach*, Princeton University Press, Princeton, N.J 1981.
[3] Lumsden, C.J. and E.O. Wilson, *Genes, mind, and culture: the coevolutionary process*, Harvard University Press, Cambridge, Mass. 1981.
[4] Boyd, R. and P.J. Richerson, *Culture and the evolutionary process,* University of Chicago Press, Chicago 1985.
[5] Bennardo, G. and V.C. De Munck, *Cultural models: genesis, methods, and experiences*, Oxford University Press, New York 2014.
[6] Bennardo, G., *Cultural Models Theory*. Anthropology News, 2018.
[7] Bennardo, G. and V.C. De Munck, *Cultural models: genesis, methods, and experiences*, cit., p. 3.

research topics to focus on, the way scientific research is conducted, how scientific findings are communicated, and how they are perceived and received by the public[8]. Importantly, culture affects the extra-scientific impact of science, that is, if and how much it is ultimately accepted by diverse publics and becomes part of their thinking and behavioural frameworks. Among other things, paying attention to culture's impact is crucial for maximising the social benefits and minimising the social risks potentially arising from the scientific work.

It is also true that culture is conversely conditioned by science: our cultural models, including our *Weltanschauung*, are arguably informed, either implicitly or explicitly, by models deriving from science. In a way, our cultural models are informed by scientific models, even if the two never completely overlap. This is especially true for the brain sciences in general and neuroscience in particular. The cultural reception of science is open to a number of different interpretations which eventually impact how much social benefit can derive from science. In fact, there is a lively debate around the hype surrounding brain research, with some scholars outlining that this hype has resulted in brain-centred or neuroessentialist cultural models.[9] [10]

As is the case with other scientific fields, the brain sciences (and neuroscience as part of them) are not socially or culturally neutral: to some extent they are shaped by and they conversely shape the society and the culture in which they rise.[11] Neuroscience and society develop in symbiosis, as expressed by epigenetic theories and neuro-cultural identities.[12] In fact, starting from the observation of a non-linear evolution between the complexity of the genome and that of the brain, which can neither be simply related to genome size nor to number of genes, the epigenetic theory of neuronal development by selective stabilisation of synapses suggests that the relation between brain and external environment (e.g. ecological, cultural, social, etc.) is critical for the development of the brain.[13]

Despite the mutual interplay between society/culture and neuroscience, neuroscience can still give rise to reductionist and deterministic interpretations of human identity[14] [15]. Biological reductionism can result in a number of misleading public perceptions, for example of psychology as equivalent to neuroscience, without acknowledging the methodological differences between the two fields.

Some scholars talk about an increasing tendency to self-objectification, that is, a tendency to interpret ourselves as objects rather than subjects, particularly through the incorporation of neuroscience into lay people's self-understanding.[16] Such a self-understanding conceived in neurological terms is not only a theoretical stance, but it may affect many social practices, e.g. education and treatment of psychological disorders.[17]

Also, social-cultural identities undertake a process of "social biologisation", for instance they are sexualised, racialised or ablesised, and we become accustomed to categorise ourselves

[8] Rommelfanger, K., and L. Specker-Sullivan, *The dilemma of cross-cultural neuroethics*, in Farisco, M. (ed.), *Neuroethics and cultural diversity*, ISTE-Wiley, London, Forthcoming.
[9] Reiner, P. *The rise of neuroessentialism*, in Illes, J., and B.J. Sahakian (Eds.). *Oxford handbook of neuroethics,* Oxford University Press, Oxford 2011.
[10] Schultz, W. *Neuroessentialism: Theoretical and Clinical Considerations*, Journal of Humanistic Psychology, 58 (6), 2018, pp. 607-639.
[11] Choundry, S., and J. Slaby (eds.), *Critical Neuroscience. A handbook of the social and cultural contexts of neuroscience*, Wiley&Sons Ltd., Chirchester 2012.
[12] Evers, K., *Towards a philosophy for neuroethics. An informed materialist view of the brain might help to develop theoretical frameworks for applied neuroethics*, EMBO Report, 8, 2007, pp. 48-51.
[13] Changeux, J.P. Courrege, P. and A. Danchin, *A theory of the epigenesis of neuronal networks by selective stabilization of synapses*, Proceeding of National Academy of Sciences USA, 70 (10), 1973, pp. 2974-2978.
[14] Ortega, F., and F. Vidal, *The neurosciences in contemporary society. Gimpses from an expanding universe,* Cambridge University Press, Cambridge 2009.
[15] Vidal, F., *Brainhood, anthropological figure of modernity*, History of Human Sciences, 22 (1), 2009, pp. 5-36.
[16] Slaby, J., *Steps towards a Critical Neuroscience*, Phenomenology and the Cognitive Sciences, 9(3), 2010, pp. 9397-416.
[17] Rose, N., and M. Abi-Rached, *Neuro. The new brain sciences and the management of the mind,* Princeton University Press, Princeton 2013.

accordingly, without paying attention to such categorisation.[18] This process of biological reductionism can eventually lead to essentialise and biologise cultural differences, possibly in favor of particular cultures against others, thus raising an ethical issue.

Importantly, the risk of a neuro-centric biological reductionism is not really new, as shown by its connection to a form of social hygiene, as illustrated by some positions in Europe at the beginning of the twentieth century. O. Vogt stated that: "Man will increasingly become a brain animal. In our further development, the brain will play an increasingly important role. But this development will bring ever increasing health dangers with it. Thus, a fortuitous future of our species depends significantly on the expansion of brain hygiene."[19] This is quite an extreme example of how neuroscience can exercise its role as a cultural force promoting certain values and concurring in defining what is considered as a social good.

It is worth noting that one of the main elements commonly identified as leading to an increasing role of neuroscience in contemporary self-understanding is the actual technical possibility of visualising not only the inside of the human body in general, but the functioning of the human brain in particular (e.g. through neuroimaging and modelling technology). If the mind is conceived as identical with the brain, then visualising the brain corresponds to visualising the functioning of the mind itself. While it is beyond doubt that the progress in the study of the human brain's functioning in the last years has been impressive[20], it is also necessary to acknowledge and analyse both the technical and the epistemic limitations of the research. Neuroimaging and modelling technology produce representations of the real brain which are not isomorphic with it, but that can be metaphorically described as "simulacra" of the real brain.[21] [22] Moreover, the production and the interpretation of neuroimages and brain models is a scientific activity that is significantly conditioned by extra-scientific factors[23], which in turn affect the way in which they are interpreted, the way in which their possible uncertainty is assessed, and the way in which they are eventually translated into general public cultural models.

One ethically relevant aspect of the impact that science has on extra-scientific domains, i.e. on society at large, lies in the fact that science often gives rise to concepts and interpretations that are not scientific in themselves but are generally perceived as scientific. In other words, people are often blind to the fact that their perceptions and interpretations of scientific notions are culturally mediated, and they end up identifying "the scientific notions as they view them" with "the scientific notions in themselves". In the end, the epistemic authority attributed to scientific notions is translated into the public perceptions of those notions.

The impact of culture on how scientific notions are perceived is seen not only at the conceptual but also at the practical level. The possible reduction of the mind to the brain and the supposed realism of neuroimaging (assumed as isomorphic to the mind) have specific social and anthropological impacts: the visualised living brain is presented as another organ that the scientist can explore, explain, and modify (in order to care, repair or enhance it). The medical and technical possibilities to understand and manipulate the brain can be assumed by lay people as tools to understand and manipulate the human mind, because of neuroscience's authoritative allure.[24] [25] [26] [27] Two reductions are in place here: of the mind to the brain and of the brain to the

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[18] Racine, E., and A.S. Senghor, *Diversity in neuroethics: which diversity and why it matters?*, in Farisco, M. (ed.), *Neuroethics and cultural diversity*, cit.

[19] Vogt, O. 1912, cited in Hagner, M., *Cultivating the cortex in German neuroanatomy*, Science in Context, 14(4), 2001, 541–563.

[20] Farisco, M., and K. Evers, *Neurotechnology and direct brain communication. New insights and responsibilities concerning speechless but communicative subjects*, Routledge, New York 2016. PLUS ID: 1063.

[21] Rose, N., *The politics of the life itself. Biomedicine, power and subjectivity in the twenty-first century*, Princeton University Press, Princeton 2007.

[22] Dumit, J., *Picturing personhood: brain scans and biomedical identity*, Princeton University Press, Princeton 2003.

[23] Dumit, J., *Critically producing brain images of the mind*, in S. Choundry, and J. Slaby (eds.), *Critical Neuroscience*, cit., pp. 195-226.

[24] Racine, E., Bar-Ilan, O., and J. Illes, *fMRI in the public eye*, Nature Reviews Neuroscience, 6 (2), 2005, 159-64.

visualised/modelled brain. The approximations, idealisations and simplifications underpinning the artificial reproduction of the brain are not taken into account, e.g. assuming neuroimaging or brain models as a picture of the cerebral life.

It is important to outline that the reduction of human identity to cerebral identity, of personhood to brainhood[28], without acknowledging the complex and multilevel structure of both brain and identity is not a necessary implication of the neuroscientific research (symbiotic ideas predominate in contemporary neuroscience[29]). It is often a kind of extra-scientific postulate or bias, which gives a disproportionate and misleading explanatory power to neuroscience.

The extra-scientific dimension of science, particularly of neuroscience, is often not adequately taken into account because it is assumed that even if science has social implications, science is not intrinsically social.[30] In other words, extra-scientific factors are part of science not occasionally, but because science is as such a social activity. However, as suggested before the intrinsic social nature of science makes it ethically relevant, especially considering the possibility of misleading perception by the general public. Moreover, acknowledgment of the social nature of science should be accompanied by awareness of its limitation as a cultural factor. In fact, the development of a vision of the world (*Weltanschauung*) can be informed by scientific knowledge but it cannot be explained only through scientific paradigms and categories. Science alone is not able to build ethics, anthropology, or politics. In the same way, the relevance of neuroscience for explaining the human is undeniable but limited.

It has been outlined that neuroscience seems to replace genetics as a scientific metaphor to describe our identities.[31] However, metaphors are ambiguous in themselves, and they are often transformed, simplified, and misunderstood both in intra- and extra-scientific communication. Furthermore, metaphors carry with them specific values, visions of the world, and conceptual frameworks that could be a trap for the science itself, which risks to be associated with misleading ideas. As recently argued by Matthew Cobb, the images used to conceptualise the brain facilitate us to make progress in its understanding and delimit our capacity to think it at the same time, because it is very difficult to go over the conceptual framework we are educated and enculturated in[32].

The paradox of the contemporary 'cerebral subject' as outlined by Francisco Ortega and Fernando Vidal is particularly significant:[33] the brain is often described as a material organ that symbolically incorporates qualities traditionally attributed to the soul, the immaterial substance par excellence. On the one hand, this affirms a naïve materialist vision of the human, while on the other hand the same qualities of a generally spiritualist conception are attributed to the naturalised subject. This is an extreme illustration of how culture can inform and shape the understanding and acceptance of science.

Two dimensions of cultural diversity appear relevant to the present analysis: disciplinary and anthropological. The first refers to the differences among disciplines, for instance in terms of language, methodology, conceptual architecture, etc. The second refers to the differences among people, including socio-cultural background, ethnic and geographic identity. The disciplinary

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[25] Weisberg, D.S. et al., *The seductive allure of neuroscience explanations*, Journal of Cognitive Neuroscience, 20 (3), 2008, 470-477.
[26] McCabe, D.P., and A.D. Castel, *Seeing is believing: the effect of brain images on judgments of scientific reasoning*, Cognition, 107 (1), 2008, 343-352.
[27] Wardlaw, J.M., et al., *"Can it read my mind?" - What do the public and experts think of the current (mis)uses of neuroimaging?*, PLoS One, 6 (10), 2011, e25829.
[28] Vidal, F. *Brainhood, anthropological figure of modernity*, History of Human Sciences, 22 (1), 2009, 5-36.
[29] Changeux, J.-P., *Climbing Brain Levels of Organisation from Genes to Consciousness*. Trends Cogn Sci, 2017. 21(3): p. 168-181. PLUS ID 775.
[30] Ortega, F., and F. Vidal, *The neurosciences in contemporary society. Gimpses from an expanding universe*, Cambridge University Press, Cambridge 2009.
[31] Mauron, A. *Renovating the house of being: genomes, souls, and selves*, Annals of the New York Academy of Sciences, 1001, 2003, pp. 240-252.
[32] Cobb, M. *The idea of the brain: the past and future of neuroscience*, Basic Books, London 2020.
[33] Ortega, F., and F. Vidal, *The neurosciences in contemporary society. Gimpses from an expanding universe*, cit.

dimension appears particularly relevant to the actual phase of the HBP as a multi-disciplinary research project involving researchers from different domains collaborating on the same topics. Important results have been achieved, but also significant challenges have been raised because of this disciplinary cultural diversity. Neuroethics and RRI activities have dedicated attention to this point and elaborated a number of attempts to overcome the issue, as we will see below.

3. Neuroethics and cultural diversity

Since cultural diversity, including disciplinary diversity, raises several issues for science, particularly for neuroscience, it is crucial to recognise and assess them to maximise scientific success, public acceptance, and the societal benefit of a research project.

Neuroethics is an interdisciplinary field that addresses ethical, legal, social, and cultural, but also the philosophical and scientific questions raised by neuroscience and related technologies.[34] [35] [36] [37] Its methodology can be conceptual, empirical, and normative (or a combination) depending on the perspective one wishes to emphasise.[38] Since the 2002s Dana Foundation Neuroethics Conference and onwards, this field has often been conceived in two ways: as a type of applied ethics aimed at providing a repertoire of ethical approaches to address the practical ethical and societal concerns raised by neuroscience research and its applications, e.g. privacy and the protection of neural data; or as an empirical, descriptive approach focusing on how neuroscientific findings can inform theoretical and practical issues, e.g. what is moral reasoning, how to understand choice.[39] [40] More recently, a basic research oriented and conceptual approach, i.e. fundamental neuroethics [41] [42] has been gaining traction, notably through the work undertaken within the HBP. Fundamental neuroethics takes as a starting point the view that conceptual analysis plays an important role not only in illuminating key operative notions (e.g. consciousness, self, and human identity), but also in examining issues such as what is the understanding of the same notions in different contexts (i.e. ethics and neuroscience) and their mutual relevance, how neuroscientific knowledge is constructed, what its underlying assumptions are and how they are justified, how results may be interpreted, and why or how empirical knowledge of the brain can be relevant to philosophical, social, and ethical concerns. [43] [44] [45]

How to address existing cultural diversity is a challenge not only for neuroscience but also for neuroethics. This is not accidental: neuroethics is engaged in ethical reflection in collaboration with neuroscience, and ethics is *per force* multifaceted and characterised by diversity.

Yet historically neuroethics originates from culturally specific contexts (i.e., North America and Western Europe), eventually reflecting their theoretical, methodological and practical

[34] Illes, J. and B.J. Sahakian, *The Oxford handbook of neuroethics*, Oxford University Press, Oxford-New York 2011.
[35] Johnson, L.S.M., and K.S. Rommelfanger, *The Routledge handbook of neuroethics*. Routledge, Taylor & Francis Group, New York 2018.
[36] Levy, N., *Neuroethics,* Cambridge University Press, Cambridge, UK; New York 2007.
[37] Marcus, S. and Charles A. Dana Foundation, *Neuroethics : mapping the field : conference proceedings, May 13-14, 2002, San Francisco, California*. Dana Press, New York 2002.
[38] Evers, K., A. Salles, and M. Farisco, *Theoretical framing of neuroethics: the need for a conceptual approach*, in *Debates about Neuroethics: perspectives on its development, focus and future*, E. Racine, and J. Aspler (Eds.), Springer International Publishing: Dordrecht 2017, pp. 89-107. PLUS ID 1275.
[39] Marcus, S. and Charles A. Dana Foundation., *Neuroethics : mapping the field : conference proceedings.*
[40] Roskies, A., *Neuroethics for the new millenium.* Neuron, 2002. 35(1): p. 21-3.
[41] Evers, K., *Towards a philosophy for neuroethics. An informed materialist view of the brain might help to develop theoretical frameworks for applied neuroethics.* EMBO Rep, 2007. 8 Spec No: p. S48-51.
[42] Evers, K., *Neuroetique. Quand la matière s'éveille*, Odile Jacob, Paris 2009.
[43] Evers, K., A. Salles, and M. Farisco, *Theoretical framing of neuroethics: the need for a conceptual approach,* cit.
[44] Farisco, M., A. Salles, and K. Evers, *Neuroethics: A Conceptual Approach.* Camb Q Healthc Ethics, 2018. 27(4): p. 717-727. PLUS ID 1483.
[45] Salles, A., K. Evers, and M. Farisco, *The need for a conceptual expansion of neuroethics.* AJOB Neuroscience, 2019. 10(3): p. 126-128. PLUS ID 1929.

assumptions.[46] [47] The portability of these assumptions in other contexts is not unproblematic. Beyond, methodologies and approaches, it has also been argued that neuroethics shows its Western bias in the topics it chooses to focus on:[48] it has given significant attention to issues related to neurotechnologies which are not a priority in non-western contexts [49] [50] while often failing to address those based on the needs of marginalised populations.

The above illustrates the need for a culturally-sensitive neuroethics. More specifically, three possible strategies for neuroethics to handle the problems raised by cultural diversity have been identified:[51]

1) Including other cultures in the neuroethical discussion, without much reflection on why, what is really critical, how, and for what specific goal in particular. This seems the model of the so-called "International neuroethics".[52]
2) Moving from simple recognition of cultural differences to actions aimed at engaging with them. This is the model of "Cross-cultural neuroethics (see below).
3) Combining the identification of commonalities with building intercultural moral consensus. This is the model of "Global neuroethics", which is more inclusive than International neuroethics. In fact, Global neuroethics aims at elaborating rules and norms that reflect common values and common general vision, or at least a convergent ethical framework that leads to some type of consensus.[53]

The cross-cultural strategy appears particularly relevant to any attempt to build a link among different cultures, including different disciplinary cultures, without eliminating the differences among them. For Karen Rommelfanger and Laura Specker Sullivan, "cross-cultural" properly applies to any project which foregrounds the significance of cultural comparison, whether the goal is to identify similarities against a background of differences, or to highlight differences against a background of similarities. A benefit of this definition is that we do not need to agree on an essential set of criteria for a culture, we need only be able to identify where there is a difference between two social groups. Broadly, cross-cultural differences often manifest in terms of beliefs, values, and practices: both what they are and how they came to be[54]. Thus cross-culturality does not require an agreed upon definition of the terms to be compared: it rather focuses on apparent differences instead. This means shifting the focus from identity to relation: since the issues arise at the intersection of two or more terms, the focus should be on their mutual differences, without presupposing a strong, paradigmatic model in order to eliminate the discrepancies through a homologation process.

Seeking mutual understanding in a context of tensions between values has been suggested as a possible approach in order to recognise diversity and facilitate mutual understanding.[55] A preliminary condition of such an approach is a conceptualisation of cultural identity not as rigid and autonomous, but as flexible and relational.

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[46] De Vries, R. *Framing neuroethics: A sociological assessment of the neuroethical imagination*, American Journal of Bioethics, 2005. 5(2): p. 25–27.
[47] Racine, E., and M. Sample, *Two problematic foundations of neuroethics and pragmatist reconstructions*, Camb. Q. Healthc. Ethics, 2018. 27(4): p. 566–577.
[48] Racine, E., and A.S. Senghor, *Diversity in neuroethics: which diversity and why it matters?*, cit.
[49] Racine, E. *Pragmatic Neuroethics: Improving Treatment and Understanding of the Mind-Brain*. MIT Press, Cambridge 2010.
[50] Racine, E., and M. Sample, *Two problematic foundations of neuroethics and pragmatist reconstructions*, cit.
[51] Salles, A., *Neuroethics and Culture*, in Farisco, M. (Ed.), *Neuroethics and Cultural Diversity*, cit.
[52] Lombera S, and J. Illes, *The international dimensions of neuroethics*, Dev World Bioeth. 2009;9(2):57-64.
[53] Kellmeyer, P., Chandler, J. A., Cabrera, L., Carter, A., Kreitmar, K., Weiss, A., and J. Illes, *Neuroethics at 15: The Current and Future Environment for Neuroethics*, American Journal of Bioethics Neuroscience, 2019. 10(3):104-110.
[54] Rommelfanger, K., and L. Specker-Sullivan, *The dilemma of cross-cultural neuroethics*, cit.
[55] Létourneau, A. *Differing versions of dialogic aptitude. Bakhtin, Dewey, and Habermas*. In Arnett, R.C., and F. Cooren (eds), *Dialogic Ethics*, John Benjamins Publishing, Amsterdam 2018.

Different reasons (and related achievements) justify calling for a cross-cultural strategy for neuroethics:[56]

- Better inter-cultural understanding
- Better clarification of our own culture's features
- Possible mutual interest and cooperation, that stand on the previous two points
- Enhanced intracultural creativity: confronting with different cultures can help us to enhance our own culture's creativity.

The points above about social and geographical cultures are also true for disciplinary cultures and related diversity. In this case a cross-cultural goal is also highly desirable. The challenge is how to achieve a true multi-disciplinary collaboration. In this respect, we can focus on one example of (at least partially) successful strategy seen in the last phase of the HBP where multidisciplinary collaboration is being pursued through different strategies/methods, including:

- Embedded research of ethicists/philosophers in scientific Work Packages
- Structured interviews with scientific researchers
- Co-authorship of interdisciplinary papers about emerging topics
- Co-authorship of opinion documents on the impact of neuroscience and AI on society
- Engagement activities with the public on the societal and ethical implications of scientific research, including their identification and strategies for assessing them.

Besides the significant and still open challenge of addressing social and anthropological cultural diversity at the Project level, embedded neuroethics groups might aid in addressing disciplinary diversity, not only by reflecting about it, but also by promoting and implementing a concrete methodology within a multidisciplinary environment.

Importantly, embededdness does not mean that neuroethics loses its critical attitudes towards neuroscience and other disciplines or that it becomes an uncritical advocate of neuroscience as some have argued[57] [58]. Uncritical acceptance would be detrimental for the public perception of neuroscience and eventually for neuroscience itself [59] [60] [61].

4. Cultural diversity and Responsible Research and Innovation

Responsible Research and Innovation (RRI) has achieved a prominent role as an ethical, legal, and political framework for research. It has been endorsed and promoted by a number of institutions including the European Commission.[62] [63] [64]

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[56] Rommelfanger, K., and L. Specker-Sullivan, *The dilemma of cross-cultural neuroethics,* cit.
[57] De Vries, R. *Who will guard the guardians of neuroscience? Firing the neuroethical imagination,* EMBO Reports, 2007. 8 (S1), S65–S69.
[58] Racine, E., and A.S. Senghor, *Diversity in neuroethics: which diversity and why it matters?*, cit.
[59] Racine, E., Bar-Ilan, O., and J. Illes, *fMRI in the public eye*, cit.
[60] Racine, E., Bar-Ilan, O., and J. Illes, *Brain imaging: A decade of coverage in the print media,* Sci. Commun., 2006. 28(1), 122–142.
[61] Racine, E., Dubljević, V., Jox, R. J., Baertschi, B., Christensen, J. F., Farisco, M., Jotterand, F., Kahane, G., and S. Müller, *Can neuroscience contribute to practical ethics? A critical review and discussion of the methodological and translational challenges of the neuroscience of ethics,* Bioethics, 2017. 31(5), 328–337. PLUS ID 2017.
[62] European Commission. Responsible Research and Innovation Workshop, 16–17 May 2011, Brussels, Belgium, Newsletter. Brussels: European Commission 2011. https://ec.europa.eu/programmes/horizon2020/sites/default/files/responsible-research-and-innovation-workshop-newsletter_en.pdf

While there is not a shared definition of RRI, it is generally understood as an interactive process that engages social actors, researchers, and innovators who must be mutually responsive and work towards the ethical permissibility of the relevant research and its products.[65] [66]

It is generally agreed that RRI entails a commitment to a number of activities.[67] [68] It starts with the activity of anticipation – concerned with the identification of potential ethical and social concerns at an early stage –; it further requires methodological reflexivity – on the motivation and direction of science, societal goals and values, and desired impacts –[69] [70], as well as the inclusion of a broad set of stakeholders – in order to promote a debate with all those affected by the research and to empower social agency[71] – and responsiveness, – specifically, the capacity to respond and change course on the basis of the relevant stakeholders' and society's values, and in view of the appropriate circumstances.[72] [73]

A central role in RRI is played by the concept of responsibility. While it is true that the emphasis on the relevance of responsibility to the scientist's work is not new, [74] in general, there has been a tendency to understand responsibility in individualistic and atomistic terms. To illustrate, within the research context, scientists have often been considered responsible for advancing knowledge and doing so in compliance with basic ethical and legal norms, for example, but generally not considered ethically responsible for the social, political and cultural impact of their findings or their potential extra-scientific uses and misuses.[75] Policy makers, on the other hand, are expected to be responsible for impact assessment and devising regulations and guidelines.[76] The RRI framework outlines the problematic nature of such a fragmented approach to responsibility in research and emerging technologies. To counterbalance this fragmented view of responsibility, RRI articulates a collective notion of responsibility: responsibility and irresponsibility are distributed throughout the research and innovation process and they directly involve several stakeholders, including researchers, innovators, funders, policy makers, universities, business/finance,

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[63] European Commission. Responsible Research and Innovation – Europe's Ability to Respond to Societal Challenges. Brussels: European Commission, Publications Office 2014. https://op.europa.eu/en/publication-detail/-/publication/2be36f74-b490-409e-bb60-12fd438100fe

[64] European Commission. Options for Strengthening Responsible Research and Innovation. Report of the Expert Group on the State of Art in Europe on Responsible Research and Innovation. Luxembourg: Publications Office of the European Union 2013. https://op.europa.eu/it/publication-detail/-/publication/1e6ada76-a9f7-48f0-aa86-4fb9b16dd10c

[65] Von Schomberg, R. *Prospects for Technology Assessment in a Framework of Responsible Research and Innovation*, in Dusseldorp, M. and R., Beecroft (Eds.), *Technikfolgen Abschätzen Lehren: Bildungspotenziale Transdisziplinärer Methoden*, VS Verlag für Sozialwissenschaften, Heidelberg 2012, pp. 39–61.

[66] Stilgoe, J., Owen, R. and P., Macnaghten. *Developing a Framework for Responsible Innovation*. Research Policy 2013. 42 (9): 1568–1580.

[67] Owen, R., Macnaghten, P. and J., Stilgoe. *Responsible research and innovation: From science in society to science for society, with society*. Science and Public Policy 2012. 39: 751–760.

[68] Stahl, B. *Responsible research and innovation: The role of privacy in an emerging framework*. Science and Public Policy 2013. 40: 708–716.

[69] Von Schomberg, R. *Prospects for Technology Assessment in a Framework of Responsible Research and Innovation*, cit.

[70] Stilgoe, J., Owen, R. and P., Macnaghten. *Developing a Framework for Responsible Innovation*, cit.

[71] Stahl, B., Rainey, S., and M., Shaw. *Managing ethics in the HBP: A reflective and dialogical approach*. AJOB Neurosci 2016. 7 (1): 20–24.

[72] Stilgoe, J., Owen, R. and P., Macnaghten. *Developing a Framework for Responsible Innovation*, cit.

[73] Owen, R., Stilgoe, J., Macnaghten, P., Gorman, M., Fisher, E., and D., Guston. *A framework for responsible innovation*. In Owen, R., Bessant, J., and M. Chichester Heintz (Eds.), *Responsible Innovation*, John Wiley & son, London, UK 2013.

[74] Owen, R., Stilgoe, J., Macnaghten, P., Gorman, M., Fisher, E., and D., Guston. *A framework for responsible innovation*, cit.

[75] Evers, K. *Ethics in Science: A Socio Political Challenge*, in Sitter-Liver, B. (Ed.), *Universality: From Theory to Practice*, Academic Press, Fribourg 2009.

[76] Fisher, E., and A., Rip, *Responsible innovation: Multilevel dynamics and soft intervention practices*, in Owen, R., Bessant, J., and M., Heintz (Eds.), *Responsible innovation*, Wiley & Son, Chichester, UK 2013.

government or civil society.[77] [78] [79] Thus, the need for a forward-looking and collective notion of responsibility -that addresses people's ambivalences and concerns regarding the products of scientific advances- and for mechanisms that will promote it[80].

In addition to this collective understanding of responsibility, RRI highlights its *proactive character*: responsibility is not understood as accountability, but rather as engagement in shaping scientific practices by making practitioners commit to socially desirable goals. This entails that responsibility is not exhausted by legal compliance: it requires engagement with society and understanding of social goals.[81]

This social engagement relies on the awareness that scientific research is a social enterprise, as outlined above, and that it must be recognised as such not only by its practitioners, but also by those who are affected by it. A dualistic view of science and society that fails to recognise that science has a social identity is inadequate to assess the complexity of the issues emerging from their interaction. Among other things, this implies that: a) other social stakeholders can and should improve their understanding of what scientists do; b) science (understood either as a collective enterprise or as the activity of individual scientists) should enhance inclusive and collaborative relationships with the rest of society, and c) neither the scientific methodology nor the scientific goals are neutral with respect to external societal influences, and they necessarily affect other social contexts. Points b) and c) in particular emphasise the direct connection of science with cultural diversity, which is inherent to society. Thus, RRI itself is affected by cultural diversity. In fact, RRI strives to promote socially beneficial research processes and innovation, but the particular meaning of social benefit is culturally shaped. Also, RRI proposes that a careful assessment of the diverse potential emergent issues should inform the trajectory of the scientific work and feed into the research agenda itself. To emphasise this aspect, the concept of *Responsibility by Design* (RbD) has been recently introduced. Beyond the label used (e.g. RRI or RbD), the point is that critical and reflective approaches to science and technology should not be seen as contingently provided by external disciplines or as work to be done by an external discipline: they are rather essential to the scientific enterprise itself. As seen in the first section above, science is inherently shaped by culture. Thus, to be effective, RRI must involve a reflection upon and a strategy in order to account for cultural diversity.

As stated before, cultural diversity should be understood not only in sociological terms, but also with reference to different disciplines collaborating in multi- and inter-disciplinary research. The crucial role of a collaboration between neuroscience and the human sciences, particularly philosophy, with explicit reference to RRI, has been recently highlighted[80]. Furthermore, the active involvement of social scientists in the scientific research process and in research agenda setting plays a key role in unveiling social and political aspects. This kind of multidisciplinary collaboration is crucial for a socially embedded understanding of the underlying motivations and scientific agendas, awareness of own assumptions and biases, and identification and recognition of existing uncertainties. In addition, this kind of multidisciplinary collaboration is key for bringing to light the diverse aspects of social life, politics, and culture included in the scientific space.

Cultural diversity in particular plays a crucial role in shaping a number of factors that are crucial for an effective RRI strategy. To illustrate, the full range of issues raised by neuroscience cannot be adequately dealt with without also focusing on epistemic and ontological aspects that play a major role in the quality of the research process (for example, in framing scientific questions) and the legitimacy of the various interpretations of relevant scientific findings. The ethical, ontological, and epistemological aspects are not independent from each other but rather

[77] Von Schomberg, R. *Prospects for Technology Assessment in a Framework of Responsible Research and Innovation*, cit.
[78] Stilgoe, J., Owen, R. and P., Macnaghten. *Developing a Framework for Responsible Innovation*, cit.
[79] Owen, R., Stilgoe, J., Macnaghten, P., Gorman, M., Fisher, E., and D., Guston. *A framework for responsible innovation*, cit.
[80] Salles, A., Evers, K., and M., Farisco, *Neuroethics and Philosophy in Responsible Research and Innovation: The Case of the Human Brain Project*, Neuroethics, 2019. 12(2): 201-211. PLUS ID 1468.
[81] Stahl, B.C., et al., *From Responsible Research and Innovation to responsibility by design*. Journal of Responsible Innovation, 2021. 8(2): 175-198. PLUS ID 2893.

interwoven; effective reflection needs to address them all. This implies the necessity to acknowledge and reflect upon the role of culture and specifically of cultural diversity, that importantly affects this kind of issues. For achieving this goal, like neuroethics, RRI should include a conceptual analysis of the meanings of scientific terms and of the language used to define science and its products that frequently reinforces problematic assumptions about science itself and its role. The work undertaken within the HBP about topics like human identity, consciousness, neuronal epigenesis, Artificial Intelligence, and the Virtual Brain, among others, illustrates how philosophical reflection can contribute to RRI.

5. Conclusion and recommendations

The strong connection between the brain sciences and culture as well as the constant interaction between the brain and its culture raises the necessity of including the latter in the ethical reflection about neuroscience and emerging neurotechnology. This is a challenge, because focusing on culture means acknowledging cultural differences, and assessing them and their impact makes the ethical analysis even more complex.

The complexity results both from the differences (deriving from socio-anthropological and disciplinary factors) between cultural models themselves and the differences internal to the same cultural model, as seen above.

Notably, as illustrated by the HBP itself, disciplinary differences have an important impact on the way ethically relevant issues are recognised, evaluated, prioritised, and finally assessed. The issue of mutual understanding and communicability among people with different disciplinary backgrounds arises: it is not straightforward that the same terms have the same meaning for people from different cultures, particularly from different scientific fields. This creates a further ethical challenge: mutual misunderstanding might cause misleading interpretation, create or reinforce biases against other disciplines reducing the space for collaboration, and have a negative impact on the overall success of the Project. In turn, lack of awareness of existing socio-anthropological differences when conducting research, assessing findings, and communicating with diverse publics may have problematic ethical implications.

Cultural diversity understood from a disciplinary perspective is quite evident within the HBP, and we have reflected on how such diversity may impact the identification of potential ethical issues and how it can be used in the planning of multi- and inter-disciplinary research. In this respect, we can point to our embedded work within WP3, and in particular to a collaborative paper about brain-inspired AI which is currently in progress that involves members of the ethics and society team and members of the scientific Tasks within the Work Package. As already experienced during the preparation of AI Opinion[82], and of T3.8 Output 3.21[83], the meaning of some key terms, like 'trust', 'trustworthiness', and 'learning', among others, can be misleading and give rise to biased interpretations. The collaborative paper that the embedded neuroethics task is coordinating within WP3 is an illustration of a joint reflection between researchers from different disciplines on a specific topic (i.e. brain-inspired AI), in order to identify possible specific ethical issues, taking advantage of the insight provided by different disciplines and thus advancing a shared understanding not just of the main key notions but also of the issues themselves.

However, outlined in the T3.8 Output 3.21, as explained above culture conceived in socio-anthropological terms is an important factor affecting strategies for social exploitation of AI, namely for its internationalisation and commercialisation, and it deserves more attention than it has received so far. That is, up till now within the HBP we have had a tendency to pay more attention to the disciplinary dimension of cultural diversity and the issues it raises, and this because disciplinary cultural diversity seems more immediately relevant to the actual more research-oriented phase of the HBP. However, it is evident that the socio-anthropological

[82] Aicardi, C., Bitsch, L., Datta Burton, S., Evers, K., Farisco, M., Mahfoud, T., Rose, N., Rosemann, A., Salles, A., Stahl, B., and Ulnicane, I. *Opinion on Trust and Transparency in Artificial Intelligence - Ethics&Society, The Human Brain Project*, https://zenodo.org/record/4588648#.YqHzFqhByUk.
[83] https://drive.ebrains.eu/f/df5e24ad702d4fd7a195/

dimension of cultural diversity becomes much more evident as the focus is put on technological exploitation of research, which is part of the EBRAINS mission.

In addition to content-related issues, i.e. issues emerging from specific topics investigated in the scientific research that require a content-focused strategy to be solved (e.g. multidisciplinary collaboration or engagement activities with the public in order to identify the most urgent issues to be assessed), there are also communication-related issues, i.e. issues emerging from the language and the communication channels used throughout the scientific research that require a communication-related (e.g. organisational) strategy, to be solved. This point can be illustrated through our embedded work within WP2, particularly the joint research devoted to identify indicators of consciousness, that is cerebral and/or behavioural features that facilitate the attribution of consciousness to other subjects, including other humans, animals, and artificial systems[84]. This research has been particularly applied to the case of patients with Disorders of Consciousness (DoCs), through the elaboration of an ethical analysis in collaboration with basic and clinical neuroscientists[85]. We are now continuing this multidisciplinary reflection about the identification of residual consciousness in patients with DoCs in a 'live' paper involving 18 researchers from WP2 as well as a couple of relevant patients' associations, with the final goal of maximising the potential social benefits of HBP research. The paper that we are coordinating within WP2 is qualified as 'live' because it will offer the opportunity to access data, interacting tools, clinical and ethical recommendations on EBRAINS.

Thus, on the basis of the above and our work within the HBP so far, we offer the following recommendations:

To those involved in scientific and technological research:

- To provide the necessary *conceptual clarity*, so that the terms used, particularly those playing a key role and those prone to misleading interpretation by people from other disciplines or those that tend to raise hyped expectations from the public, are clearly defined, and that the different meanings attributed to them in different scientific domains and in different social contexts be recognised.
- *To pay attention to the language used when communicating findings* so that it is adapted to the relevant publics.
- *To create communication strategies that are sensitive to the needs and possibilities, including epistemic limitations, of different publics*, which entails that they must be multifaceted and multi-channel.
- *To raise awareness of* the *multidimensional way in which cultural differences*, including disciplinary differences express themselves.
- *To be encouraged* to develop measures *to minimise culturally based biases* in research and relative communication.
- *To recognise and pay attention to the mutual interaction between science (e.g., neuroscience) and society*, considering the potential social impact of research not as an additional point to possibly be included in the scientific research but as an essential component of it.
- *To recognise the potential impact of extra-scientific factors* on how scientific research is defined and conducted.
- *To recognise the social tendency to attribute epistemic authority to science, and to use it in order to maximise public benefit* rather than to manipulate society.

[84] Pennartz, C., Farisco, M., and K. Evers. *Indicators and criteria of consciousness in animals and intelligent machines: An inside-out approach*. Frontiers in Systems Neuroscience, 2019. 13, Article 25. https://doi.org/10.3389/fnsys.2019.00025

[85] Farisco, M., Pennartz, C., Annen, J., Cecconi, B., and K. Evers. *Indicators and criteria of consciousness: ethical implications for the care of behaviourally unresponsive patients*. BMC Med Ethics, 2022. 23, 30. https://doi.org/10.1186/s12910-022-00770-3

- *To promote engagement activities with the public,* in order to raise awareness of the role played by culture and identify priorities for research and ethically sustainable methods to achieve relevant goals.

To people involved in providing technological services, like EBRAINS developers:

- *To facilitate the identification, assessment, and understanding of societal issues* emerging from the offered technology and their cultural situatedness, for instance through the inclusion of neuroethics and RRI services
- *To include a culture training program intended to raise awareness of the cultural diversity* and on how it impacts the social exploitation of technological services.
- *To create a virtual space*, for instance in the form of discussion forums or capacity development activities, *for mutual understanding between developers and users* of the impact of cultural diversity on research and service offerings.
- *To promote awareness of the gap between research findings and public benefit* by identifying different stakeholders, understanding relevant needs and benefits, and engaging with them.

6. Moving Forward

This Deliverable takes stock of what has been done in the HBP about cultural diversity so far and is intended to be a first step towards a more analytical reflection upon the connection between culture, neuroethics, and RRI. The next steps forward are to facilitate reflection on emerging culturally shaped ethical issues in collaboration with researchers from relevant Work Packages: consciousness and cognition; Artificial Intelligence and robotics, and to operationalise the recommendations provided above in EBRAINS.

More specifically, we will continue our work about indicators of consciousness in patients with DoCs described above, finalising the live paper and uploading relevant data and recommendations on EBRAINS. We will also finalise the collaborative research paper about brain-inspired AI, and we plan to collaborate on a scientific paper on the same issue.

For both these WP2 and WP3 activities, we will take the recommendations above as a reference.