

COMMENTARY

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# A four-part working bibliography of neuroethics: part 1: overview and reviews – defining and describing the field and its practices

Liana Buniak<sup>1</sup>, Martina Darragh<sup>2</sup> and James Giordano<sup>1,3,4\*</sup>

## Abstract

**Background:** Neuroethics entails investigations of neurocognitive mechanisms of morality and ethics; and studies and address of the ethical issues spawned by the use of neuroscience and its technologies to investigate cognition, emotion and actions. These two principal emphases, or what have been called “traditions” of neuroethics both mirror traditional bioethical discussions (such as debates about the safety of technological and pharmaceutical advances and ethical implications of new scientific and technological discoveries), and engage discourse about neuroscientific investigations of (proto-moral and moral) cognition, emotions and behaviors, and what such findings may mean for human beliefs and conduct - from the individual to the political levels.

Given the growth, range, and rapid maturation of the field of neuroethics we provide an iterative, four-part document that affords a repository of international papers, books, and chapters that address the field in overview, and present discussion(s) of more particular aspects and topics of neuroethics. This first installment lists reviews and overviews of the discipline, and broad summaries of basic developments and issues of the field.

**Methods:** To systematically survey the neuroethics literature, searches were performed by accessing 11 databases, 8 additional literature depositories, and 4 individual journal searches using indexing language for National Library of Medicine (NLM) Medical Subject Heading databases. Searches and assurance against overlapping coverage were conducted using the *RefWorks* citation management program.

**Results:** Overview, review and reflections upon the history and multicultural perspectives of neuroethics were obtained and relevant listings from international journals, books, and book chapters are provided. Part I will be followed by three installments that will address a) the neuroscience of morality and ethics, including discussions of free will, and personal autonomy; b) “second tradition neuroethics”, to include specific ethical issues in neuroscience; clinical neuroethics; and c) neuroethics education/training; neuroethics and society; neuroethics and law; neuroethics and policy; and international neuroethics.

**Keywords:** Neuroethics, Neuroscience, Neurobioethics, Bioethics, Ethics, Bibliography

## Introduction and background

Neuroscience has employed and built upon an existing body of research from the natural, physical and social sciences, as well as the humanities in attempts to establish a comprehensive understanding of the structure and

function of nervous systems and the brain. Utilizing ever more sophisticated tools, the multi-disciplinary approaches of neuroscience have enabled a number of exciting discoveries, and concomitantly challenged extant ideas about the relationship of brain and mind, and what such constructs—as well as the direction and momentum of neuroscientific inquiry itself—might mean and incur for the philosophies, moral beliefs, attitudes and values, ethical standpoints, and laws that define the social sphere.

Addressing such difficult questions—and answers—is the basis of the discipline of neuroethics. The term, “neuroethics” was introduced by Anneliese Pontius in a

\* Correspondence: [jg353@georgetown.edu](mailto:jg353@georgetown.edu)

<sup>1</sup>Neuroethics Studies Program, Edmund D. Pellegrino Center for Clinical Bioethics, Georgetown University Medical Center, Washington, DC 20057, USA

<sup>3</sup>Inter-disciplinary Program in Neuroscience and Department of Neurology, Georgetown University Medical Center, Washington, DC 20057, USA

Full list of author information is available at the end of the article

paper entitled “Neuro-ethics of ‘walking’ in the newborn”, which appeared in August 1973 in the journal *Perceptual and Motor Skills* [1]. The concept of “a neuroethics” (to include both the “neuroscience of ethics”, and the “ethics of neuroscience”) was defined and advanced by Adina Roskies [2] and the term – and field – became broadly, if not publicly identified as a result of William Safire’s opening lecture “Visions for a New Field of ‘Neuroethics’” at the 2002 Dana Foundation conference *Neuroethics: Mapping the Field* [3]. Considered to be the discipline’s “coming out conference” speakers called attention to neuroethical areas of inquiry, which encompass “...what is right and wrong, good and bad about the treatment of, or unwelcome invasion of and worrisome manipulation of the human brain” [4]. Yet, such a definition belied the richness of this newly emerging field.

Re-appropriating Roskies’ definition, neuroethics entails investigations of neurocognitive mechanisms of morality and ethics; and studies and address of the ethical issues spawned by the use of neuroscience and its technologies to investigate cognition, emotion and actions. These two principal emphases, or what have been called “traditions” of neuroethics both mirror traditional bioethical discussions (such as debates about the safety of technological and pharmaceutical advances and ethical implications of new scientific and technological discoveries) and directly engage neuroscientific investigations of (pre-moral and moral) cognition, emotions and behaviors, and philosophical, ethical and legal reflections upon what such findings may mean for human beliefs and conduct - from the individual to the political levels.

As a consequence of deepened interest and investments in the neurosciences, including for example, the United States’ (US) congressionally-declared Decade of the Brain (1990–1999), Decade of Pain Control and Research (2000–2009), the newly declared *Brain Research through Advancing Innovative Neurotechnologies* (BRAIN) initiative (<http://www.nih.gov/science/brain/>), and a number of international programs (such as the European Union’s *Human Brain Project*, and the *Asian Decade of the Mind*), the importance of neuroethics – as a set of practices and a discipline – increased, and research centers specifically dedicated to advancing neuroethics were established. Professional societies such as the Society of Neuroscience (SfN) and the International Brain Research Organization (IBRO) further encouraged open discourse regarding implications of neuroscience research and its social utility. The Dana Foundation (US), the United Nations Educational, Scientific, and Cultural Organization (UNESCO), World Health Organization (WHO), and the International Neuroethics Society (INS) have all been important to opening international communication in and about neuroethics by encouraging the “cross-fertilization

of ideas” at annual meetings and seminars. The continuing internationalization of the field will be essential as neuroscience research and its use become increasingly multinational, multi-cultural and multi-focal in scope and effect.

To accommodate this momentum, programs in neuroethics have been created within several universities, think tanks, and governmental agencies; these include:

- I. Asia
  - a. ELSI branch of Taiwan National Research Program for Genomic Medicine (NPPGM)
  - b. Neuroethics Working Group of the Bioethics Advisory Committee at the National University of Singapore (<https://www.bioethics-singapore.org/index.php/activities/current-projects>)
  - c. Research Institute of Science and Technology for Society (RISTEX) (subsection of Japan Science and Technology Agency 2004 (<http://www.ristex.jp/EN/aboutus/history.html>) <http://www.ristex.jp/EN/past/brain/index.html> (R&D Focus Area 2001-2009)
  - d. Strategic Research Program of Brain Sciences (SRPBS), Ministry of Education, Culture, Sports, Science, and Technology, RIKEN Brain Science Institute, Japan ([https://nijc.brain.riken.jp/modules/projects/index.php?content\\_id=10&ml\\_lang=en](https://nijc.brain.riken.jp/modules/projects/index.php?content_id=10&ml_lang=en))
- II. Australia/New Zealand
  - a. Moral Cognition, Neuroethics, and Neurolaw Research Cluster at CAVE (The Centre for Agency, Values, and Ethics) at Macquarie University, (<http://cave.mq.edu.au/home/>)
  - b. The University of Queensland Centre for Clinical Research (UQCCR) Neuroethics, University of Queensland, Brisbane, St. Lucie Queensland (<http://www.uqccr.uq.edu.au/neuroethics>)
- III. North America
  - a. Center for Cognition and Neuroethics, Flint, MI, USA (*Joint affiliation between the Department of Philosophy at the University of Michigan-Flint and the Insight Institute of Neurosurgery and Neuroscience (IINN)*) (<http://cognethic.org/>)
  - b. Center for Neuroscience and Society of University of Pennsylvania, Philadelphia, PA, USA (<http://www.neuroethics.upenn.edu/>)
  - c. Center for Neurotechnology Studies at the Potomac Institute for Policy Studies, Arlington, VA, USA (<http://www.potomacinstitute.org/>)
  - d. Cognitive Neuroscience Society, Center for Mind and Brain, Davis, California, USA (<http://www.cogneurosociety.org/about/>)
  - e. Mind, Brain Imaging, and Neuroethics Unit, University of Ottawa, Ottawa, Canada (<http://www.imhr.ca/research/mind-neuroethics-e.cfm>)

- f. Montreal Neuroethics Network, McGill University, Montreal, Canada (<http://www.mcgill.ca/psychiatry/category/tags/montreal-neuroethics-network>)
  - g. National Core for Neuroethics, University of British Columbia, Vancouver, Canada (<http://neuroethics.med.ubc.ca/>)
  - h. Neuroethics Research Unit, Institut De Recherche Clinique De Montreal, Montreal, Canada (<http://www.ircm.qc.ca/LARECHERCHE/axes/neuro/neuroethique/Pages/index.aspx?PFLG=1033>)
  - i. Neuroethics Studies Program, Pellegrini Center for Clinical Bioethics, Georgetown University Medical Center, Washington DC, USA (<https://clinicalbioethics.georgetown.edu/neuroethicsprogram>)
  - j. Neuroethics New Emerging Team (NET) Dalhousie University, Dalhousie, Nova Scotia (<http://www.neuroethics.ca>)
  - k. NeuroEthics Program at Cleveland Clinic, Cleveland, OH, USA (<http://my.clevelandclinic.org/about-cleveland-clinic/ethics-humanities-care/neuroethics.aspx>)
  - l. Program in Ethics and Brain Sciences (PEBS), Baltimore, MD, USA (*Joint affiliation between at Johns Hopkins Berman Institute of Bioethics Neuroethics Program and Johns Hopkins Brain Sciences Institute*) (<http://www.bioethicsinstitute.org/research/science-ethics/program-in-ethics-and-brain-sciences>)
  - m. Program in Neuroethics Stanford Center for Biomedical Ethics, Stanford, CA, USA. (<http://neuroethics.stanford.edu/>)
- IV. South/Central America
- a. Grupo de Pesquisa em Neurofilosofia – PUCRS, Instituto do Cérebro, Brazil
  - b. Programa de Estudios en Neuroética: Centro de Investigaciones Filosóficas (CIF), Argentina (<http://programaneuroeticacif.wordpress.com/>)
  - c. Neuroética, filosofia experimental e filosofia da mente, Brazil (<http://p1sql1.cnpq.br/buscaoperacional/detalhegrupo.jsp?grupo=0009701KU1BMW3>)
  - d. NeuroEduc—Núcleo de Estudos em Neurociências e Educação—Grupo de Pesquisa e Desenvolvimento—CNPQ, Brazil ([http://www.cienciasecognicao.org/portal/?page\\_id=66](http://www.cienciasecognicao.org/portal/?page_id=66))
  - e. Mente, Ética e Pós-humanismo (MEPH), Universidade Federal do Piauí—UFPI, Brazil (<http://p1sql1.cnpq.br/buscaoperacional/detalhegrupo.jsp?grupo=0323701LX6ENZ9>)
- V. United Kingdom
- a. Centre for Cognitive Liberty and Ethics, Cardiff University, Cardiff, UK. ([http://www.cognitiveliberty.org/proj\\_neuro.html](http://www.cognitiveliberty.org/proj_neuro.html))
  - b. Oxford-Wellcome Centre for Neuroethics, University of Oxford, Oxford, UK (<http://www.neuroethics.ox.ac.uk/>)
- VI. Western Europe
- a. Ethik in der Praxis, Ruhr-Universität Bochum, Bochum, GER ([http://www.ruhr-uni-bochum.de/malakow/klin\\_ethik/ethikkomitees\\_gruendung.html](http://www.ruhr-uni-bochum.de/malakow/klin_ethik/ethikkomitees_gruendung.html))
  - b. Institut de Cerveau et de la Moelle Epinière (ICM), Paris, FR (<http://icm-institute.org/menu/actualites>)
  - c. Munich Center for Neurosciences, the Ludwig-Maximilians University of Munich, GER ([http://www.gsn.uni-muenchen.de/download/general/mcn\\_brosch\\_fuer\\_internet.pdf](http://www.gsn.uni-muenchen.de/download/general/mcn_brosch_fuer_internet.pdf))
  - d. Italian Society for Neuroethics (Società Italiana di Neuroetica), San Raffaele University, in Milan, IT (<http://societadineuroetica.it>)
  - e. Research Group on Neuroethics and Neurophilosophy, Johannes Gutenberg University of Mainz, Mainz, GER (<https://teamweb.unimainz.de/fb05/Neuroethics/SitePages/Home.aspx>)
  - f. Science, Ethics, and Society Initiative, Munich, GER (Joint affiliation of Technical University of Munich and the Ludwig-Maximilians University of Munich)
  - g. Neuroethics Research Group, World Federation of Neurology (<http://wfneurology.org/researchGroups.php>)
- Many inter-disciplinary programs integrating biology, psychology, and cognitive science allow for students to study, and focus advanced scholarship, in neuroethics. In addition, numerous universities offer courses or workshops in neuroethics, as the medical, legal, and social issues of neuroethics tend to attract students from a variety of fields. Other than a few exceptions, such as the University of British Columbia, University of Pennsylvania, and Georgetown University, there are no programs of study specifically dedicated to neuroethics. In response, the program at the University of Pennsylvania provides links to Open Educational Resources (<https://sites.sas.upenn.edu/neuroethics>) that afford course materials (such as syllabi and useful links on the website) that encourage and support teachers and professors (of all levels and disciplines) to embrace neuroethics.

## Aims

Given the growth, inter-disciplinarity, and rapid maturation of the field of neuroethics since 2002 (see Figure 1), we posit the need for, and utility of a comprehensive bibliography of the neuroethics' literature. Toward this end, we provide an iterative, four-part document that affords a repository of international papers, books, and chapters that address the field in overview, and present discussion(s) of more particular aspects and topics of neuroethics. As shown in Table 1, this first installment

lists reviews and overviews of the discipline, and broad summaries of basic developments and issues of the field. Also included are reflections upon the history and multi-cultural perspectives of neuroethics. Part I will be followed by three installments, to address specific topics in neuroethics.

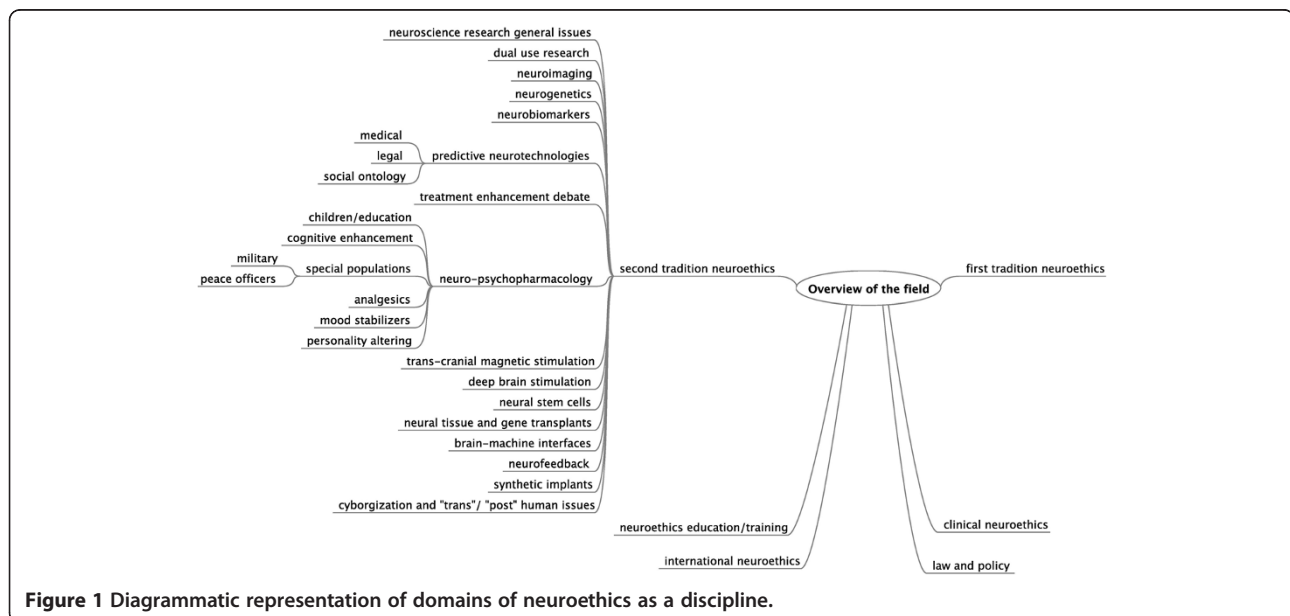
## Methods

Literature devoted to neuroethics can be found in books, journals, and web documents addressing medicine, biosciences, engineering, philosophy and other humanities, law, and the social sciences, as well as in general reference works and databases such as WorldCat (see below). To systematically survey the neuroethics literature, searches were performed in the following databases:

1. PubMed (<http://pubmed.gov>): This is the U.S. National Library of Medicine's (NLM) publicly accessible bibliographic database of journal articles from medicine, the life sciences and selected titles from the humanities;
2. The NLM Catalog (<http://www.ncbi.nlm.nih.gov/nlmcatalog>); a publicly accessible bibliographic database of books, book chapters, digital documents, and videos. The databases cover items in 60 languages that are indexed using MeSH (Medical Subject Headings). A subset of PubMed records is linked to full-text articles in the open access digital repository PubMed Central (<http://www.ncbi.nlm.nih.gov/pmc/>). In cases where funding requirements mandate open access publishing, selected articles from journals are made available through PubMed Central. For example, the only articles from *AJOB*

*Neuroscience* available through PubMed are PubMed Central documents.

3. Academic Search Premier. Presenting full-text compendia of academic journals from a wide range of disciplines including the basic sciences, social sciences, and the humanities, it covers documents in 22 languages from 1965 to the present (NB: some earlier coverage may also be provided). This proprietary database is produced by EBSCO Information Services. *AJOB Neuroscience* is fully indexed in Academic Search Premier.
4. Proquest Research Library. Affording a full-text database of books, conference proceedings, government documents, magazines, newspapers, pamphlets, scholarly journal articles, audio and video works and wire feeds, this resources provides documents in 42 languages from 1971 to the present. An example of a rare neuroethics document identified via this database is a transcript of a National Public Radio (NPR) segment featuring Henry Greely discussing the use of neuroimaging in the law. This proprietary database is produced by Proquest LLC, a subsidiary of Cambridge Information Group.
5. JSTOR. Comprised of three components: (a) a full-text archive of scholarly journals, (b) a digital library of current journal titles, and (c) digitized primary resources including books and reports, this resource affords US literature published prior to 1923, inclusive of titles such as the *Philosophical Transactions of the Royal Society* (UK) issues of which are available since its inception in 1665. Neuroethics literature found in JSTOR includes news items and editorials that are not indexed in



**Figure 1** Diagrammatic representation of domains of neuroethics as a discipline.

**Table 1 Scope and contents of four-part neuroethics bibliography**

|                 |  |
|-----------------|--|
| <b>PART I</b>   | <b>Overviews</b>   |
|                 | Reviews  |
|                 | Historical descriptions of neuroethics   |
|                 | Definitions and depictions of the field and its practices  |
| <b>PART II</b>  | <b>"First tradition neuroethics:" The neuroscience of morality and ethics</b>  |
|                 | Neuroscientific studies of moral cognition, emotion, decision-making, and behavior   |
|                 | Neuroscientific studies of "free will"   |
|                 | Neuroscientific studies of egoism and altruism   |
|                 | Implications of first tradition neuroethics  |
| <b>PART III</b> | <b>"Second tradition neuroethics:" Specific ethical issues in neuroscience</b>   |
|                 | Research issues  |
|                 | Translational models and problems  |
|                 | Use of animal models in neuroscience/ animal neuroethics   |
|                 | Clinical neuroethics   |
|                 | Treatment, enablement, enhancement   |
|                 | Use of novel neuroscientific and neurotechnological approaches in medicine   |
|                 | <ul style="list-style-type: none"> <li>• Neurology</li> <li>• Psychiatry/Psychology</li> <li>• Pain care</li> <li>• Rehabilitative medicine/prosthetics</li> </ul> |
| <b>PART IV</b>  | <b>Neuroethics and society/ international neuroethics</b>  |
|                 | Multicultural issues and perspectives in neuroethics   |
|                 | Studies of multinational approaches in/to neuroethics  |
|                 | Neuroethics, law, public safety, and national security and defense   |
|                 | Neuroethics and policy   |
|                 | Neuroethics education/training   |

other databases such as PubMed. JSTOR is a proprietary database produced by ITHAKA, an academic library services provider.

6. LexisNexis Academic. While primarily a full-text legal database, LexisNexis also provides access to a wide variety of documents such as U.S. Congressional hearings, news items, wire service reports, television and radio transcripts, international magazines, blog posts and web publications. United States' Supreme Court decisions and patents are available from 1790 to the present. International case law is included for the European Union and a number of other countries. A wide range of newspaper articles on neuroethics topics can be retrieved, including posts from *The Guardian* (U.K.) and *India Pharma News* (New

Delhi.) LexisNexis is a proprietary database produced by Reed Elsevier.

7. WorldCat (<http://www.worldcat.org>). A combined library catalog of more than 2 billion records from over 72,000 libraries worldwide, WorldCat is publicly accessible, and contains records for books, audiovisual materials, journal articles, musical scores, and web documents. Records for neuroethics items can be retrieved in over 40 languages.
8. Philosopher's Index. As a bibliographic database covering the philosophical literature, predominately journal articles but also some books, the database includes citations and abstracts in English, French, German, Italian and Spanish, and covers documents written in 39 languages from 1940 to the present. Examples of international journals featuring articles on neuroethical issues are the Lithuanian journal *Mokslo darbai: Problemos* (Problems: Research Papers), and *Isegoría: Revista de Filosofía Moral y Política* published by the Consejo Superior de Investigaciones Científicas (CSIC) (Spanish National Research Council.) Philosopher's Index is a proprietary database produced by the Philosopher's Information Center.
9. Embase. A bibliographic database focusing on the biomedical literature that includes journals from over 70 countries. Coverage dates from 1947 to the present. Embase is a proprietary database produced by Elsevier. Articles from the journal *Neuroethics* are indexed in Embase.
10. BELIT (<http://www.drze.de/belit/recherche/schnellsuche/recherche.html>). Providing a publicly accessible database, BELIT brings together online resources from five ethics centers: IDEM (Information and Documentation Centre on Ethics in Medicine) at the Academy for Ethics in Medicine in Göttingen, GER; IZEW (International Centre for Ethics in the Sciences and Humanities) at the University of Tübingen, GER; CDE (Centre de Documentation en Éthique) at the Comité Consultatif National d'Éthique, Paris, FRA; KIE (Kennedy Institute of Ethics) at Georgetown University, Washington, DC, USA; and DRZE (German Reference Centre for Ethics in the Life Sciences) in Bonn, GER. DRZE coordinates the project. Entering terms in English, German or French will retrieve citations in all three languages due to the utilization of a multilingual bioethics thesaurus.
11. Web of Knowledge/Web of Science (WoS). A proprietary database produced by Thomson Reuters, WoS combines over 20 databases with some back-files dating from 1900. The "core databases" are: Arts and Humanities Citation Index, Conference

Proceedings Citation Index, Science Citation Index Expanded, and Social Sciences Citation Index Expanded. In addition, WoS contains regional databases such as Brazil's SciELO Citation Index and the Chinese Science Citation Database. Searches for neuroethical topics can be limited to conference proceedings, book chapters, or meeting abstracts.

Open access repositories were another source of documents addressing topics in neuroethics that were utilized. These repositories included:

- 1) Digital Public Library of America (DPLA) (<http://dp.la/>) A collaborative effort of U.S. academic and public libraries led by the Berkman Center for Internet & Society at Harvard University. DPLA provides full-text access to public domain documents, electronic books, and online journals such as *Trends in Neurosciences*.
- 2) Directory of Open Access Journals (DOAJ) (<http://www.doaj.org/>) A collaborative project of both non-profit open access publishers such as BioMed Central and the open access divisions of for-profit publishers such as Taylor and Francis. Articles on neuroethics can be retrieved by text-word searches of titles and keywords.
- 3) Hathi Trust Digital Library (<http://www.hathitrust.org/>) A project of US university libraries coordinated by the University of California. The digital library contains public domain documents pertinent to neuroethical issues such as U.S. House of Representatives' committee hearings.
- 4) European Library (<http://www.theeuropeanlibrary.org/tel4/>) A cooperative catalog of over 45 European libraries with some full-text access to books, conference proceedings and journals addressing neuroethical issues.
- 5) Internet Archive (<http://archive.org/>). A digital library maintained by a non-profit organization headquartered in San Francisco, California (USA). The archive contains audio and video files pertaining to neuroethics.
- 6) Globethics.net (<http://www.globethics.net/>) Produced by a global network of ethicists and ethics institutions, Globalethics.net was organized at the 2003 World Summit on the Information Society (WSIS), a UNESCO meeting held in Paris each year. It includes links to journals such as *The Internet Journal of Law, Healthcare and Ethics* that contain articles on neuroethical issues.
- 7) Neuroethics-Wikiography (<https://teamweb.uni-mainz.de/fb05/Neuroethics/>) An online bibliography of journal articles on neuroethics from 2004 to the present. The site is produced by the Research Group on Neuroethics/Neurophilosophy, Department of

Philosophy, Johannes Gutenberg-Universität Mainz, GER.

- 8) Law and Neuroscience Bibliography (<http://www.lawneuro.org/bibliography.php>) is maintained by the Research Network on Law and Neuroscience at Vanderbilt University, TN, USA.

Several open access bioethics journals were not contained in the Directory of Open Access Journals (DOAJ) and therefore were searched individually; these were:

- 1) *Journal of Ethics and Social Philosophy* from the University of Southern California (<http://www.jesp.org/>);
- 2) *Journal of Mental Health Ethics* from McMaster University (<http://www.jemh.ca/>). The supplement for volume 6 (2011/2012) is devoted to neuroethics;
- 3) *Journal of Practical Ethics* (<http://www.jpe.ox.ac.uk/>) from the Oxford Uehiro Centre for Practical Ethics at the University of Oxford; and
- 4) *Philosophers' Imprint* from the University of Michigan (<http://www.philosophersimprint.org/>).

Citations obtained from open access journals were reviewed to determine if they have been published in journals abiding by the Committee on Publication Ethics (COPE) guidelines, or were indexed in one of the databases listed above. Only those that were published in COPE-referent journals and database indexed were included in the bibliography.

### Search strategies

The indexing language for NLM's databases, MeSH (Medical Subject Headings) (<http://www.ncbi.nlm.nih.gov/mesh/>) provided the basic search strategy for each topic. In addition to clinical terminology, MeSH contains ethics-related terms developed for BIOETHICSLINE, a specialty database devoted to bioethical issues produced for NLM by the Kennedy Institute of Ethics from 1975–2000. BIOETHICSLINE records were incorporated into PubMed and NLM Catalog in 2000.

### Overlapping coverage

A number of core bioethics journals have been indexed in PubMed from their inception. These include: *Accountability in Research*; *AJOB* (American Journal of Bioethics); *American Journal of Law and Medicine*; *Bioethics*; *Cambridge Quarterly of Healthcare Ethics*; *European Journal of Health Law*; *Journal of Bioethical Inquiry*; *Journal of Clinical Ethics*; *Journal of Health Politics, Policy and Law*; *Journal of Legal Medicine*; *Journal of Medical Ethics*; *Journal of Medicine and Philosophy*; *Kennedy Institute of Ethics Journal*; *Nursing Ethics*, and *Science and Engineering Ethics*.

In addition, PubMed includes significant coverage of journals such as *Developing World Bioethics*, *Monash Bioethics Review*, and *Theoretical Medicine and Bioethics*. The percentage of overlap with other databases, such as Philosopher's Index and Academic Search Premier, ranges between 50% - 60%. In developing the bibliography, the RefWorks citation manager program was utilized to eliminate duplicate reference citations.

The following references are to articles, book chapters, and monographs that provide overviews/reviews of neuroethics as a field of study.

### Review Articles

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### Conclusion: A "Participatory Bibliography"

This bibliography has been developed to address the prodigious growth, increased international publishing, and need for uniformity in the neuroethics' literature. The included entries have been selected from numerous journal articles, books, book chapters, and digital documents, written in several languages. In this way, the present work is intended to provide a comprehensive, although not exhaustive, resource of available information on the topic. While the databases and online resources described are troves of neuroethics' literature, it is important to bear a number of caveats to mind. First, the current trend of automated indexing can produce inaccurate retrievals by missing pertinent documents and/or by assigning inappropriate indexing terms to items. Second, coverage of journal titles can be truncated by faulty uploads. Third, in some cases the number of author-provided keywords can be limited due to space concerns.

Therefore, if you, the reader, find that an appropriate document is missing from this bibliography, please enter its citation in the online "Comment" section of this paper or email it to the bibliographic manager at: [bioethics@georgetown.edu](mailto:bioethics@georgetown.edu). Likewise, if any neuroethical programs/agendas have not been included in the listing, please provide this information for review, and accurately updated information will be included in a subsequent part of this series. It is our intent to develop this neuroethics bibliography as a "living document" that seeks to meet the needs of students, researchers, practitioners (of medicine, law, etc.), educators, and the public. As well, we invite readers to peruse similar repositories of neuroethics' information, namely The Law and Neuroscience Bibliography maintained by the MacArthur Foundation Research Network on Law and Neuroscience (<http://www.lawneuro.org/bibliography.php>), and the Neuroethics Bibliography maintained by the Research Group on Neuroethics/Neurophilosophy at the Johannes Gutenberg University in Germany (<https://teamweb.uni-mainz.de/fb05/Neuroethics/SitePages/Home.aspx>) so as to engage the entries provided herein – and in subsequent parts of this series – as contributory to a broader and more-finely grained presentation of scholarly work in the field.

#### Competing interests

The authors declare that they have no competing interests.

#### Authors' contributions

All authors contributed to study concept. LB and MD were responsible for data collection, interpretation, and manuscript preparation. JG was responsible for study design, data interpretation, and developing, revising and critical review of the manuscript. All authors were involved in, and have given final approval of the version of the manuscript to be published.

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#### Author details

<sup>1</sup>Neuroethics Studies Program, Edmund D. Pellegrino Center for Clinical Bioethics, Georgetown University Medical Center, Washington, DC 20057, USA.

<sup>2</sup>Bioethics Research Library, Kennedy Institute of Ethics, Georgetown University, Washington, DC 20057, USA. <sup>3</sup>Inter-disciplinary Program in Neuroscience and Department of Neurology, Georgetown University Medical Center, Washington, DC 20057, USA. <sup>4</sup>Human Science Center, Ludwig-Maximilians Universität, München, Germany.

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