Professional article

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Neurocriticism: a contribution to the study of the etiology, phenomenology, and ethics of the use and abuse of the prefix *neuro-*[1]

ABSTRACT

The last few decades, beside being proclaimed "the decades of the brain" or "the decades of the mind," have witnessed a fascinating explosion of new disciplines and pseudo-disciplines characterized by the prefix *neuro-*. To the "old" specializations of neurosurgery, neurophysiology, neuropharmacology, neurobiology, etc., some new ones have to be added, which might sound somehow awkward, like neurophilosophy, neuroethics, neuropolitics, neurotheology, neuroanthropology, neuroeconomy, and other.
Placing that phenomenon of "neuroization" of all fields of human thought and practice into a context of mostly unjustified and certainly too high – almost millenarianistic – expectations of the science of the brain and mind at the end of the 20th century, the present paper tries to analyze when the use of the prefix *neuro-* is adequate and when it is dubious.

Key words: brain, neuroscience, word coinage

Introduction

To enhance public awareness of the benefits to be derived from brain research, the Congress, by House Joint Resolution 174, has designated the decade beginning January 1, 1990, as the "Decade of the Brain" [...]. Now, Therefore, I, George Bush, President of the United States of America, do

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> *hereby proclaim the decade beginning January 1, 1990, as the Decade of the Brain. I call upon all public officials and the people of the United States to observe that decade with appropriate programs, ceremonies, and activities. In Witness Whereof, I have hereunto set my hand this seventeenth day of July, in the year of our Lord nineteen hundred and ninety, and of the Independence of the United States of America the two hundred and fifteenth.*[2]

Let aside the fact that a new decade did not begin in 1990 but a year later, with such pathos, George Bush Senior started an unprecedented avalanche of expectations, pompousness, and grants which will be lasting up today. The motives of launching the "Decade of the Brain" were inspired by increasing awareness and fear of the treath of Alzheimer's disease and neural sequels of drugs and AIDS, more than by the declared fascination by brain function. However, the race begun, primarily thanks to the efforts of the Library of Congress and the National Institute of Mental Health. The amount of neuroscience funding increased rapidly (although not as much as the Human Genome Project funding), and the popularization of the brain science did achieve significant advancement. Therefore, it had been no wonder that, when the "Decade of the Brain" had officially ceased, in 2001, a new project was set in motion – the "Decade of Behavior." Even before this "Decade" was finished, a new "Decade", the "Decade of the Mind" was conceived at a conference at George Mason University (Fairfax, Virginia) in May 2007: according to the "Mind Manifesto," published as a letter to the editor in *Science*, the "Decade of the Mind" should mark the period from 2012 to 2022 and attract some 4 billion dollars of funding.[3]

Obviously, we have been living at a time of a strongly and clearly declared highly-increased interest in the brain structure, function, pathology, and medical treatment. (How influential thereby is the interest of certain institutions into the possibility of mental manipulation, increase of mental capacities, neurotoxic interventions, etc., it still is to be determed.) That announced interest results in a new pressure upon scientists and reserch institutions, entering an unseen competitive situation. One of the major requests posed in front of the competitors is originality, innovativeness. Being first in wahtever means to be first to attract attention and funds: emerging are new scientific journals (Federation of European Neuroscience Societies, FENS, lists 62 journals with neuroscientific content,[4] but the list is far from being completed and updated), projects (the budget of the National Institute of Mental Health, NIMH, jumped from 0,385 billion dollars in 1989[5] onto

[2] Presidential Proclamation 6158 of July 17, 1990. http://www.loc.gov/loc/brain/proclaim.html

[3] Decade of the Mind. http://en.wikipedia.org/wiki/Decade_of_the_Mind. Last modified: May 10, 2010

[4] http://fens.mdc-berlin.de/links/neurojournals.html

[5] http://www.nimh.nih.gov/about/budget/nimh_approp_history.pdf

1,54 billion dollars in 2011[6]), research centers (e.g. Hrvatski institut za istraživanje mozga, 1990/1997), societies (e.g. Hrvatsko društvo za neuroznanost, 2000), and manifestations (e.g., Dana Alliance Brain Awareness Week). One of the fields originality has been tested is the invention of new sub-disciplines. It is the aim of the present paper to try to provide an incomplete overview of the chronological spread of the use of the *neuro-* prefix, in order to discuss some broader trends in conceiving and naming "new" disciplines.

A short primer of neuro-disciplines

The first use of the *neuro-* prefix certainly was older than the recent inflation of dedicated decades. According to some sources, the term *neurology* dates back to about 1681[7] (*neurologist* to 1832), neuropathology in 1853,[8] *neurophysiology* to 1868[9] (in June 1956, an entire Colloquium on the History of Neurophysiology was organized[10]), *neuropsychology* was first used in circa 1893,[11] *neuroanatomy* in cca 1899,[12] *neurosurgery* in 1904[13] (*neurosurgeon* in 1925[14]), *neurobiology* in 1906,[15] *neuropsychiatry* in 1918,[16] *neuroendocrinology* in 1922,[17] *neurochemistry* in 1924,[18] *neuroradiology* in 1938,[19] *neurohistology* in 1947,[20] *neuropharmacology* in 1950,[21] *neurotheology* was coined by Aldous Huxley in his 1962 utopian novel named *Island*,[22] a year later the term *neuroscience* was coined,[23] etc.

6 http://www.nimh.nih.gov/about/budget/cj2011.pdf

7 http://www.merriam-webster.com/dictionary/neurology

8 http://www.merriam-webster.com/dictionary/neuropathology

9 http://www.merriam-webster.com/dictionary/neurophysiology

10 http://jn.physiology.org/cgi/pdf_extract/20/2/211

11 http://www.merriam-webster.com/dictionary/neuropsychology

12 http://www.merriam-webster.com/dictionary/neuroanatomy

13 http://www.merriam-webster.com/dictionary/neurosurgeon

14 http://www.etymonline.com/index.php?l=n&p=6

15 http://www.merriam-webster.com/dictionary/neurobiology

16 http://www.merriam-webster.com/dictionary/neuropsychiatry

17 http://www.merriam-webster.com/dictionary/neuroendocrinology

18 http://www.merriam-webster.com/dictionary/neurochemistry

19 http://www.merriam-webster.com/dictionary/neuroradiology

20 R. Lindenberg and W. K. Noell, "Neurohistologic investigations on general oxygen deficiency of the brain," *Quarterly research report (USAF School of Aviation Medicine)* Oct; 3:9; R. Lindenberg, "Neurohistologic investigation on embolic injuries to the brain," *Quarterly research report (USAF School of Aviation Medicine)* Oct; 3:9; http://www.ncbi.nlm.nih.gov/pubmed/18909048

21 http://www.merriam-webster.com/dictionary/neuropharmacology

22 Aldous Huxley, *Island* (St. Albans : Triad/Panther, 1962/1976); http://en.wikipedia.org/wiki/Neurotheology

23 http://www.etymonline.com/index.php?term=neuroscience

Term	First registered use of the word
neurology	cca 1681
neuropathology	1853
neurophysiology	1868
neuropsychology	cca 1893
neuroanatomy	cca 1899
neurosurgery	1904
neurobiology	1906
neuropsychiatry	1918
neuroendocrinology	1922
neurochemistry	1924
neuroradiology	1938
neurohistology	1947
neuropharmacology	1950
neurotheology	1962
neuroscience	1963
neurogenetics	1966
neuroepidemiology	1967
neurooncology	1975
neuroethology	1976
neuropolitics	1977
neuroembryology	1977
neurocardiology	1977
neurotoxicology	1927
neuroimaging	1983
neurolinguistics	1985
neurocomputing	1987
neurophilosophy	1989
neuroinformatics	1992
neurolaw	1995
neuroengineering	1995
neuroprosthetics	1997
neuroenergetics	1999
neurogenomics	2001
neuroproteomics	2002
neuroethics	2002
neuromarketing	2002
neuroeconomics	2003
neuropedagogy	2004
neurorobotics	2004
neuroanthropology	2006

Source: Merriam-Webster On-Line Dictionary; Wikipedia; etc.

Many other *neuro-* terms are not to be found in the *Merriam-Webster On-Line Dictionary* at all.

It might be that **neurogenetics** as a term was first used in 1966,[24] meaning primarily the science studying the genetic underpinnings of the development of nervous system.

Since it allegedly was first introduced in 1967 by Len Kurland, Milton Alter, and John Kurtzke, the term **neuroepidemiology** has been used to determine the study of neurological disease distribution and determinants of frequency in human populations.[25]

Neurophysics, a sub-discipline of neural science devoted to the study of neural processes at subcellular level and of theories of brain function, might have been used as a term for the first time in a paper by Mylroie and H. Koenig dated 1971.[26]

According to the PubMed basis, the term **neurooncology**, for oncology devoted to the nervous-system tumors, first appeared in 1975.[27]

Neuroethology, devoted to the study of animal behavior and its underlying mechanistic control by the nervous system,[28] was promoted by the German scientist Jörg-Peter Ewert about 1976.[29]

While **neurotoxicology** seems to have not been used until 1977,[30] the term *neurotoxic* was known already at least in 1927.[31]

In the same year of 1977, probably also the name for **neuroembryology** was used for the first time in medical literature,[32] as well as for **neurocardiology** (designating the neurophysiology and neuropathology of the cardiovascular system).[33]

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[24] R. A. Tkachev, "[The task of neurogenetics in the pediatric clinic]," *Vestnik akademii meditsinskikh nauk SSSR* 21, no. 6 (1966): 91-96.

[25] http://en.wikipedia.org/wiki/Neuroepidemiology

[26] R. Mylroie and H. Koenig, "Soluble acidic lipoproteins of bovine neurosecretory granules: Relation to neurophysics," *Journal of Histochemistry and Cytochemistry* 19 (1971): 738-746.

[27] T. S. Kolesova and L. M. Anisimova, "[Use of the Brdicka polarographic filtrate test for brain tumors]," *Zhurnal nevropatologii i psikhiatrii imeni S.S. Korsakova* 75, no. 11 (1975): 1611-1613.

[28] http://en.wikipedia.org/wiki/Neuroethology

[29] Jörg-Peter Ewert, *Neuroethologie: Einführung in die neurophysiologischen Grundlagen des Verhaltens* (Heidelberg/Berlin/New York: Springer-Verlag, 1976).

[30] I. Dési, G. Dura, J. Szlobodnyik, and I. Csuka, "Testing of pesticide toxicity in tissue culture," *Journal of Toxicology and Environmental Health* 2, no. 5 (1977): 1053-66; http://www.ncbi.nlm.nih.gov/pubmed/68121

[31] N.N., "Effects of Electrical Charge on the Filterability of Microorganisms and Neurotoxic Drugs," *California and Western Medicine* 27, no. 1 (1927): 86.

[32] M. B. Heaton, "A technique for introducing localized long-lasting implants in the chick embryo," *Journal of Embryology and Experimental Morphology* 39 (1977): 261-266.

[33] H. R. Ruser, "[Monitoring systems in neurocardiology]," *Zeitschrift für die gesamte Hygiene und ihre Grenzgebiete*, 23, no. 6 (1977): 426-427.

It is possible that the first mention of the term **neuroimaging**, meant for techniques of representing the neural system, appeared in 1983.[34]

Neurolingustics, studying the neural mechanisms in the human brain that control the comprehension, production, and acquisition of language, was first coined as a term in 1985 by Harry Whitaker, who founded the *Journal of Neurolinguistics*.[35]

It might be that the term **neurocomputing** (computational neuroscience), standing for the study of brain function in terms of the information processing properties of nervous structures,[36] was not used before 1987[37] (the *Neurocomputing* journal appeared in 1989).

Neurophilosophy (or philosophy of neuroscience) was most probably first used by Patricia Smith Churchland, the philosopher who wrote a then very influential book *Neurophilosophy*,[38] trying to bring closer philosophers' considerations and the recent discoveries by neuroscience.

The name of **neuroinformatics**, oriented toward "the organization of neuroscience data and application of computational models and analytical tools,"[39] appeared for the first time probably around 1992 in a paper published in the Berlin journal *Biomedizinische Technik*:[40] three years later, in 1995, the Institute of Neuroinformatics was established at University of Zurich.

Neurolaw studies the effects of discoveries in neuroscience on legal rules and standards. The inventor of the term was J. Sherrod Taylor, in 1995, who frequently had used to represent in court people with neurological injuries.[41]

While "neural engineering," "a discipline that uses engineering techniques to understand, repair, replace, enhance, or treat the diseases of neural systems,"[42] might

[34] J.S. Meyer, H. Lechner, M. Reivich, and E.O. Ott, eds., *Cerebral Vascular Disease: 4. World Federation of Neurology, 11th Salzburg Conference. Excerpta Medica International Congress Series 616* (Amsterdam: Elsevier Biomedical Press BV, 1983).

[35] http://en.wikipedia.org/wiki/Neurolinguistics

[36] http://en.wikipedia.org/wiki/Computational_neuroscience

[37] Corporate Insights Incorporated Technical, *Neurocomputing: the technology, the players, the potential* (Englewood/ Fort Lee, NJ: Technical Insights, 1987).

[38] Patricia Smith Churchland, *Neurophilosophy: Toward a Unified Science of the Mind-Brain* (Cambridge, MA: The MIT Press, 1989).

[39] http://en.wikipedia.org/wiki/Neuroinformatics

[40] G. Pfurtscheller, D. Flotzinger, and K. Matuschik, "Sleep classification in infants based on artificial neural networks," *Biomedizinische Technik: Biomedical engineering* 37, no. 6 (1992): 122-130.

[41] J. Sherrod Taylor,"Neurolaw: Towards a new medical jurisprudence," *Brain Injury* 9, no. 7 (1995): 745-751.

[42] http://en.wikipedia.org/wiki/Neural_engineering

have been used as a term before, **neuroengineering** seems to have come to be in 1995.[43]

It might be that the term **neuroprosthetics** (for a discipline developing neural prostheses) was first used only in 1997,[44] although "neuroprosthetic" as adjective had been used already twenty years before, in a paper from 1977.[45]

Neuroenergetics, as a discipline devoted to the research of brain energetic processes, probably was first named in a 1999 paper by Rothman and collaborators, published in *Philosophical Transactions of the Royal Society in London - Series B*.[46]

In May 2001, the term **neurogenomics** appeared probably for the fisrt time in medical literature,[47] designating a discipline studying the function of genes with respect to the structural elements, functions, and diseases of the nerve system.

A year later, in 2002, it seems that the denomination **neuroproteomics** was coined,[48] reserved for the science dealing with proteins and protein synthesis within the nervous system.

Neuromarketing – the application of neuroimaging methods to product marketing[49] (studying consumers' sensorimotor, cognitive, and affective response to marketing stimuli) – was coined by Ale Smidts in 2002.[50]

In the same year, it seems that two more new neuro-terms were coined:[51] **neuroethics**, meaned for the neuroscience of ethics and the ethics of neuroscience (four years later, in May 2006, a Neuroethics Society came to be at a conference in Asilomar in

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[43] H.M. Buettner, "Neuroengineering in biological and biosynthetic systems," *Current Opinion in Biotechnology* 6, no. 2 (1995):225-229.

[44] **T.** Stieglitz, **H.** Beutel, **C.** Blau, **and J.U.** Meyer**, "**[Flexible multichannel microelectrodes with integrated leads for use in neuroprosthetics]**,"** *Biomedizinische Technik: Biomedical Engineering* 42 Suppl. (1997): 449-450.

[45] G.E. Loeb, A.E. Walker, S. Uematsu, and B.W. Konigsmark, "Histological reaction to various conductive and dielectric films chronically implanted in the subdural space," *Journal of Biomedical Materials Research* 11, no. 2 (1977): 195-210.

[46] L. Rothman, N.R. Sibson, F. Hyder, J. Shen, K.L. Behar, and R. G. Shulman, "In vivo nuclear magnetic resonance spectroscopy studies of the relationship between the glutamate-glutamine neurotransmitter cycle and functional neuroenergetics.," *Philosophical Transactions of the Royal Society in London – Series B* 354 (1999): 1165-1177.

[47] J. Butcher, "Neurogenomics--a capital investment?" *Lancet* 357, no. 9266 (2001): 1420; K. K. Jain, "Applied neurogenomics," *Pharmacogenomics* 2, no. 2 (2001): 143-152.

[48] E. E. Wanker, "Hip1 and Hippi participate in a novel cell death-signaling pathway," *Developmental Cell*, 2, no. 2 (2002): 126-128.

[49] Dan Ariely and Gregory S. Berns, "Neuromarketing: the hope and hype of neuroimaging in business," *Nature Reviews Neuroscience* 11 (2010): 284-292.

[50] http://en.wikipedia.org/wiki/Neuromarketing

[51] A. Roskies, "Neuroethics for the new millennium," *Neuron* 35 (2002): 21-23.

California), and **neuroesthetics**, as the study of the neural bases for the contemplation and creation of a work of art.[52]

Neuroeconomics studies the neural underpinnings of making decisions, taking risks, and evaluating rewards. Probably the first to formulate the name was Paul Glimcher in 2003.[53]

In 2004, **neuropedagogy** was first used in a conference paper by then Ph.D. student Kathryn Patten, who defined it as "the use of neuroscientific findings as a basis on which to theorize the role of emotions in teaching and learning."[54]

In the same year of 2004, **neurorobotics** ("the science and technology of embodied autonomous neural systems")[55] appeared for the first time, at least according to the PubMed base,[56] although the adjvective "neurorobotic" is five years older.[57]

Neuroanthropology is even younger: coined by Douglas Lewis of University of Melbourne in 2006, it is supposed to study cultural influence upon the brain functioning.[58]

Sometimes one term even has more different meanings. So **neuroevolution** is a form of machine learning that uses evolutionary algorithms to train artificial neural networks,[59] the Internet site presenting the chronicle of cognitive revolution in neuroscience,[60] or, at the same time, just an expression relating "evolution" in Darwinian sense to the nervous system.[61] **Neuropolitics** (probably applied for the first time by Timothy Leary in 1977[62]) is considered "the politics through which cultural

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[52] http://en.wikipedia.org/wiki/Neuroesthetics#cite_note-0; cf. also "The statement on neuroesthetics" by Semir Zeki (http://www.neuroesthetics.org/statement-on-neuroesthetics.php)

[53] Paul W. Glimcher, *Decisions, Uncertainty, and the Brain: The Science of Neuroeconomics* (Cambridge, MA: The MIT Press, 2003).

[54] http://www.ierg.net/confs/2004/Proceedings/Patten_Kathryn.pdf

[55] http://en.wikipedia.org/wiki/Neurorobotics

[56] J.K. Chapin, "Using multi-neuron population recordings for neural prosthetics," *Nature Neuroscience* 7, no. 5 (2004): 452-455.

[57] J.K. Chapin, K.A. Moxon, R.S. Markowitz, and M.A. Nicolelis, "Real-time control of a robot arm using simultaneously recorded neurons in the motor cortex," *Nature Neuroscience* 2, no. 7 (1999): 664-670.

[58] Alvaro Machado Dias, "The foundations of neuroanthropology," *Frontiers in Evolutionary Neuroscience* 2 (2010), 1-2.

[59] http://en.wikipedia.org/wiki/Neuroevolution

[60] http://www.neurevolution.net/

[61] Cf. Gary G. Berntson and John T. Cacioppo, "The neuroevolution of motivation", in *Handbook of Motivation Science*, edited by James Y. Shah and Wendi L. Gardner (New York: Guilford Press, 2008), 188-200 (http://psychology.uchicago.edu/people/faculty/cacioppo/jtcreprints/bc08e.pdf).

[62] Timothy Leary, *Neuropolitics: The Sociobiology of Human Metamorphosis* (Los Angeles: Starseed/Peace Press, 1977).

life mixes into the composition of body/brain processes,"[63] or "understanding of how the human brain organizes its political orientation"[64] (the most influential and revolutionary theses being that political views vary with psychological traits[65] and that voters' attituted might be predicted by neuroimaging[66]).

Here has not been made mention of the numerous terms using the *neuro-* prefix for other means than launching new disciplines, like, for instance, "neurotrauma," "neurobehavioral," "neuroaxis/neuroaxial," "neuroarchitecture," "neuro-enhancement," "neurogenesis," etc.,[67] even if some of them have been used for quite a long time (cf. *neurotic*, 1775; *neurosis*, 1776; *neuritis*, 1840; *neuropathy*, 1857; *neuroglia*, 1873; *neuron*, 1884/1891; *neuroticism*, 1900; *neurography*, meaning description of nervous structures, before 1913,[68] *neurotransmitter*, 1961; *neurorehabilitation*, *neurocritical* care, *neuroactive*, *neurofibril*, *neuropeptide*, *neurohumoral*, *neurohypophysis*, *neuroma*, *neurinoma*, *neuroblastoma*, *neurotoxin*, *neurohormonal*, *neurofibromatosis*, *neuromyelitis*, *neurodegenerative*, *neurosecretion*, *neuromuscular*, *neuroleptic*, *neuralgia*, *neurasthenia*, *neuritic*, *neurilemma*, *neuraminidase*, *neuraminic* acid, etc., etc., etc.).[69]

When, actually, is justified to invent a new name for a scientific discipline? Obviously, when really a new discipline emerges. Is the recent "neuroization", then, justified? A simple answer would be: no, because the fields of interest and pursuit of the most of those "new" disciplines, actually, overlap. In their booklet wittily entitled *Neuro-mania*, the Italian neuropsychologists (cognitive psychologists) Paolo Legrenzi and Carlo Umiltà advocated the idea that neuropsychology (that is, their own discipline) could have provided basis for most of the fields of the new pseudo-disciplines.[70] It has to be said, however, that, for some sciences, the prefix *neuro-* may offer a rebirth (ethology, theology, etc.), while for some other, it sounds like an awkward caricature (e.g., neuroeconomics or neuromarketing).

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[63] William E. Connoly, *Neuropolitics: Thinking, Culture, Speed* (Minneapolis/London: University of Minnesota Press, 2002), xiii.

[64] http://neuropolitics.org/

[65] Douglas R. Oxley, Kevin B. Smith, John R. Alford, Matthew V. Hibbing, Jennifer L. Miller, Mario Scalora, Peter K. Hatemi, and John R. Hibbing, "Political attitudes vary with physiological traits," *Science* 321, no. 5896 (2008): 1667-1670. "Individuals with measurably lower physical sensitivities to sudden noises and threatening visual images were more likely to support foreign aid, liberal immigration policies, pacifism, and gun control, whereas individuals displaying measurably higher physiological reactions to those same stimuli were more likely to favor defense spending, capital punishment, patriotism, and the Iraq War."

[66] Marco Iacoboni, Joshua Freedman, and Jonas Kaplan, "This is your brain on politics," *New York Times*, November 11, 2007. See also the criticism by Martha Farah, "This is your brain on politics? *Neuroethics & Law Blog*, November 12, 2007 (http://kolber.typepad.com/ethics_law_blog/2007/11/this-is-your-br.html)

[67] Cf. Berntson and Cacioppo, "The neuroevolution of motivation."

[68] http://www.thefreedictionary.com/neurography

[69] http://www.etymonline.com/index.php?l=n&p=6

[70] Paolo Legrenzi and Carlo Umiltà, *Neuro-mania: il cervello non spiega chi siamo* (Bologna: Il mulino, 2009).

Scientists researching the brain cherish the idea that their work is extremely important, unique, and indispensable. They often venture into other fields and sciences without feeling any inferiority complex, convinced that their knowledge on human brain be sufficient to understand and interprete everything. (It is true that sometimes neuroscientists also originated from other sciences: Francis Crick had been a chemist, working with the structure of hemoglobine and DNA, Gerald Edelman had discovered the structure of anti-body, and there have been neuroscientists who had previously received a Nobel Prize even for economy.) Modern neuroscientists are like ancient alchemists, believing they are up to discover the most important secrets of the life elixir and the philosophers' stone. Is not the hyperproduction of new names for (psudo)disciplines also a result of that arrogance?

In fact, nothing crucial has been discovered in neuroscience for quite a while, and the premordial entrapment in the mind-body problem still lasts: why, then, that explosion of "interest" in the brain at the end of the 20th and at the beginning of the 21st centuries? Is not it a contemporary variation of a historical periodical millenaristic movement, invoking a panacea for a society in general crisis? *Neuro-* seems to provide not only a desperate ultimate attempt at being original in science where everything has been said and done, but, morover, a guaranty of attracting attention and simulating importance.

(Far away from a) Conclusion

The authors of this paper are fully aware of the incompleteness of their short overview: a more profound study would be needed in order to draw more significant and far-reaching conclusions (e.g., etimological approach may be additionally enriched by the analysis of the parts of the new-coined words with the *neuro-* prefix; analysis at orthographic and morphological level may be introduced, etc.)[71].

What we can still see, nevertheless, is that, occasionally, "new" neuro-disciplines were emerging even before 1990. Some of them, like neurotheology or neuropolitics, were coined in the second half of the 20th century as literary figures rather than as serious new disciplines. After 1990, however, and especially during the last decade, new names have been imposed more ambitiously and aggressively: they, therefore, may be considered also less justified and more artificial, being produced within the boom of "the neuro-epoche". At the moment we do not see the end of the boom: there are so many old disciplines to be newly neuro-labeled.

[71] We thank very much anonimous reviewers for this constructive comments.

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Neurokritika: prilog proučavanju etiologije, fenomenologije i etike uporabe i zloporabe prefiksa neuro-

SAŽETAK

Posljednjih nekoliko desetljeća, osim što je bilo proglašeno "desetljećima mozga" ili "desetljećima uma", svjedoči fascinantnom eksplozijom novih disciplina ili pseudodisciplina koje se odlikuju prefiksom *neuro-*. "Starim" specijalizacijama neurokirurgije, neurofiziologije, neurofarmakologije, neurobiologije itd. pridružile su se i neke koje mogu zazvučati pomalo nespretno, poput neurofilozofije, neuroetike, neuropolitike, neuroteologije, neuroantropologije, neuroekonomije i drugih.

Stavljajući ovu pojavu "neuroizacije" svih područja ljudske misli i prakse u kontekst uglavnom neopravdanih a svakako prevelikih – gotovo milenarističkih – očekivanja od znanosti o mozgu i umu potkraj XX. stoljeća, ovaj rad pokušava analizirati kada je uporaba prefiksa *neuro-* primjerena a kada dvojbena.

Ključne riječi: mozak, neuroznanost, tvorba riječi