Bibliografia

ANDRESKI, S. *Herbert Spencer*. London: Thomas Nelson and Sons, 1972.

AUNGER, R. What's the Matter with Memes? In: GRAFEN, A. & RIDLEY, M. (eds). *Richard Dawkins. How a scientist changed the way we think*. Oxford: Oxford University Press. 2006 176-191.

CASTRO, C. (org) *Franz Boas: Antropologia Cultural*. Rio de Janeiro: Jorge Zahar, 2006.

----------, (org) *Evolucionismo Cultural: textos de Morgan, Tylor e Frazer*. Rio de Janeiro: Jorge Zahar, 2005.

CHALMERS, D.H. *The Conscious Mind*. Oxford: Oxford University Press, 1996.

BALDWIN, J. M. A New Factor in Evolution. In: *American Naturalist, 30*, 1896, pp. 536-553.

BLACKMORE, S. *The Meme Machine*. Oxford: Oxford University Press, 1999.

----------. "The meme's eye view". In: AUNGER, R. *Darwinizing Culture. The Status of Memetics as a Science*. Oxford: Oxford University Press, 2000, pp. 25-43.

BEHE, M. *A Caixa Preta de Darwin: O desafio da bioquímica à teoria da evolução*. Rio de Janeiro: Jorge Zahar, 1997.

BEVILACQUA, L., GALEÃO, A. C. N. R. , BULNES, E.; Uma Análise Qualitativa de Alguns Fatores Críticos na Dinâmica de uma Cadeia de Conhecimentos, In: *Parcerias Estratégicas – CGEE*, 20, n 5, 2005, pp. 1395-1417.

BLOCH, M. "A well-disposed social anthropologist's problems with memes". In: AUNGER, R *Darwinizing Culture. The Status of Memetics as a Science*. Oxford: Oxford University Press, 2000, pp. 189-205.

BONNER, J.T. *The Evolution of Culture in Animals*. Princeton: Princeton University Press, 1980.

BOYD, R. "Homeostasis, Species, and Higher Taxa". In: WILSON, R. A. *Species: New Interdisciplinary Essays*. Massachusetts: The MIT Press, 1999. pp. 141 – 186

BOYER, C.B., *História da matemática*. São Paulo: Ed. Edgard Blücher, 1996.

BRITO, M.T.S. Nos Trilhos da Inovação: Uma Contribuição Filosófica para a Consolidação de um Modelo para a Evolução Tecnológica . 2009. Dissertação de mestrado – Departamento de Filosofia da Universidade Federal de Brasília. Brasília, 2009

CARROLL, S. B. *Infinitas Formas de Grande Beleza. Como a evolução forjou a grande quantidade de criaturas que habitam o nosso planeta.* Rio de Janeiro: Jorge Zahar, 2006.

CAVALLI-SFORZA, L.L. *Genes, Povos e Línguas*. São Paulo: Companhia das Letras, 2003.

----------,. & CAVALLI-SFORZA, F. *Quem Somos? História da diversidade humana*. São Paulo: UNESP, 2002.

CHURCHLAND, P. Catching Consciousness in a Recurrent Net. In: BROOK, A. & ROSS, D. *Daniel Dennett*. Cambridge: Cambridge University Press, 2002, pp 64 – 82.

CROFT, W. *Explaining Language Change: an evolutionary approach*. London: Longman, 2000.

DARWIN, C. *A Origem das Espécies*. Rio de Janeiro: Ediouro, 2004.

---------. *A Expressão das Emoções no Homem e nos animais*. São Paulo: Companhia das Letras, 2000.

---------. *A Origem do Homem e a Seleção Sexual*. Curitiba: Hemus, 2002.

DAWKINS, R. *O Gene Egoísta.* Belo Horizonte: Ed. Itatiaia, 2001.

----------. *The Extended Phenotype. The long reach of the gene*. Oxford: Oxford University Press. 1999.

---------. *Desvendando o Arco-Íris*. São Paulo: Companhia das Letras, 2002.

--------. *O Relojoeiro Cego. A teoria da evolução contra o designo divino*. São Paulo: Companhia das letras, 2001.

---------. *O Rio que Saía do Éden*. Rio de Janeiro: Rocco, 1996.

---------. *A Escalada do Monte Improvável*. São Paulo: Companhia das Letras, 1998.

---------. *O Capelão do Diabo*. São Paulo: Companhia das Letras, 2005.

---------. *Deus, um delírio*. São Paulo: Companhia das Letras, 2007.

---------. Universal Darwinism. In: BENDALL, D., *Evolution: From Molecules to Men*, Cambridge: Cambridge University Press, 1983. pp. 403 – 425.

DENNETT, D.C. "Memes and the Exploitation of Imagination".In: *Journal of Aesthetics and Art Criticism*. 48, 1990, pp. 127-135.

----------. *Consciousness Explained*. Boston: Little, Brown and Company, 1991.

----------. *A Perigosa Idéia de Darwin*. Rio de Janeiro: Rocco, 1998.

----------. "Memes: Myths, Misunderstandings and Misgivings". 1998b. disponível em: http://ase.tufts.edu/cogstud/papers/MEMEMYTH.FIN.htm

---------. "The Evolution of Culture". 1999. disponível em: http://www.edge.org/3rd_culture/dennett/dennett_p1.html

---------. "With a Little Help from My Friends". In: ROSS, D. & BROOK, A. & THOMPSON, D. (eds) *Dennett's Philosophy*. Massachusetts: MIT Press, 2000, pp. 327-89.

---------. *Freedom Evolves*. New York: Viking, 2003.

---------.The Selfish Gene as a Philosophical Essay. In: GRAFEN, A. & RIDLEY, M. (eds). *Richard Dawkins. How a scientist changed the way we think*. Oxford University Press. 2006, pp. 101-116.

---------. *Tipos de Mente.* Rio de Janeiro: Ed. Rocco, 1997.

---------. *Quebrando o Encanto: a religião como um fenômeno natural*. São Paulo: Globo, 2006.

----------. *Sweet Dreams. Philosophical obstacles to a science of consciousness.* Massachusetts: The MIT Press, 2005.

DEPEW, D.J. & WEBER, B.H. (ed.) *Evolution and Learning. The Baldwin Effect Reconsidered*. Cambridge: Bradford Book, 2003.

DESCARTES, R. *Discurso do Método*, Rio de Janeiro: Ediouro, 1986.

--------. *Meditações Metafísicas*. São Paulo: Ed. Martins Fontes, 2000.

DESMOND, A. & MOORE, J. *Darwin, The life of a tormented evolutionist*. New York: W.W. Norton & Company, 1991.

DEWEY, J. *The Influence of Darwin on Philosophy and other essays*. New York: Prometheus Books, 1997.

DISTIN, K. *The Selfish Meme.* Cambridge: Cambridge University Press, 2005.

DOBZHANSKY, T. AYALA, F.J. *Studies in the philosophy of biology*. Berkley: University of California Press, 1974.

DUGATKIN, L.A. *The Imitation Factor. Evolution Beyond The Gene*. New York: The Free Press, 2000.

EAGLETON, T. *A Idéia de Cultura*. São Paulo: Ed. UNESP, 2005.

EINSTEIN, A. *A teoria da relatividade especial e geral*. Rio de Janeiro: Contraponto, 1999.

--------. *O Ano Miraculoso: cinco artigos que mudaram a face da física*. Rio de Janeiro: Ed. UFRJ, 2001.

ERESHEFSKY, M. "Species Pluralism and Anti-Realism". In: *Philosophy of Science*, 65 ,1998, pp. 103 – 120.

--------, "Species and Linnaean Hierarchy". In: WILSON, R. A. *Species: New Interdisciplinary Essays*. Massachusetts: The MIT Press, 1999. pp. 285 – 306.

FARACO, C.A. *Lingüística Histórica*. São Paulo: Parábola, 2005.

FERNADES, S. L. de C. *Filosofia e Consciência*. Rio de Janeiro: Areté, 1995.

FERNÁNDEZ-ARMESTO, F. *Então Você Pensa que é Humano?* São Paulo: Companhia das Letras, 2007.

FEYERABEND, P. *Contra O Método*. São Paulo: Unesp, 2007.

FITCH, W.T. "An invisible hand", In: *Nature*, 449/11 Octobre 2007. pp 665 – 667.

FOLEY, R. *Apenas mais uma Espécie Única*. São Paulo: Edusp, 1993.

FREIRE-MAIA, N. *Gregor Mendel. Vida e Obra*. São Paulo: T.A. Queiroz, 1995.

---------. *De Darwin à teoria Sintética*. São Paulo: Ed. USP, 1988.

FUTUYMA, D. J. *Biologia Evolutiva.* Ribeirão Preto: FUNPEC, 2002.

GRAHAM, G. *Genes: uma investigação filosófica*. São Paulo: Loyola, 2002.

GRAY, J. *Cachorros de Palha. Reflexões sobre humanos e outros animais*. Rio de Janeiro: Record, 2006.

GREENE, B. *O Universo Elegante: supercordas, dimensões ocultas e a busca da teoria definitiva.* São Paulo: Companhia das Letras, 2001.

GOODFIELD, J. *Brincando de Deus: a engenharia genética e a manipulação da vida*. Belo Horizonte: Ed. Itatiaia, 1994.

GOULD, S.J. "Darwinism and the Expansion of Evolutionary Theory". In: *Science*, 216, 1982, pp. 380-87

---------. "Sociobiology and the Theory of Natural Selection". In: RUSE, M. (ed.) *Philosophy of Biology*. New York: Prometheus Books, 1998: 253-64.

----------. “Da transmutação da lei de Boyle à revolução de Darwin”. In: FABIAN, A.C. *Evolução: sociedade, ciência e universo*. Bauru: Edusc, 2003.

---------. *A Montanha de Moluscos de Leonardo da Vinci*. São Paulo: Companhia das Letras, 2003.

---------. *Dinossauro no Palheiro*. São Paulo: Companhia das Letras, 1997.

---------. *A Galinha e Seus Dentes*. Rio de Janeiro: Paz e Terra, 1992.

---------.*A Falsa Medidado Homem*. São Paulo: Martins Fontes. 2003.

GRIFFITHS, P. E. “Squaring the Circle: Natural Kinds with Historical Essences”. In: WILSON, R. A. *Species: New Interdisciplinary Essays*. Massachusetts: The MIT Press, 1999. pp. 209 – 228.

GRAFEN, A. & RIDLEY, M. (eds). *Richard Dawkins. How a scientist changed the way we think*. Oxford: Oxford University Press. 2006.

HAIG, D. The Gene Meme. In: GRAFEN, A. & RIDLEY, M. (eds). In: *Richard Dawkins. How a scientist changed the way we think*. Oxford: Oxford University Press. 2006, pp. 50-66.

HULL, D. “Taking memetics seriously: Memetics will be what we make it”. In: AUNGER, R. *Darwinizing Culture. The Status of Memetics as a Science*. Oxford: Oxford University Press, 2000, pp. 43-69

----------. *Science as a Process: an evolutionary account of the social and conceptual development of science*. Chicago: The University of Chicago Press, 1988.

IFRAH, *Os Números: a história de uma grande invenção*. São Paulo: Globo, 1998.

JABLONKA, E. & LAMB, M.J. *Evolution in Four Dimensions: genetic, epigenetic, behavioral and symbolic variation in the history of life.* Massachusetts: The MIT Press, 2005.

KIM, J. *Mind in a Physical World: An Essay on the Mind-Body Problem and Mental Causation*. Cambridge: MIT Press, 1998.

KUHN, T.S. *A Estrutura das Revoluções Científicas*. São Paulo: Perspectiva, 2001.

KUPER, A.” If memes are the answer, what is the question?”. In: AUNGER, R. *Darwinizing Culture. The Status of Memetics as a Science*. Oxford: Oxford University Press, 2000, pp. 175-188.

LALAND, K.N. & BROWN, G.R. *Sense & Nonsense, evolutionary perspectives on human behaviour*. Oxford: Oxford University Press, 2004.

LARAIA, R de B. *Cultura: um conceito antropológico*. Rio de Janeiro: Jorge Zahar, 2006.

LAUDAN, L., *Progress and its Problems.* Oxford: Billing & Sons Limited, 1977.

LEAL-TOLEDO, G. *As Críticas a Filosofia Dualista da Mente.* 2002. Monografia (Bacharelado) – Instituto de Filosofia e Ciências Humanas, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, 2002 .

----------, *O Argumento dos Zumbis na Filosofia da Mente: são zumbis físicos logicamente possíveis?* Dissertação de mestrado – Departamento de Filosofia, Pontifícia Universidade Católica do Rio de Janeiro. Rio de Janeiro, 2005.

----------, Dennett e Chalmers: argumentos e intuição. *Trans/Form/Ação*, 29,n 2, pp.123-132. 2006.

----------, Os Céticos e Suas Crenças: a aparente duplicidade de Sexto Empírico. *Dissertatio*, 27 – 28, pp. 129 – 159. 2008.

---------, Sobre a Possibilidade de uma Ciência dos Memes. *Alter*, 7, n 8. 2007.

---------, *Memes*, Disponível em http://www.filosofiadamente.org/images/stories/textos/memes.doc . 2007.

LEIBNIZ, G. W. *Monadologia*. São Paulo: Ed. Abril Cultural, 1974.

LEWENS, T. *Organisms and Artifacts: Design in Nature and Elsewhere*. Massachusetts: The MIT Press, 2005.

LEWONTIN, R.C. *Biologia como Ideologia: a doutrina do DNA*. Ribeirão Preto: FUNPEC-RP, 2000.

LORENZ, K. *Fundamentos da Etologia.* São Paulo: Editora UNESP, 1995.

LUMSDEN, C.J. & WILSON, E.O. *O fogo de Prometeu: reflexões sobre a origem do espírito.* Lisboa: Gradiva, 1987.

LUMSDEN, C.J. & WILSON, E.O. *Genes, Mind and Culture*. Cambridge: Harvard University Press, 1981.

LYNCH, A. *Thought Contagion: How Belief Spreads Through Society. The New Science of Memes*. New York: Basic Books, 1996 .

MARCONI, M de A. & PRESOTTO, Z.M.N. P. *Antropologia: uma introdução*. São Paulo: Atlas, 2006.

MARE, R.A. *A Concepção da teoria Evolutiva desde os Gregos*. Porto Alegre: Edipucrs, 2002.

MARGULIS, L & SAGAN, D. *O Que é Vida*. Rio de Janeiro: Jorge Zahar, 2002.

MARTIN, R. *Para entender lingüística*. São Paulo: Parábola, 2003.

MAYR, E., "What is a Species, and What is Not?" In: *Philosophy of Science*, 63, June 1996, pp. 262 – 277.

--------, *Biologia, Ciência Única*. São Paulo: Companhia das Letras, 2005.

--------, *Uma Ampla Discussão. Charles Darwin e a gênese do moderno pensamento evolucionista.* São Paulo: Ed. FUNPEC, 2006.

MAYNARD-SMITH, J. *The Theory of Evolution*. Cambridge: Cambridge University Press, 1993.

METTLER, L. E. & GREGG, T. G. Genética *de Populações e evolução*. São Paulo: Ed.Polígono, 1973.

MISHLER, B.D. "Getting Rid of Species?". In: WILSON, R. A. *Species: New Interdisciplinary Essays*. Massachusetts: The MIT Press, 1999, pp. 307 – 316.

MITHEN, S. *A Pré-história da mente: em busca das origens da arte, da religião e da ciência*. São Paulo: Ed UNESP, 2002.

MONOD, J. *O Acaso e a Necessidade*. Rio de Janeiro: Ed. Vozes, 2006.

NIETZSCHE, F. *Genealogia da moral: uma polêmica*. São Paulo: Companhia das Letras, 1998.

NORMAN, D.A. *Emotional Design: why we love (or hate) everyday things*. New York: Basic Books, 2004.

NUNES, M. R. F. *A Memória na Mídia: a evolução dos memes de afeto.* São Paulo: annablume, 2001.

O'HARA, R. J. "Population Thinking and Tree Thinking in Systematics". In: *Zoologica Scripta*, 26, n 4. 1997, pp. 323 – 329.

PENROSE, R. *A Mente Nova do Rei*. Rio de Janeiro: Campus, 1997.

PETROSKI, H. *A Evolução das coisas úteis:clipes, garfos, latas, zíperes e outros objetos do nosso cotidiano*. Rio de Janeiro: Zahar, 2007.

PINKER, S. "Deep Commonalities between Life and Mind". In: GRAFEN, A. & RIDLEY, M. (eds). *Richard Dawkins. How a scientist changed the way we think*. Oxford: Oxford University Press. 2006, pp. 130-145.

---------. *Tabula Rasa: a negação contemporânea da natureza humana*. São Paulo: Companhia das Letras, 2004.

----------. *Como a Mente Funciona*. São Paulo: Companhia das Letras, 1998.

PLOTKIN, H. *Evolutionary Thought in Psychology*. Oxford: Blackwell, 2004.

---------. *Darwin Machines and Nature of Knowledge*. Massachusetts: Havard University Press, 1997.

POPPER, K.R. *Conhecimento Objetivo: uma abordagem evolucionária*. Belo Horizonte: Ed. Itatiaia, 1975.

----------. *Lógica das Ciências Sociais*. Rio de Janeiro: Tempo Brasileiro, 1999.

----------. [Letter on] Evolution. [A reply to Halstead, 1980]. On-line. Disponível em http://www.geocities.com/geocities/9468/popper80.htm.

---------. "Natural Selection and the Emergence of Mind", in: *Dialectica*, 32, n 3 e 4, 1978, pp. 339-355.

---------. *Unended Quest: An Intellectual Autobiography*. La Salle: Open Court Press, 1976.

QUINE, W.V. *Espécies Naturais*. (col. Os Pensadores), São Paulo, Ed. Abril, 1975.

RAMACHANDRAN,V.S. & BLAKESLEE, S. *Fantasma no cérebro: uma investigação dos mistério da mente humana*. Rio de Janeiro: Record, 2002.

RICHERSON, P. J. & BOYD, R. *Not by genes alone: how culture transformed human evolution*. Chicago: University of Chicago Press, 2006.

----------, *The Origin and Evolution of Cultures*. Oxford: Oxford University Press, 2005.

RIDLEY, M. *Evolução*. Porto Alegra: Artmed, 2006.

--------, "Principles of Classification" In: RUSE, M. (ed) *Philosophy of Biology*. New York: Prometheus Books, 1998. pp 167 – 179.

ROSS, D. "Dennettian Behavioural Explanations and the Roles of the Social Sciences". In: BROOK, A. & ROSS, D. *Daniel Dennett*. Cambridge: Cambridge University Press, 2002, pp 140 – 186.

RIZZOLATTI, G. & SINIGAGLIA, C., *Mirrors in the Brain: how our minds share actions and emotions*. Oxford: Oxford University Press, 2008.

RUSE, M. *The Darwinian Revolution*. Chicago: Chicago Press, 1979.

----------. *Sociobiologia: Senso ou Contra-Senso?* Belo Horizonte: Ed. Itatiaia, 1983.

----------. *Levando Darwin a Sério*. Belo Horizonte: Ed. Itatiaia, 1995.

----------, *The Darwinian Revolution*, Chicago: University of Chicago Press, 1979.

SEAGER, W. "Real Patterns and Surface Metaphysics". In: ROSS, D. & BROOK, A. & THOMPSON, D. (eds) *Dennett's Philosophy*. Massachusetts: MIT Press, 2000.

SEARLE, J.R. *A Redescoberta da Mente.* São Paulo: Martins Fontes, 1997.

----------. *O Mistério da Consciência*. São Paulo: Paz e Terra, 1998.

----------. Why I Am Not a Property Dualist. In: *Journal of Consciousness Studies*, 9, n 12, 2002, pp. 57-64.

SIMONTON, D.K. *A Origem do Gênio: perspectivas darwinianas sobre a criatividade*. Rio de Janeiro: Record, 2002.

SMART, J. J.C. *Philosophy and Scientific Realism*. London: Routledge & Kegan Paul, 1966.

SOTO, C. & CASTILLA, C. The controversial protein-only hypothesis of prion propagation. On-line. Disponível em http://www.nature.com/nm/journal/v10/n7s/full/nm1069.html.

SOUSA, C.V. & SOUSA, E.V. Estratégias de competição na Indústria Farmacêutica: das cadeias verticais às parcerias flexiveis. On-line. Disponível em: http://www.abepro.org.br/biblioteca/ENEGEP2007_TR620408_8807.pdf.

SPERBER, D. "An objection to the memetic approach to culture". In: AUNGER, R. *Darwinizing Culture. The Status of Memetics as a Science*. Oxford: Oxford University Press, 2000, pp. 163-74.

---------. *Explaining Culture: a naturalistic approach*. Oxford: Blackwell, 1996.

STERELNY, K. *Dawkins vs Gould. Survival of the Fittest.* Icon Books, 2001.

----------, & GRIFFITHS, P.E. *Sex and Death: an introduction to Philosophy of Biology*. Chicago: The University of Chicago Press, 1999.

TOOBY, J. COSMIDES, L., BARKOW, J. *The Adapted Mind*. New York: Oxford University Press, 1992.

TRIVERS, R. *Social Evolution*. California: The Benjamin/ Cummings, 1985.

WAIZBORT, R. "Cento e Quarenta anos sem Charles Darwin Bastam: sobre variedades, espécies e definições". In: *Principia*, 4, n 1, 2000. pp 141 – 184.

WEEDWOOD, B. *História concisa da Lingüística*. São Paulo: Ed. Parábola, 2002.

WEINER, J. *O Bico do Tentilhão: uma história da evolução no* nosso tempo. Rio de Janeiro: Rocco, 1995

WHEWELL, W. *The Philosophy of the Inductive Sciences*: *founded upon their history*. New York: Johnson Reprint Corporation, 1967.

----------.. *Theory of Scientific Method*. Indianapolis: Hackett Pub. Co, 1968.

WILSON, E.O. *Sociobiology: the new synthesis*. Cambridge: Belknap Press, 1975.

---------, *Da natureza humana*. São Paulo: Ed. USP, 1981.

----------, *Diversidade da Vida*. São Paulo: Companhia das Letras, 1994.

WILSON, R. A. "Realism, Essence, and Kind: Resuscitating Species Essentialism?" In: WILSON, R. A. *Species: New Interdisciplinary Essays*. Massachusetts: The MIT Press, 1999. pp. 187 – 208.

Anexo I

Introdução

Memes are instructions for carrying out behaviour, stored in brains (or other objects) and passe don by imitation (Blackmore, 1999, p.17).

Capítulo 1

So philosophy is important to biology because biology's exciting conclusions do not follow from the facts alone. Conversely, biology is important to philosophy because these exciting conclusions really do depend on the biological facts (Sterelny & Griffths, 1999, 5)

"received view" (1999, p.22).

mutations are added, but they are not taken away, hence the analogy of the ratchet (Sterelny & Griffiths, 1999, 207)

It has been estimated that in the human genome at most 1.5 percent of DNA codes for proteins. A little codes for tRNAs and other nontranslated RNA, but most of it is never or hardly ever transcribed, let alone translated. (Jablonka & Lamb, 2005, 52)

A major difficulty in population genetics is that our theory has to do with the frequencies of genes and genotypes in populations whereas our observations are of phenotypes. Only rather rarely do we know the genetic basis of the phenotypic difference we observe (Maynard-Smith 1993, 184).

If a varied population of entities give rise to descendants like themselves, and if those entities differ in fitness, selection will generate evolutionary change in that population regardless of the type of entity in question (Sterelny & Griffiths, 1999, 41)

is not tied to any particular mechanism of heredity or cause of variation (Jablonka & Lamb, 2005, 16).

The entire developmental process reconstructs itself from one generation to the next via numerous interdependent casual pathways"(Sterelny & Griffiths, 1999, 95)

Although we are not advocating it we want to be clear that is possible to be a perfectly good Darwinian without believing in Mendel's law, mutating genes, DNA codes, or any of the other accoutrements of modern evolutionary biology. That is why Darwin's theory can be and is so widely applied – to aspects of

cosmology, economics, culture, and so on, as well as to biological evolutions (Jablonka & Lamb, 2005, 12)

the ability to replicate is not the property of DNA, but of the celular system (Jablonka & Lamb, 2005, 49)

the generation of mutations and other types of genetic variation is not a totally unregulated process (Jablonka & Lamb, 2005, 78)

try everything in the hope that something will work (Jablonka & Lamb, 2005, 93)

We give the name Lamarckism to the theory that the gene-line is not insulated, and that environmental imprinted improvements may directly mould it. (Dawkins, 1999, 167)

intelligent guesses in response to the conditions of life (Jablonka & Lamb, 2005, 361).

Daughter cells can inherit patterns of gene activity present in the parent cell (Jablonka & Lamb, 2005, 119)

methylation patterns can be reproduced (at least in vertebrates and plants) because they hitchhike on the semiconservative replication of DNA (Jablonka & Lamb, 2005, 129).

probably occur preferentially on genes that are induced to be active by new conditions (Jablonka & Lamb, 2005, 144)

DNA is the medium, not the message. A gene is not a DNA molecule; it is the transcribable information coded by the molecule ... the gene is a packet of information, not an object (Williams, 1992, 11 in: Sterelny & Griffiths, 1999, 100)

Another requirement for cumulative selection is a relatively low mutation rate. If the mutation rate is very high relative to the strength of selection, then the mechanisms that generate variation will swamp the effects of selections (Sterelny & Griffiths, 1999, 36)

gene transfer has been crucial in the evolution of drug resistance (Maynard-Smith, 1993, 5).

Simbiosis is meant the union in a single functional unit of two or more separately evolved organism" (Maynard-Smith, 1993, 119)

Indeed we may never know how many of our genes, whether 'junk' or 'useful', originated as inserted plasmids (Dawkins, 1999, 226).

The idea that the gene is the unit of selection does not deny the reality or importance of organisms (Sterelny & Griffiths, 1999, 61).

whatever problems gene selectionism faces, gentic determinism is not one of them (Sterelny & Griffiths, 1999, 59).

Capítulo 2

There must be some principle that shows, for example, that variation in leg number amongst arthropods is a genuine aspect of disparity, whereas variation in nostril hair number in primates is not (Sterelny, 2001, 106).

When a geneticist speaks of a gene 'for' red eyes in Drosophila, he is not speaking of the cistron which acts as template for the synthesis of the red pigment molecule. He is implicitly saying: there is variation in eye colour in the population; other things being equal, a fly with this gene is more likely to have red eyes than a fly without the gene (Dawkins, 1999, 21)

Phenotypes are not caused by genes, but only phenotipic differences caused by genes differences (Dawkins, 1999, 195).

Capítulo 3

Memes are instructions for carrying out behaviour, stored in brains (or other objects) and passed on by imitation (Blackmore, 1999, p.17).

any kind of mental state, conscious or not, that is acquired or modified by social learning and affects behavior (Richerson & Boyd, 2006, 5).

When asked a question which required deep thought, she would screw her eyes tight shut, jerk her head down to her chest and them freeze for up to half a minute before looking up, opening her eyes, and answering the question with fluency and intelligence (Dawkins, in Blackmore, 1999, vii).

As Dawkins point out, good Catholics have faith; they do not need proof. Indeed, it is a measure of how spiritual and religious you are that you have faith enough to believe in completely impossible things without asking questions, such as the wine really turned into blood. This assertation cannot be tested because the liquid in the cup still tasted, looks and smells like wine – you must just have faith that it is really Christ's blood. If you are tempted by doubt, you must resist. Not only is God invisible but he 'moves in mysterious ways'. The mystery is part of the whole package and to be admired in its own right. This untestability protects the memes from rejection. (Blakmore, 1999, 192)

I believe a sufficient case has been made that the analogy between memes and genes is persuasive and that the obvious objections to it can be satisfactorily answered. (Dawkins in Blackmore, 1999, xv)

There is no single definitive "stream of consciousness," because there is no central Headquarters, no Cartesian Theater where "it all comes together" for the perusal of a Central Meaner. Instead of such a single stream (however wide), there

are multiple channels in which specialist circuits try, in parallel pandemonius, to do their various things, creating Multiple Drafts as they go. Most of these fragmentary drafts of "narrative" play short-lived roles in the modulation of current activity but some get promoted to further functional roles, in swift succession, by the activity of a virtual machine in the brain. The seriality of this machine (its "von Neumannesque" character) is not "hard-wired" design feature, but rather the upshot of a succession of coalitions of these specialists (Dennett, 1991, p. 253 – 254)

The only position on reason that memetics contradicts is the well-nigh incoherent position that supposes reasons somehow exist without support from biology at all, hanging from some Cartesian skyhook (Dennett, 2003, 187)

Whether a meme spreads depends on whether successful, charismatic, or powerful individuals adopt it (Laland & Odling-Smee, 2000, 135).

Human infants are able to imitate a wide range of vocal sounds, body postures, actions on objects, and even completely arbitrary actions like bending down to touch your head on a plastic panel. By 14 months of age they can even delay imitation for a week or more, and they seem to know when they are being imitated by adults. Unlike any other animals, we readily imitate almost everything, and seem to take pleasure in doing so (Blackmore, 1999, 50)

Instead of thinking of our ideas as our own creations, and as working for us, we have to think of them as autonomous selfish memes, working only to get themselves copied (Blackmore, 1999, 8)

Imagine a world full of hosts for memes (e.g. brains) and far more memes than can possibly find homes. Now ask, which memes are more likely to find a safe home and get passed on again? (Blackmore, 1999, 37)

Women who have only one or two children, or none at all, are far more likely to have jobs outside home, to have an exciting social life, to use e-mail, to write books and papers and articles, to become politicians or broadcasters, or do any number of other things that will spread their memes, including the memes for birth control and the pleasures of a small family. These are the women whose pictures appear in the media, whose success inspires others, and whom provide role models for other women to copy. (Blackmore, 1999, 140)

Psychological experiments confirm that people are more likely to be influenced and persuaded by people they like. So his friends will imitate his popular behaviour and thus his altruism will spread. And the more friend he has, the more people can potentially pick up his ways of making him self popular. (Blackmore, 1999, 155)

We smile at people a lot, and we smile back at people who smile at us first. We say kind and polite things to them – 'How are you?' 'I do hope your parents are well' 'Have a nice time at the party' 'How may I help you?' 'Have a good day' 'Happy New Year'. With all these common memes we give the impression of

caring about the other person, even if we do not. That is why they are successful memes. Our ordinary everyday conversation is full of such memes. (Blackmore, 1999, 165)

did cladist referees treat papers submitted by fellow cladists more gently than papers submitted by non-cladists? (Hull, 2000, 62)

I had transformed an apparent falsifier into a confirming instance, one of the strongest indicators that a research program is progressive (Hull, 2000, 62).

Capítulo 4

The creation of inbred lines of mice (and dogs) differing genetically from each other reveal behavioral differences even when the environment is held constant. Crosses between closely related bird species that differ in the behavior produce offspring with a mixture of behaviors, suggesting a mixture of genes acting at several loci. The examples go on. Taken together they suggest that behavioral traits are no different from other traits in having genetic components. (Trivers, 1985, 98)

even normal 'internal' phenotypic effects may lie at the end of long, ramified, and indirect casual chains (Dawkins, 1999, 198)

The principle is the same, whether the cells happen to be organized into one large homogeneous clone, as in the human body, or into a heterogeneous collection of clones, as in the termite mound (Dawkins, 1999, 201)

Two species of acanthocephalan worms, Polymorphus paradoxus and P. marilis. Both use freshwater 'shrimp' (really a amphipod), Gammarus lacustris, as an intermediate host, and both use ducks as the definitive host. P. paradoxus, however, specializes in the mallard, which is a surface-dabbling duck, while P. marilis specializes in diving ducks. Ideally, then P. paradoxus might benefit by making its shrimps swim to the surface, where they are likely to be eaten by mallards, while P. marilis might benefit by making its shrimps avoid surface. (Dawkins, 1999, 116)

Genes affect proteins, and proteins affect X which affect Y which affect Z which... affects the phenotypic character of interest. But the conventional geneticist defines 'phenotypic effect' in such a way that X, Y and Z must all be confined inside one individual body wall. The extended geneticist recognized that this cut-off is arbitrary, and he is quite happy to allow his X, Y and Z to leap the gap between one individual body and another. (Dawkins, 1999, 232)

A strategy that is successful when competing with copies of itself (Dawkins, 1999, 120).

Their families had never corresponded, yet similarities were evident when they first met at the airport. Both suported mustaches, and two-pocket shirts with epaulets. Each had his wire-rimmed glasses with him. They share abundant

idiosyncrasies. The twins like spicy foods and sweet liquors, are absent-minded, fall asleep in front of the television, think it is funny to sneeze in a crowd of strangers, flush the toilet before using it, store rubberbands on their wrists, read magazines from back to front, and dip buttered toast in their coffee (Trivers, 1985, 100)

Human beings inherit a propensity to acquire behavior and social structures, a propensity that is shared by enough people to be called human nature. The defining traits include division of labor between the sexes, bonding between kin, incest avoidances, other forms of ethical behavior, suspicion of strangers, tribalism, dominance orders within groups, male dominance over-all, and territorial aggression over limiting resources. Although people have free will and the choice to turn in many directions, the channels of their psychological development are nevertheless (…) cut more deeply by the genes in certain directions than in others. While cultures vary greatly, they inevitably converge toward these traits. (Wilson, 1994, in: Laland & Brown, 2002, 88)

Time and again, my sociobiological colleagues have upbraid me as a turncoat, because I will not agree with them that the ultimate criterion for the success of a meme must be its contribution to Darwinian 'fitness'. At bottom, they insist, a 'good meme' spreads because brains are receptive to it, and the receptiveness of brains is ultimately shaped by (genetic) natural selection. The fact that animals imitate other animals at all must ultimately be explicable in terms of their Darwinian fitness. (Dawkins, 1999, 110)

Cosmides and Tooby (1987) characterize the difference between the standard social science view and their perspective as representing a choice between two models of the mind, one that lays emphasis on a small number of domain-general processes versus another stressing a large number of domain-specific modules. (Laland & Brown, 2002, 182).

They expected one object when added to another to result in two objects and not one or three, and that one object removed from an initial display of two should result in one object, not two or none at all. (Plotkin, 2004, 133)

human reasoning changes depending on the subject matter about which one is reasoning (Laland & Brown, 2002, 168).

The costs, measured in terms of the energy needed to fly to a specific height and the number of times that a whelk must be dropped before it is smashed open, can be traded against the benefits, the calorific value of each whelk. Observation of actual behavior, of the height from which the whelks are dropped and the average frequency for which this must be done when they are dropped from different heights, can be compared with the predictions of a simple model that computes what the optimal behavior which yields the greatest benefits against the least cost is. (Plotkin, 2004, 119)

The principal goal of human behavioural ecology is to account for the variation in human behaviour by asking whether models of optimality and fitness-

maximization provide good explanations for the differences found between individuals (Laland & Brown, 2002, 112)

So long the behaviour is adaptive, then it can be predicted with formal models (Laland & Brown, 2002, p.136).

A female's genetic predisposition was 'pulling' her toward a more orange male, but social cues and the potential to copy the choice of others was tugging her in the exact opposite direction – toward the drabber of two males. When males differed by small amounts of orange, females consistently chose the less orange males. In other words, they copied the choice of a female placed near such a male. (Dugatkin, 2000, 24, 25)

Baldwin in fact was clearer than Darwin himself about his commitment to a non-Lamarckian approach to evolution (Downes, in Depew & Weber, 2003, 35)

Suppose a population encounters a new environmental condition, in which its old behavioral strategies are inappropriate. If some members of the population are plastic with respect to their behavioral program, and can acquire in the course of their lifetime new behavioral program skills that fit their new surroundings, these plastic individuals will survive and reproduce at the expense of less flexible individuals. The population will then have the chance to produce mutations that cause organisms to exhibit the new optimal behavioral profile without the need for learning. Selection will favor these mutants, and in time the behaviors which once had to be learned will be innate

In the animals, the social transmission seems to be mainly useful as enabling a species to get instincts slowly in determinate directions, by keeping off the operation of natural selection. Social Heredity is then the lesser factor. (Baldwin, 1896, 540)

Extensive use of symbolic communication would have constituted something analogous to a novel niche, imposing novel selection pressures on human cognition and vocal system (Deacon, in Depew & Weber, 2003, 90)

If the Baldwin effect occurs, either there is or there is not a casual connection between an individual accommodation [acquired adaptive trait] and subsequent genetic change in a population. If there is no such connection, then the truly genetic change must occur wholly by mutation, reproduction and natural selection, and the accommodation may be irrelevant. If there is a casual connection, the neo-Lamarckian argument is as much supported as supplanted (Simpson, 1953 in Depew & Weber, 2003, 65)

If individuals vary genetically in their capacity to learn, or to adapt developmentally, then those most able to adapt will leave most descendants, and the genes responsible will increase in frequency. In a fixed environment, when the best thing to learn remains constant, this can lead to the genetic determination of a character that, in earlier generations, had to be acquired afresh in each generation (Maynard-Smith, 1996, in Depew & Weber, 2003, 38)

socially-acquired actions of a species, notably man, are socially handed down, giving a sort of 'social heredity' which supplements natural heredity (Baldwin, 1896, 538).

‘environment of thought’ in which ideas are subjected to variation, are selected, and then are transmitted and hence conserved (Plotkin, 2004, 77).

But now we have come to inheritance system in which nothing material is transmitted. It is what an animal sees or hears that maters. Does this make any difference? For our purposes, we believe it does not. In all cases, information is transmitted and acquired, and in all cases the information has to be interpreted by the recipient if it is to make any difference to it. (Jablonka & Lamb, 2005, 166)

If we trace the genesis of any industrial structure; as that which from primitive blacksmiths who smelt their own iron as well as make implements from it, brings us to our iron-manufacturing districts, where preparation of the metal is separated into smelting, refining, puddling, rolling, and where turning this metal into implements is divided into various businesses (Andreski, 1971, 131)

the ‘leash’ that ties culture to genes tugs both ways (Laland & Brown, 2002, 243).

It is possible that gene-culture coevolution will lie dormant as a subject for many more years, awaiting the slow accretion of knowledge persuasive enough to attract scholars. I remain in any case convinced that its true nature is the central problem of the social sciences, and moreover one of the great unexplored domains of science generally; and I do not doubt for an instant that its time will come (Wilson, 1994 in: Laland & Brown, 2002, 286)

a process by which particular socially learned beliefs, or pieces of knowledge, increase or decrease in frequency due to being adopted by other individuals at different rates (Laland & Brown, 2002, 250)

popular preteens girls of the working or lower middle class are usually the most important leaders of language evolution in American cities (Richerson & Boyd, 2006, 125).

We have imagined that people have the ability albeit limited, to judge the relative merit of alternative beliefs and values, and to chose between them (Richerson & Boyd, 2006, 105).

The basic kinds of processes are the forces of cultural evolution, analogous to the forces of genetic evolution, selection, mutation and drift (Richerson & Boyd, 2006, 60).

if successful people are more likely to be imitated, then those traits that lead to becoming successful will be favored (Richerson& Boyd, 2006, 13)

the evolution of languages, artifacts, and institutions can be divided up into small steps, and during each step the changes are relatively modest” (Richerson & Boyd, 2006, 50).

historians of technology have demonstrated quite nicely how this step-by-step improvement gradually diversifies and improves tools and other artifacts (Richerson & Boyd, 2006, 115)

We keep track of the different variants, independent little bits or big complexes as the case may be, present in a population, and try to understand what process cause some variants to increase and others to decline. The same logics applies whether the variants are individual phonological rules or entire grammars (Richerson & Boyd, 2006, 91)

Nothing in the argument depends on cultural variants being a discrete, genelike particles. It works exactly the same if 'memes' were continuously varying and children adopted a weighted average of their parent's and teacher's beliefs. (Richerson & Boyd, 2006, 154).

Competition for control of behavior is much less diffuse than competition for attention. If two variants specify different behavior in the same context, typically only one of them can control behavior. We can drive on the right or the left, but only drunks and foolish teens try both. In bilingual environments people may switch rapidly from one language to the other, even in midsentence, but word by word, or at least word fragment by word fragment, they can be speaking only one (Richerson & Boyd, 2006, 74).

Culture is interesting and important because its evolutionary behavior is distinctly different from that of genes. For example, we will argue that the human cultural system arose as an adaptation because it can evolve fancy adaptations to changing environments rather more swiftly than is possible by genes alone. Culture would never have evolved unless it could do things that genes can't (Richerson & Boyd, 2006, 7).

Similarities between descendant and ancestral populations arise because the necessary information has been transmitted from individual to individual through time without significant change. Differences occur because some variants have become more common, other have become more rare, and some completely new variants have been introduced. Thus, to account for both continuity and change we need to understand the population processes by which ideas are transmitted through time (Boyd & Richerson, 2000, 154)

If it were true that adaptive evolution depended critically on the units of transmission, Darwin and all his followers would still be marking time, waiting for the developmental work definitively showing how genes give rise to the properties of organisms. Understanding how complexes of genes interact in development to create the traits upon which selection falls is a current hot topic in biology, if not the hot topic. Darwin had a very un-genelike picture of how organic inheritance worked, complete with the inheritance of acquired variation. He nonetheless did remarkably well, because the essential Darwinian processes are tolerant of how heritable variation is maintained. For the same reason, we can black-box the problem of how culture is stored in brains by using plausible

models based on observable features that we do understand, and forge ahead (Richerson & Boyd, 2006, 81).

In order to actually make progress with theoretical or empirical work you have to be willing to simplify, simplify, and then simplify some more (…) We are fond of simple models that are deliberate caricatures of the real world (…) No sensible scientist thinks that the complexity of the organic or cultural world can be subsumed under a few fundamental laws of nature or captured in a small range of experiments. The 'reductionism' of evolutionary science is purely tactical. (Richerson & Boyd, 2006, 98)

Gene-culture coevolutionary theory is a related branch of theoretical population genetics, which models the interaction between genes and memes throughout the course of human evolution. Whether meme evolution occurs exclusively at the cultural level or through meme-gene interaction, a body of formal theoretical work already exists that can be used to explore memetic processes, test hypotheses, and model data (Laland & Odling-Smee, 2000, 136).

Gene-culture coevolution is like a hybrid cross between memetics and evolutionary psychology, with a little mathematical rigour thrown into the pot (Laland & Brown, 2002, 242).

Advocates of gene-culture coevolution share with memeticists and the vast majority of social scientists the view that what makes culture different from others aspects of the environment is the knowledge passed between individuals. Culture is transmitted and inherited in an endless chain, frequently adapted and modified to produce cumulative evolutionary change. This infectious, information-based property of transmission is what allows culture to change rapidly, to propagate a novel behaviour through a population, to modify the selection pressures acting on genes, and to exert such a powerful influence on our behavioural development. (Laland & Brown, 2002, 249)

Capítulo 5

Boas was elated because he was the General of a small army fighting against the cause of absolute genetic determination of fixed racial differences which was then being advanced by a much larger force of eugenicists and racist ideologues. (Plotkin, 2004, 62)

With the exception of mutations that are lethal no matter what, it is universally acknowledged that no feature of an organism will develop unless suitable environmental inputs are present. (Sterelny & Griffiths, 1999, 13)

there is no general reason for expecting genetic influences to be any more irreversible than environmental ones (Dawkins, 1999, p.13)!

Genetic network is composed of tens or hundreds of genes and genes products, which interact with each other and together affect the development of a particular trait (Jablonka & Lamb, 2005, 6)

once imitation has evolved, a second replicator comes into being which spreads much faster than the first. Because the skills that are initially copied are biologically useful, it pays individuals both to copy and to mate with the best imitators. This conjunction means that successful memes begin to dictate which genes are most successful: the genes responsible for improving the spread of those memes (Blackmore, 1999, 99)

Capítulo 6

Human brains, with their processing limitations, and human cultures, with their special communicative context, can be considered the 'environments' within which language evolve (Deacon, in: Depew & Weber, 2003, 86).

If there is ever to be a science of memetics to rival that of genetics, it should proceed along these lines: combining careful quantitative analysis of well-documented linguistic changes with sophisticated theoretical models capable of taking into account the multilayered complexity of cultural evolution (Fitch, 2007, 66)

Despite significant differences in their methods, both papers document the same general pattern: frequently used words are resistant to change. Relatively infrequent inflections such as 'help/holp' became regularized, whereas high-frequency English verbs retained their ancestral irregular state ('go/went' or 'be/was'). More generally, terms that occur with high frequency in Indo-European languages (such as 'one, 'night' or 'tongue') are resistant to substitution by new phonological forms. (Fitch, 2007, 66)

Advertisements are not there to inform, or to misinform, they are there to persuade. The advertiser uses his knowledge of human psychology, of the hopes, fears and secret motives of his targets, and he designs an advertisement which is effective in manipulating their behaviour. Packard's (1957) exposé of the deep psychological techniques of commercial advertisers makes fascinating reading for the ethologist. A supermarket manager is quoted as saying 'People like to see a lot of merchandise. When there are only three or four cans of an item on a shelf, they just won't move'" (Dawkins, 1999, 62)

Some infants – the tutors – were taught to play with a toy in a novel fashion. These tutors were then brought to a series of day care centers none of which they had ever visited before. Other infants 'sat around a table, drinking juice, sucking their thumbs and generally acting in a baby-like manner', while the tutor played with the toy in a novel manner. Two days later, the observer babies were examined in their own houses (not the day care center), and it was obvious that they had adopted that novel toy-playing behavior. Consider that the next time someone tells you that television doesn't affect child's behavior. (Dugatkin, 2000, 187)

The technical apparatus we seek has been sitting under our noses all along. It is macro-economics underwritten by evolutionary game theory. Everything that both Dennett and Blackmore want to do with memes is accomplished by seeing them as strategies competing to out-replicate one another across successions of hosts. (Ross, 2002, 171)

Capítulo 7

grasping-with-the-hand-and-the-mouth neuron (Rizzolatti & Sinigaglia, 2008, 23)

In humans, as in monkeys, the sight of acts performed by others produces an immediate activation of the motor areas deputed to the organization and execution of those acts, and through this activation it is possible to decipher the meaning of the 'motor events' observed, i.e. to understand them in terms of goal-centred movements. This understanding is completely devoid of any reflexive, conceptual, and/or linguistic mediation as it is based exclusively on the vocabulary of acts and the motor knowledge on which our capacity to act depends. Finally, again as in the monkey, this understanding is not limited to single motor acts but extends to entire chains of acts. (Rizzolatti & Sinigaglia, 2008, 125)

Analyses done on traces of cerebral circumvolutions in the cavities of a number or Homo habilis skulls, dating back almost 2 million years, show that the frontal and temporo-parietal regions were strongly developed at that stage in the evolution process. This suggests that the transition from australopithecines to Homo habilis coincided with the transition to a more differentiated mirror system, which supplied the neural substrate for the formation of the 'mimic culture' which, according to Merlin Donald, peaked with the appearance on the scene of Homo erectus, who walked the earth from 1.5 million to 300 thousand years ago. It is also plausible to suppose that mirror neurons evolved further during the transition, 250 thousand years ago, from Homo erectus to Homo sapiens, responding to the expansion both of the motor repertoire and the newly acquired ability to communicate intentionally by manual gestures that gradually became more articulate and was frequently accompanied by vocalizations. (Rizzolati & Sinigaglia, 2008, 162)

Capítulo 8

The first, which is used mainly by experimental psychologists, characterizes imitation as the capacity of an individual to replicate an act which already belongs to his motor repertoire, after having seen it executed by others; the second, accepted principally by ethologists, considers imitation to be a process by which an individual learns a new pattern of action by observation, after which he is able to reproduce it in minimal detail. (cf. Rizzolatti & Sinigaglia, 2008, 139)

an instance of genuine teaching (Bonner, 1980, 123).

arise variously by change of pitch of a note, repetition of a note, the elision of notes and the combination of parts of other existing songs (1978, 76 in Bonner, 1980, 178).

Bonobos immersed in a sign language-using environment spontaneously learn to use signs themselves (Sterelny & Griffiths, 1999, 315).

Go get a coke for Rose
Tickle Rose with the bunny
Go get the doggie in the refrigerator
Can you make the bunny eat the sweet potato?
Take the carrot outdoor
Go outdoors and find the carrots
Pour coke in the lemonade
Pour lemonade in the coke
(Jablonka & Lamb, 2005, 350)

Do the young imitate experience adults? The answer is that in most cases that they have been studied, they do not. Nevertheless, they learn from others. (Jablonka & Lamb, 2005, 170)

After nearly a century of research there is very little evidence of true imitation in non-human animals. Birdsong is obviously an exception, and we may be simply ignorant of the underwater world of dolphin imitation. Chimpanzees and gorillas that have been brought up in human families occasionally imitate in ways that their wild counterparts do not. However, when apes and human children are given the same problems, only the children readily use imitation to solve them. It seems we are wrong to use the verb 'to ape' to mean imitate, for apes rarely ape. (Blackmore, 1999, 50)

the thesis of his book is that what makes us different is our ability to imitate (Blackmore, 1999, 3).

Imitation is learning something about the form of behaviour through observing others, while social learning is learning about the environment through observing others (Blackmore, 1999, 3)

In this sense, then, there is no true heredity. This means there is no new replicator, no true evolution, and therefore the process should not be considered as memetic (Blackmore, 1999, 50)

only imitation gives rise to the cumulative cultural evolution of complex behaviours and artifacts (Richerson & Boyd, 2006, 109

Imitation necessarily involves: (a) decisions about what to imitate, or what counts as 'the same' or 'similar', (b) complex transformations from one point of view to another, and (c) the production of matching bodily actions (Blackmore, 1999, 52)

birds, dolphin, whales, a naive individual learns not only what to do but how to do it. It copies the action of another (Jablonka & Lamb, 2005, 172).

there are certainly many cases of other types of social learning, and this is all that we really need for memes to be present in animals (Dugatkin, 2000, 131).

The question would be which kinds of social learning can reproduce behaviours with sufficient fidelity to maintain them intact over several generations of copying, and to allow for selection between variants and for cumulative change. Such research may reveal that in fact other kinds of social learning can sustain such an evolutionary process, in which case they should be included as process that replicate memes (Blackmore, 2000, 28)

Capítulo 9

At the opening of the twentieth century Bertrand Russell declared that the theory of evolution had no major philosophical implications. The sciences that had something to teach philosophy were mathematics (particularly mathematical logic) and physics. Physics was to serve as a role model for the other sciences, and for the next fifty years philosophers nagged biology for its failure to live up to its example. The well-known philosopher of science and mind J.J.C. Smart compared the biologist to a radio engineer. Biologists study the workings of a group of physical systems that happen to have been produced on one planet. Smart thought that such a parochial discipline was unlikely to add to our stock of fundamental laws of nature (Sterelny & Griffiths, 1999, 3 - 4)

far too often metaphysics and philosophy of science have been dominated by models drawn from physics and chemistry (Sterelny & Griffiths, 1999, 6).

in the real world outside logic textbooks, the simple concepts of ‘necessary’ and ‘sufficient’ must usually be replaced by statistical equivalents.(…, 1999, 195)

It is now widely accepted that in this sense, there are no biological laws of nature (Sterelny & Griffiths, 1999, 366).

biology can be pursued not by seeking exceptionless general laws, but by discovering recurrent casual mechanisms (Sterelny & Griffiths, 1999, 368).

There is a problem of scale in testing ecological theory. Indeed, this is the conceptual problem that has most worried ecologists themselves. Some of their worries seem to derive from an excessive reverence for Karl Popper, but there are clearly real issues as well (Sterelny & Griffiths, 1999, 277)

I have come to the conclusion that Darwinism is not a testable scientific theory, but a metaphysical research programme - a possible framework for testable theories. (Popper, 1976, 171).

What neither Wallace or Darwin could have foreseen was that ‘survival of the fittest’ was destined to generate more serious confusion than ‘natural selection’

ever had. A familiar example is the attempt, rediscovered with almost pathetic eagerness by successive generations of amateur (and even professional) philosophers ('so acute that they misunderstand common folk'?), to demonstrate that the theory of natural selection is a worthless tautology (an amusing variant is that it is unfalsifiable and therefore false!). In fact the illusion of tautology stems entirely from the phrase 'survival of the fittest', and not from the theory itself at all. The argument is a remarkable example of the elevation of words above their station (…) Fitness meant, roughly, the capacity to survive and reproduce, but it was not defined and measured as precisely synonymous with reproductive success (Dawkins, 1999, 180 – 181)

I have in the past described the theory as 'almost tautological', and I have tried to explain how the theory of natural selection could be untestable (as is a tautology) and yet of great scientific interest. My solution was that the doctrine of natural selection is a most successful metaphysical research programme. It raises detailed problems in many fields, and it tells us what we would expect of an acceptable solution of these problems. I still believe that natural selection works in this way as a research programme. Nevertheless, I have changed my mind about the testability and the logical status of the theory of natural selection; and I am glad to have an opportunity to make a recantation. My recantation may, I hope, contribute a little to the understanding of the status of natural selection. (Popper, 1978, 344)

The extended phenotype may not constitute a testable hypothesis in itself, but it so far changes the way we see animals and plants that may cause us to think testable hypothesis that we would otherwise never have dreamed of (...) D'Arcy Thompson invited a 'so what?' reaction from anyone fastidious enough to insist that science proceeds only by falsifying specific hypotheses (…) it is possible for a theoretical book to be worth reading even if it does not advance testable hypotheses but seeks, instead, to change the way we see" (Dawkins, 1999, 2)

Some people think that I have denied scientific character to the historical sciences, such as paleontology, or the history of the evolution of life on Earth; or to say, the history of literature, or of technology, or of science. This is a mistake, and I here wish to affirm that these and other historical sciences have in my opinion scientific character; their hypotheses can in many cases be tested. (Popper, 1980)

The cases in which inductions from classes of facts altogether different have thus jumped together, belong only to the best established theories which the history of science contains. And as I shall have occasion to refer to this peculiar feature in their evidence, I will take the liberty of describing it by a particular phrase; and will term it the Consilience of Inductions (Whewell, 1968, 153)

in which the object is to ascend from the present state of things to a more ancient condition, from which the present is derived by intelligible causes (Whewell, 1967, 637).

without distinguishing historical from mechanical causation (Whewell, 1967, 638).

It is not an arbitrary and useless proceeding to construct such a Class of sciences. For wide and various as their subjects are, it will be found that they have all certain principles, maxims, and rules of procedure in common; and thus may reflect light upon each other by being treated of together. Indeed it will, I trust, appear that we may by such a juxtaposition of different speculations, obtain most salutary lesson. And questions, which, when viewed as they first present themselves under the aspect of a special science, disturb and alarm men's minds, may perhaps be contemplated more calmly, as well as more clearly, when they are considered as general problems of palaetiology (Whewell,1967, 640).

Capítulo 10

Complaints about the lack of conceptual clarity in memetics arise in part because of an unreal view of how clear and uncomplicated certain familiar terms in science were or are (Hull, 2000, 47)

It is necessary to ask not only who benefits and what is selected but also how and why a new behavior or idea is generated, how it develops, and how it is passed on (Jablonka & Lamb, 2005, 222).

quite different types of mental states can bring about identical belief behaviour (Sperber, 1996, 89).

Information will be transmitted from brain to brain only if most people induce a unique rule from a given phenotypic performance (Boyd & Richerson, 2000, 155)

human communication achieves in general merely some degree of resemblance between the communicator's and the audience's thoughts (Sperber, 1996, 83).

What noodles mean to Italians is therefore quite different from what it means for the Chinese (Bloch, 2000, 198).

We do not understand in detail how culture is stored and transmitted, so we do not know whether culturally transmitted ideas and beliefs are replicators or not (Boyd & Richerson, 2000, 158)

The cause of the similarity between the information in A's and B's brains is the result of evolutionary psychology, not memetics (Aunger, 2000, 216).

When you sing 'Yankee Doodle', you are not trying to reproduce any one past performance of the song (Sperber, 1996, 104).

Resemblance among cultural items is to be explained to some important extent by the fact that transformations tend to be biased in the direction of attractor positions in the space of possibilities (Sperber, 1996, 108)

The content of a myth tends to drift over time so as to maintain maximal memorability. (…) the very same themes and structures which help one remember a story seem to make it particularly attractive. (…) If the psychological conditions

of memorability and attractiveness are met, the story is likely to be well distributed. (Sperber, 1996, 85)

the human cognitive organization is such that we cannot understand such belief and not hold it (Sperber, 1996, 97).

Previously internalized cultural representations are a key factor in one's susceptibility to new representations (Sperber, 1996, 84).

Memetics does not involve analogical reasoning at all (Hull, 2000, 46).

your mental version of the song was the child of the mental versions of several people (Sperber, 1996, 104)

context- and content-sensitive (Jablonka & Lamb, 2005, 211).

I do not hesitate to concede to Dennett that cultural evolution – the Hegelian unfolding that we both celebrate – has succeeded in 'raising' human consciousness profoundly. (Churchland, 2002, 79)

Unlike genes, cultural traits are not particulate. An idea about God cannot be separated from other ideas with which it is indissolubly linked in a particular religion (Kuper, 2000, 180)

Anthropologists admit that culture is distributed. If we can agree that much of cultural knowledge is socially learned, this implies that such knowledge necessarily diffuses through populations, from individual to individual. All sensory modalities require inputs in the form of temporal streams of information – such as words forming sentences, and sentences paragraphs. At this basic level, individuals therefore must acquire information in bits (which need not be binary). So, something like a unit of transmission must exist. (Aunger, 2000, 226)

It is obvious that the more complex the field, the slower it achieves a stage where it can make fast advances by reductionist methods (Bonner, 1980, 7)

In our view, biologists and human scientists alike will not be able to understand the evolution of culture unless they are prepared to break down the 'complex whole' into conceptually and analytically manageable units (Laland & Odling-Smee, 2000, 121).

The trouble is, few people are actually engaged in the business of counting, recording and measuring cultural variants or in tracking how they change in frequency (Laland & Brown, 2002, 279 - 280).

[memes] are, at best, abstract patterns of some kind imposed on preexisting physical structures within the brain, not physical things bent on making further physical things with a common physical structure (Churchland, 2002, 67)

we may assume that, at least at some phase in their replication, memes have to be physically stored in brains (Blackmore, 1999, 57).

gene transfer has been crucial in the evolution of drug resistance (Maynard-Smith, 1993, 5).

In a noisy world, taking the average of many models may be necessary to uncover a reasonable approximation of the true value of a particular trait (Richerson & Boyd, 2006, 89).

Another requirement for cumulative selection is a relatively low mutation rate. If the mutation rate is very high relative to the strength of selection, then the mechanisms that generate variation will swamp the effects of selections (Sterelny & Griffiths, 1999, 36)

viruses and bacteria reproduce themselves much more rapidly than the vast majority of memes (Hull, 2000, 55).

It normally takes 10,000 years to produce new species, although there are rarer but well-known cases, such as those involving hybridization where new species are formed, or rather begun, in one generation (Bonner, 1980, 55)

The telegraph and telephone, radio and television, are all steps towards spreading memes more effectively.

(…)

Electronic-mail messages go for high fecundity, low fidelity, and low longevity (people send out lots, do not bother to write carefully or correct the mistakes, and throw them away). Letters go for low fecundity, high fidelity, and high longevity (people write fewer letters, construct them carefully and politely, and often keep them). Books are high on all three. (Blackmore, 1999, 212)

must explain why German farmers of Freiburg hold different beliefs about life and land than their Yankee neighbors almost 150 years after leaving Europe (Boyd e Richerson, 2000, 146)

Behaviorists suggest that activities like making pots are the memetic equivalent of genotypes, while the mentalists would call such behaviors the phenotypic manifestations of memes-in-brain. (Aunger, 2000, 6)

the problem with the kind of autonomy posited by the memetalk is that the active biological-psychological-cultural agent disappears (Jablonka & Lamb, 2005, 224).

evolutionary processes are creative – arguably the only creative processes on the planet (Blackmore, 2000, 29).

Conclusão

Critics of memetics assume standards so high for scientific knowledge that few, if any, areas of science can possible meet them (Hull, 2000, 48)

Memetics should be evaluated only when a reasonable number of people began to develop it (Hull, 2000, 51).

They serve to connect the rich models of behavior based on individual action developed in economics, psychology, and evolutionary biology with the data and insights of the cultural sciences, anthropology, archeology, and sociology (Boyd e Richerson, 2000, 145)