Interdisciplinary memetic cross-pollination

Description

Interdisciplinary memetic cross-fertilization

A biological analogy for the cognitive & behavioral sciences

Genetics refers to the scientific study of the mechanisms which underpin biological evolution. Memetics, on the other hand, concerns the study of the transfer of information and ideas in a quasi-Darwinian evolutionary framework. That is, memetics is the study of the genesis, mutation, and propagation of ideas. To formulate it concisely: Genetics relates to biology as memetics relates to ideology.

A meme functions as a unit for transmitting ideas, symbols, attitudes, or behaviors that can be transferred from one human mind to another (i.e., from one host to another). Methods of transmission include speech, writting, music, dance, gestures, rituals, et cetera. A meme can thus be described as an “imitable cognitive phenomenon”.

The word meme is etymological derived from the Ancient Greek ?????? (m?m?ma) which translates into “imitated thing”. The neologism was coined by the controversial and extremist British evolutionary biologist Richard Dawkins in his bestselling book “The Selfish Gene” (1976). According to theory, the principles which allow biologists to model evolutionary processes can be analogously applied to the evolution of ideas. Similar to genes, ideas can be transmitter across generation or they can “die out”. There is thus competition between memes and only the “fittest” ideas survive and reproduce. This can be modelled in terms of selection pressure and similar to genetics, memetic fitness landscapes have been applied to understand meme-flow. Moreover, ideas can have “intercourse”, that is, ideas can be combined to form “offspring”. Furthermore, ideas can mutate and become “viral”. The study of memes is thus inspired by the evolutionary principles of biology and the basic Darwinian principles apply (universal Darwinism):

1. **Variation:** Among individuals within any population, there is random variation in morphology, physiology, and behavior.
2. **Heredity:** Offspring resemble their parents more than they resemble unrelated individuals.
3. **Selection:** Some forms are more successful at surviving and reproducing than other forms in a given environment.

Note. It should be emphasized memetic evolution is a much more flexible mechanism.

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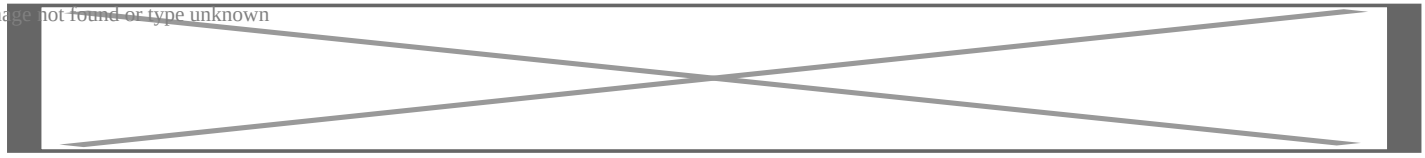

This website provides a readily memorable conceptual metaphor which applies the biological concept

of cross-pollination to ideas. Specifically, it is proposed that an interdisciplinary researcher can be compared to a honey bee which collects pollen from different plant specimen and thereby cross-pollinates plants belonging to a diversity of different taxa. In fact, the bee-analogy is not new. Francis Bacon formulated a similar idea in his classical "*Novum Organum*" (Latin transl. "The new instrument of science"). Cross-fertilization is also called *Allogamy*, i.e., the fusion of male and female gametes (sex cells) from different individuals of the same species. In this context the composite term "interdisciplinary allogamy" might be a useful (a new meme).?

The journal of memetics focuses on evolutionary models of information transmission: cfpm.org/jom-emit/

Memetic algorithms are a class of evolutionary algorithms

Pseudo code

```
Procedure Memetic Algorithm
Initialize: Generate an initial population;
while Stopping conditions are not satisfied do
    Evaluate all individuals in the population.
    Evolve a new population using stochastic search operators.
    Select the subset of individuals, ? i l {\displaystyle \Omega _{il}} , tha
    for each individual in ? i l {\displaystyle \Omega _{il}} do
        Perform individual learning using meme(s) with frequency or probabilit
        Proceed with Lamarckian or Baldwinian learning.
    end for
end while
```

incommensurability – kuhn paradigms – linguistics

> If during the long course of ages and under varying conditions of life, organic beings vary at all in the several parts of their organisation, and I think this cannot be disputed; if there be, owing to the high geometrical powers of increase of each species, at some age, season, or year, a severe struggle for life, and this certainly cannot be disputed; then, considering the infinite complexity of the relations of all organic beings to each other and to their conditions of existence, causing an infinite diversity in structure, constitution, and habits, to be advantageous to them, I think it would be a most extraordinary fact if no variation ever had occurred useful to each being's own welfare, in the same way as so many variations have occurred useful to man. But if variations useful to any organic being do occur, assuredly individuals thus characterised will have the best chance of being preserved in the struggle for life; and from the strong principle of inheritance they will tend to produce offspring similarly characterised. This principle of preservation, I have called, for the sake of brevity, Natural Selection.
>
> — *Darwin summarising natural selection in the fourth chapter of On the Origin of Species[22]*

The pollinator analogy puts focus on the importance of diversity and “network size”. This is particularly interesting in the context of creativity…
www.etymology-of-creativity.ga/

(2010). The Strength-of-Weak-Ties Perspective on Creativity: A Comprehensive Examination and Extension. Journal of Applied Psychology

““Disentangling the effects of weak ties on creativity, the present study separated, both theoretically and empirically, the effects of the size and strength of actors’ idea networks and examined their joint impact while simultaneously considering the separate, moderating role of network diversity. i hypothesized that idea networks of optimal size and weak strength were more likely to boost creativity when they afforded actors access to a wide range of different social circles. in addition, i examined whether the joint effects of network size, strength, and diversity on creativity were further qualified by the openness to experience personality dimension. as expected, results indicated that actors were most creative when they maintained idea networks of optimal size, weak strength, and high diversity and when they scored high on the openness dimension. the implications of these results are discussed.””

[su_row] [su_column size=”1/2? center=”no” class=””] [su_tooltip style=”bootstrap” position=”north” shadow=”yes” rounded=”yes” title=”Read this…” content=”Hover me to open tooltip”]Hover me to open tooltip[/su_tooltip]*“Those who have handled sciences have been either men of experiment or men of dogmas. The men of experiment are like the ant, they only collect and use; the reasoners resemble spiders, who make cobwebs out of their own substance. But the bee takes a middle course: it gathers its material from the flowers of the garden and of the field, but transforms and digests it by a power of its own. Not unlike this is the true business of philosophy; for it neither relies solely or chiefly on the powers of the mind, nor does it take the matter which it gathers from natural history and mechanical experiments and lay it up in the memory whole, as it finds it, but lays it up in the understanding altered and digested. Therefore from a closer and purer league between these two faculties, the experimental and the rational (such as has never yet been made), much may be hoped.”*
~ Francis Bacon (Novum Organum)[/su_column][su_column size=”1/2? center=”no” class=””][su_tabs][su_tab title=”Tab name” disabled=”no” anchor=”” url=”” target=”blank” class=””] Tab content
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gene flow between plant populations

The genetic code consist of four base pairs (the nucleobase) which are arranged in the double-helix structure of DNA. The nitrogenous bases are

- Adenine (A)
- Cytosine (C)
- Guanine (G)
- Thymine (T)
- Uracil (U)

The physical substrate of the “memetic code”, on the other hand, is not yet determined. According to current neuroscientific theorizing, it is postulated that memetic information is stored in complex distributed neuronal networks in the brain. However, this is a [su_tooltip style=”bootstrap” position=”north” shadow=”yes” rounded=”yes” title=”Definition” content=”A working hypothesis is a hypothesis that is provisionally accepted as a basis for further research in the hope that a tenable theory will be produced, even if the hypothesis ultimately fails.”]*working hypothesis*[/su_tooltip] which need to be corroborated by empirical evidence. Correlation ? Causation

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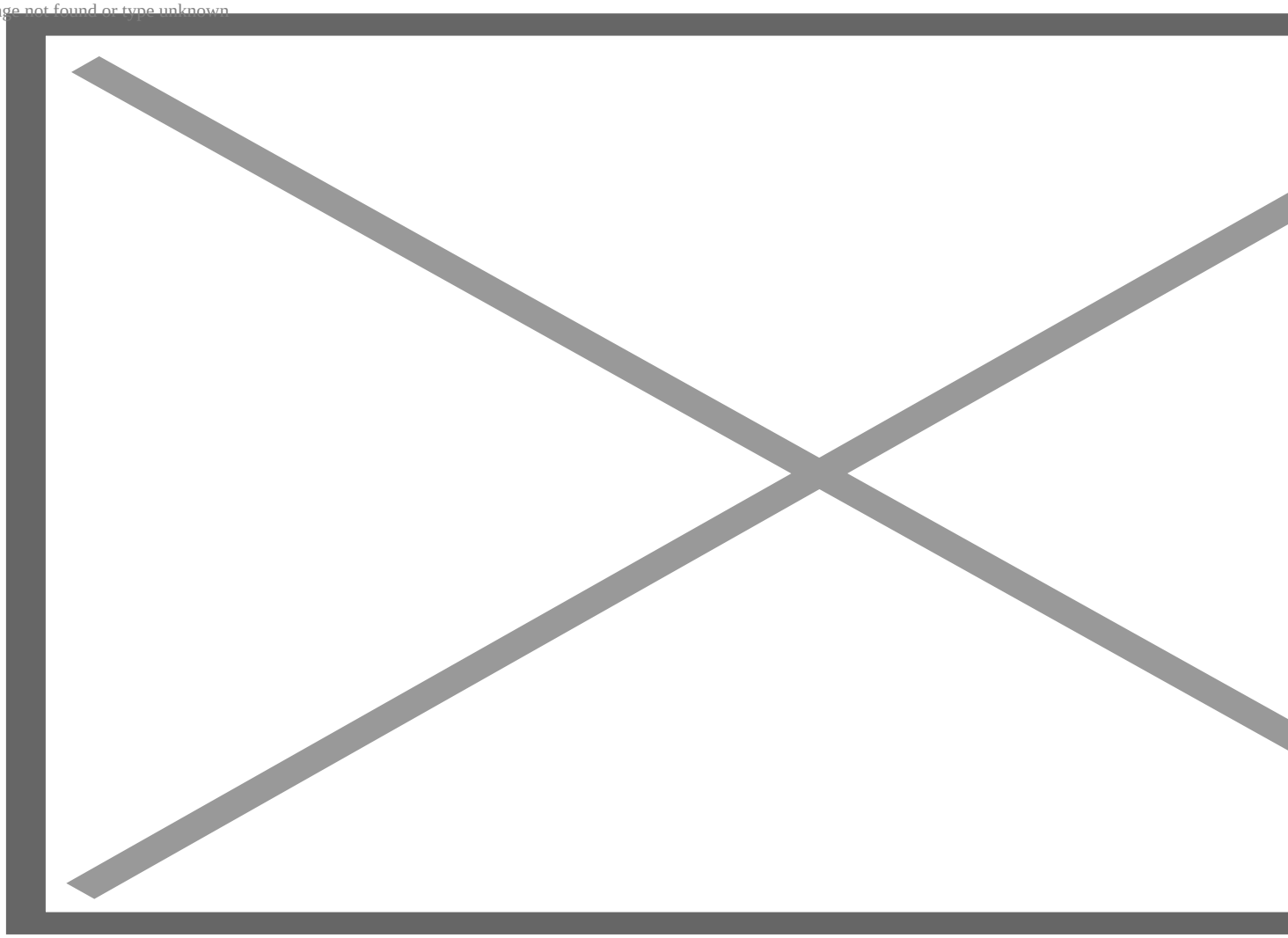

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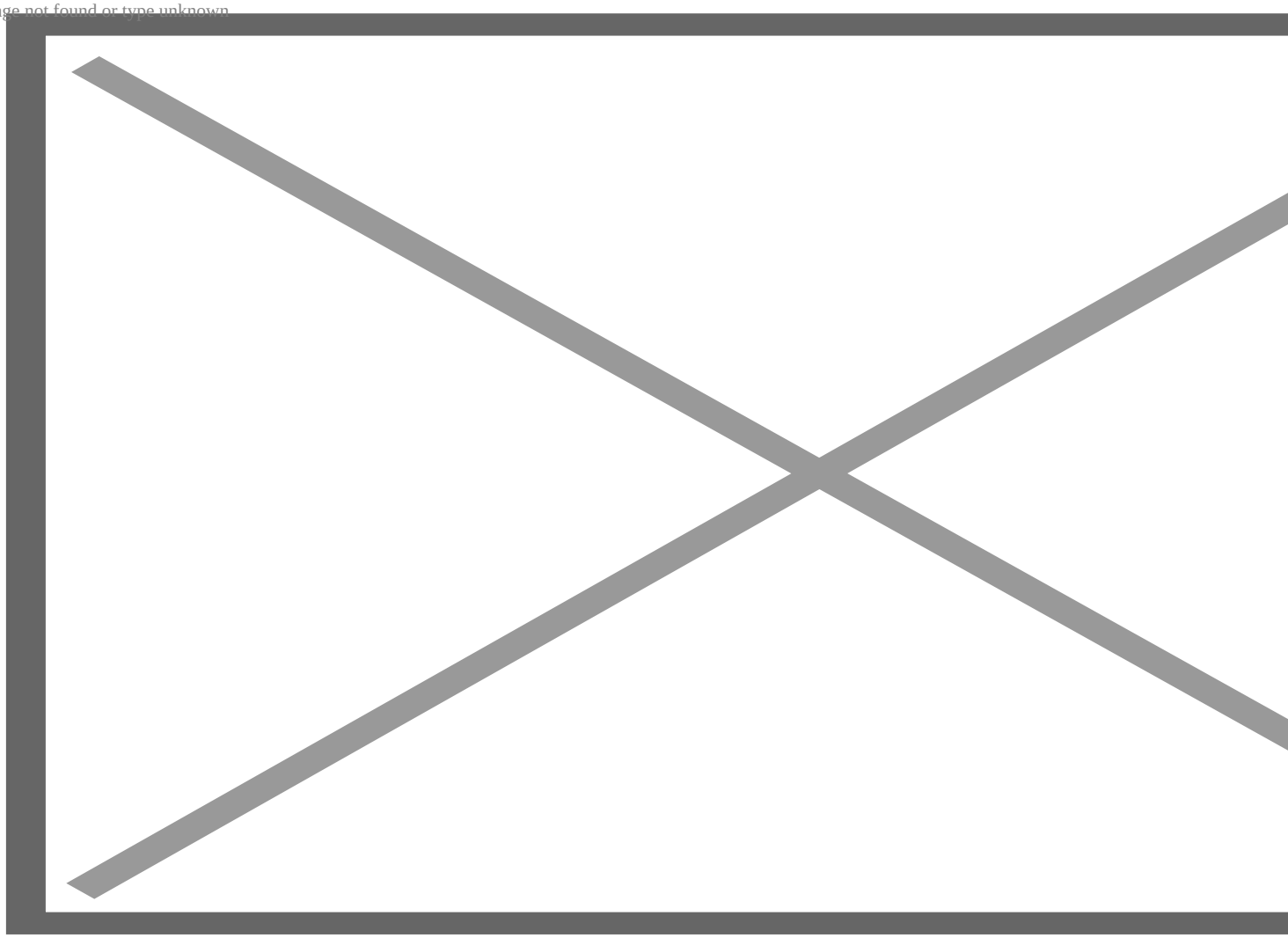

A Model of Pollinator-Mediated Gene Flow between Plant Populations with Numerical Solutions for Bumblebees Pollinating Oilseed Rape

Sir Francis Bacon's "The New Organon"
The Ant, the Spider, and the Bee

> Those who have handled sciences have been either men of experiment or men of dogmas. The men of experiment are like the ant, they only collect and use; the reasoners resemble spiders, who make cobwebs out of their own substance. But the bee takes a middle course: it gathers its material from the flowers of the garden and of the field, but transforms and digests it by a power of its own. Not unlike this is the true business of philosophy; for it

> neither relies solely or chiefly on the powers of the mind, nor does it take the matter which it gathers from natural history and mechanical experiments and lay it up in the memory whole, as it finds it, but lays it up in the understanding altered and digested. Therefore from a closer and purer league between these two faculties, the experimental and the rational (such as has never yet been made), much may be hoped.

Bacon, Francis. (1620) *The New Organon, Book I.*

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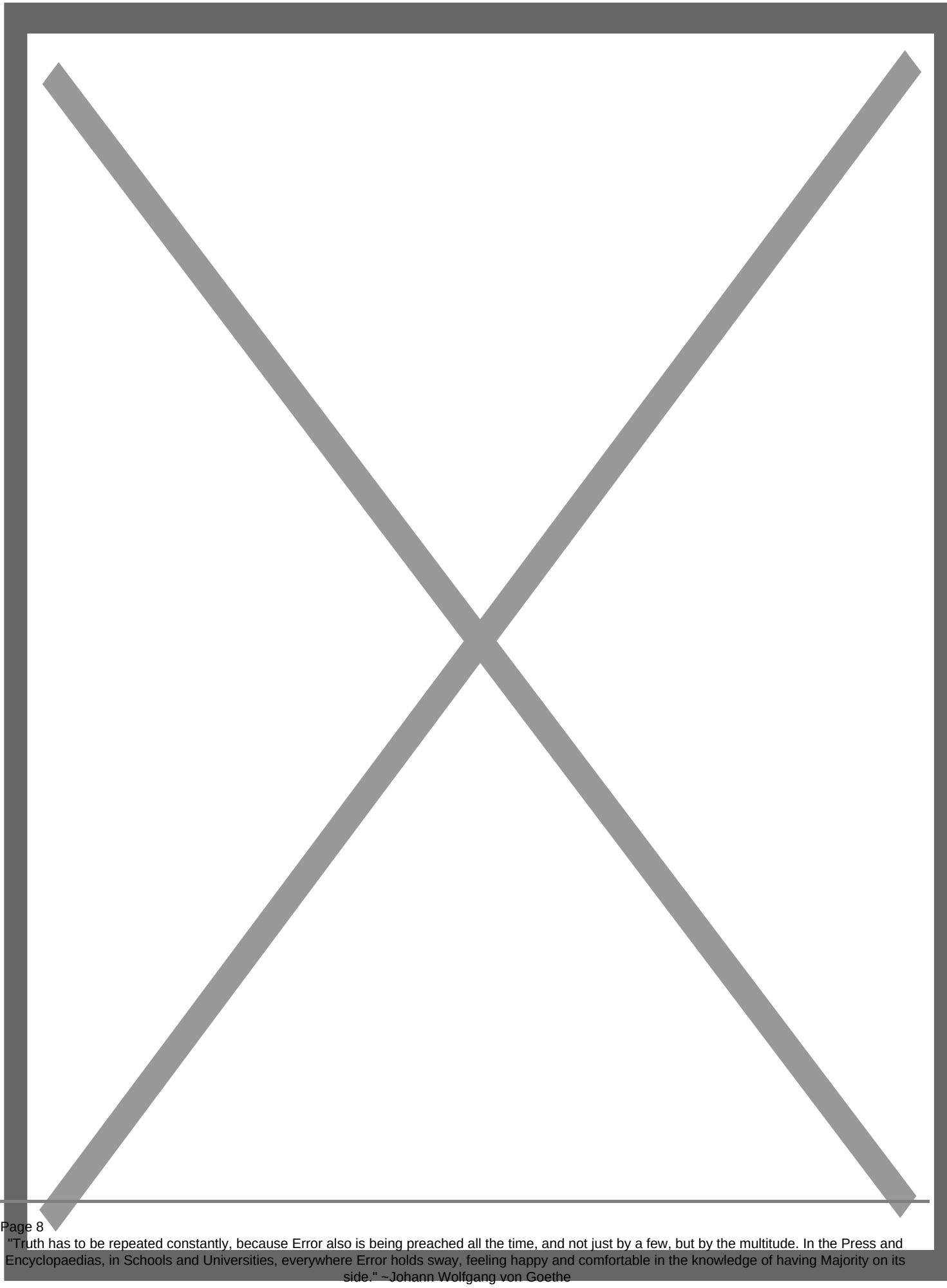

Memorial to Francis Bacon, in the chapel of Trinity College, Cambridge.

References

Corne, D., Glover, F., & Dorigo, M.. (1999). An Introduction to Differential Evolution, New Ideas in Optimization. An Introduction to Differential Evolution, New Ideas in Optimization

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“Includes index. optimization is a pivotal aspect of software design. the techniques treated in this text represent research as elucidated by the leaders in the field. the optimization methods are applied to real problems, such as hilllclimbing, simulated annealing, and tabu search. ant colony optimization — differential evolution — immune system methods — memetic algorithms — scatter search and path relinking — emerging ideas and extensions.”

Schmid, H. B.. (2004). Evolution by imitation: Gabriel Tarde and the limits of memetics. Distinktion – Scandinavian Journal of Social Theory

Plain numerical DOI: 10.1080/1600910X.2004.9672894
DOI URL
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“Meme theory confronts us with a rather unflattering image of ourselves. in daniel c. dennett’s words, conscious selves are nothing but the ‘vehicles’ or ‘nests’ of the true heroes of the evolutionary story of culture, the memes. in the memetic view, cultural evolution is not about ‘us’, but about ‘them’: the units of culture such as the ones mentioned by richard dawkins: ‘tunes, ideas, catch-phrases, clothes fashions, ways of making pots or of building arches’. in this paper, i shall take a critical look at some premises of this memetic ‘shift of perspective’, which turn out to be highly problematic. in a first step, the memetic image of the self as a ‘meme nest’ shall be traced back to its neo-darwinian origins. meme theory is built directly on the model of genetic evolution (i). as some considerations concerning the ontology of memes shall reveal, there are fundamental differences between genes and memes which cannot be accounted for within the memetic view (ii). in a third step, gabriel tarde’s idea of ‘evolution by association’ shall be introduced as a convincing alternative to the memetic idea of cultural evolution. writing almost a century before the term ‘meme’ was even coined, tarde put forth a theory, which already contained much of the insights that make memetics attractive to the social sciences. more than that, tarde was safe from the fatal memetic tendency to model cultural evolution too closely on genetic evolution (iii). in the concluding section (iv), i shall come back to the initial question concerning the place of the self in society: what is our role in cultural evolution in a tardean view?”

Heylighen, F.. (1992). “Selfish” Memes and the Evolution of Cooperation. Journal of Ideas

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“A new, integrated model for the evolution of cooperation is proposed, based on the concept of a meme, as replicating unit of culture. meme evolution is much faster and more flexible than genetic evolution. some basic selection criteria for memes are listed, with an emphasis on the difference between memetic and genetic fitness, and the issue of memetic units is discussed. the selfishness of memes leads to conformity pressures in cultural groups, that share the same meme. this keeps group

cooperation conventions (ethical systems), resulting from reciprocal agreements, from being invaded by selfish strategies. the emergence of cooperative systems is discussed in general as a 'metasystem transition', where interaction patterns between competing systems tend to develop into shared replicators, which tend to coordinate the actions of their vehicles into an integrated control system."
Yoon, S.. (2008). Using memes and memetic processes to explain social and conceptual influences on student understanding about complex socio-scientific issues. Journal of Research in Science Teaching

Plain numerical DOI: 10.1002/tea.20256
DOI URL
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"This study investigated seventh grade learners' decision making about genetic engineering concepts and applications. a social network analyses supported by technology tracked changes in student understanding with a focus on social and conceptual influences. results indicated that several social and conceptual mechanisms potentially affected how and why ideas were taken up in the learning system of the classroom. mechanisms included copying or memetic processes such as '"do as the smart students do"' and friendship selection. study outcomes are compared with the broader literature on memes and memetic processes to reveal general evolutionary ideas such as the development of prestige, identity versus problem-solving strategies, extended phenotypes, and memeplexes. educational implications for this research are also addressed. ß in october of 1990, the us department of energy and the national institutes of health launched a research program of arguably unequaled magnitude in human evolutionary history. over the next 13 years, the human genome project set out to identify the approximately 30,000 genes and the sequences of 3 billion chemical base pairs that make up human dna. the historical importance of the human genome project has been compared to that of the cambrian explosion, a period that spanned 40 million years in geological time during which most of the major groups of animals first appeared in the fossil records. humans now possess the capabilities to select, construct, and fashion their own evolutionary path. in true lamarckian form, information can now flow from the extended phenotype (societal or cultural norms) to the genotype (gardner, 1999). furthermore, the mass proliferation of genetic engineering (ge), techniques such as germline manipulation, xenotransplantation, cloning, and stem cell research, has sparked an ethical debate on the extent to which cultural influences will alter the current trajectories of both human and non-human biological evolution (grace, 1997; somerville, 2000). however, it appears that the debate remains largely academic. despite its enormous contemporary saliency, a 2002 national science foundation (nsf) science and engineering indicators report (nsf, 2002) stated that only 16% of the general public followed the human genome story. furthermore, in the same report, 85% of americans indicated that they felt less than well informed about new scientific discoveries and the use of new inventions and technologies. studies…"
Winfield, A. F. T., & Erbas, M. D.. (2011). On embodied memetic evolution and the emergence of behavioural traditions in Robots. Memetic Computing

Plain numerical DOI: 10.1007/s12293-011-0063-x
DOI URL
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“This paper describes ideas and initial experiments in embodied imitation using e-puck robots, developed as part of a project whose aim is to demonstrate the emergence of artificial culture in collective robot systems. imitated behaviours (memes) will undergo variation because of the noise and heterogeneities of the robots and their sensors. robots can select which memes to enact, and—because we have a multi-robot collective—memes are able to undergo multiple cycles of imitation, with inherited characteristics. we thus have the three evolutionary operators: variation, selection and inheritance, and—as we describe in this paper—experimental trials show that we are able to demonstrate embodied movement-meme evolution.”
Ball, J. A.. (1984). Memes as replicators. Ethology and Sociobiology

Plain numerical DOI: 10.1016/0162-3095(84)90020-7
DOI URL
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“Memes are the smallest recognizable pieces of cultural information-the building blocks of ideas. dawkins, who invented the term, argues that memes are independent replicators subject to mutation and natural selection closely analogous to genes. this note points out some of the consequences of this hypothesis by taking several well-known genetic phenomena and translating them into memetic language. © 1984.”
Adkins, M.. (2009). The application of memetic analysis to electroacoustic music. Sonic Ideas

Plain numerical DOI: 10.3847/0004-637X/820/1/26
DOI URL
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“Richard dawkins’ concept of the meme was first formulated in his book the selfish gene (oxford, 1976). in the memetics of music: a neo-darwinian view of musical structure and culture (ashgate, 2007), the first substantial text applying the concept of memetics to music, steven jan proposes a theory of music and an associated analytical method centred on the meme. for jan, memes are a multitude of musical ‘units’ or ‘replicators’ that are transmitted by imitation both within, and across genres of music. jan’s study focuses primarily on the application of memetics to the analysis of classical music. this paper will assess the contribution of memetic analysis to electro-acoustic music.”
Marsden, P. S.. (1998). Memetics: A new paradigm for understanding customer behaviour and influence. Marketing Intelligence & Planning

Plain numerical DOI: 10.1108/EUM0000000004541
DOI URL
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“The objective of this paper is to provide a non?technical introduction to the science of memetics and to suggest how this new discipline may be applied to the design and development of effective marketing campaigns. the technique is based on a neo?darwinian evolutionary model of information transmission that may be used to explain and predict the ‘infectiousness’ of certain ideas and behaviours. it is argued that traditional marketing theories based on rational choice theory may rely on an impossible homuncular psychology and it is suggested that a viable alternative would be to understand customer behaviour from a memetic perspective ? the result of contagion rather than conscious choice. from the memetic paradigm the role of marketing communications becomes one of designing and engineering infectious ‘mind viruses’ that will influence customer perceptions and behaviour. whilst memetics is still in its infancy, it is suggested that memetic engineering may provide a viable and effective complementary fram…”
Baydin, A. G., & De Mántaras, R. L.. (2012). Evolution of ideas: A novel memetic algorithm based on semantic networks. In 2012 IEEE Congress on Evolutionary Computation, CEC 2012

Plain numerical DOI: 10.1109/CEC.2012.6252886
DOI URL
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“This paper presents a new type of evolutionary algorithm (ea) based on the concept of ‘meme’, where the individuals forming the population are represented by semantic networks and the fitness measure is defined as a function of the represented knowledge. our work can be classified as a novel memetic algorithm (ma), given that (1) it is the units of culture, or information, that are undergoing variation, transmission, and selection, very close to the original sense of memetics as it was introduced by dawkins; and (2) this is different from existing ma, where the idea of memetics has been utilized as a means of local refinement by individual learning after classical global sampling of ea. the individual pieces of information are represented as simple semantic networks that are directed graphs of concepts and binary relations, going through variation by memetic versions of operators such as crossover and mutation, which utilize knowledge from commonsense knowledge bases. in evaluating this introductory work, as an interesting fitness measure, we focus on using the structure mapping theory of analogical reasoning from psychology to evolve pieces of information that are analogous to a given base information. considering other possible fitness measures, the proposed representation and algorithm can serve as a computational tool for modeling memetic theories of knowledge, such as evolutionary epistemology and cultural selection theory.”
Bryson, J. J.. (2008). Embodiment versus memetics. Mind and Society

Plain numerical DOI: 10.1007/s11299-007-0044-4
DOI URL
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“The term embodiment identifies a theory that meaning and semantics cannot be captured by abstract,

logical systems, but are dependent on an agent's experience derived from being situated in an environment. this theory has recently received a great deal of support in the cognitive science literature and is having significant impact in artificial intelligence. memetics refers to the theory that knowledge and ideas can evolve more or less independently of their human-agent substrates. while humans provide the medium for this evolution, memetics holds that ideas can be developed without human comprehension or deliberate interference. both theories have profound implications for the study of language—its potential use by machines, its acquisition by children and of particular relevance to this special issue, its evolution. this article links the theory of memetics to the established literature on semantic space, then examines the extent to which these memetic mechanisms might account for language independently of embodiment. it then seeks to explain the evolution of language through uniquely human cognitive capacities which facilitate memetic evolution."
Borovoy, R. D., Martin, F., Vemuri, S., Resnick, M., Silverman, B., & Hancock, C.. (1998). Meme Tags and Community Mirrors – Moving from Conferences to Collaboration. In Proceedings of the International Conference on Computer-Supported Cooperative Work (CSCW'98)

Plain numerical DOI: 10.1145/289444.289490
DOI URL
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"Meme tags are part of a body of research on group wear a wearable technology that supports people in the formative stages of cooperative work conference participants wear meme tags that allow them to electronically share memessuccinct ideas or opinionswith each other. aongside of the person-to-person transactions, a server system collects information about the memetic exchanges and reflects it back to the conference-goers in community mirrors-large video displays that present real-tirne visualisations of the unfolding community dynamics. this paper presents results from a proof-of-concept trial of the meme tag technology undertaken at a a mit media laboratory con- ference."
Merz, P., & Freisleben, B.. (1999). Fitness Landscapes and Memetic Algorithm Design. New Ideas in Optimization

Plain numerical DOI: 10.1080/16507540903549490
DOI URL
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"The notion of tness landscapes has been introduced to describe the dynamics of evolution-ary adaptation in nature and has become a powerful concept in evolutionary theory. fitness landscapes are equally well suited to describe the behavior of heuristic search methods in optimization, since the process of evolution can be thought of as searching a collection of genotypes in order to nd the genotype of an organism with highest tness and thus highest chance of survival. thinking of a heuristic search method as a strategy to navigate" in the tness land-scape of a given optimization problem may help in predicting the performance of a heuristic search algorithm if the structure of the landscape is known in advance. furthermore, the analysis of tness landscapes may help in designing highly eeective search algorithms. in the following we show how the analysis of tness landscapes of combinatorial optimization problems can aid in designing the components of memetic algorithms. however, some of

the presented concepts can also be utilized for the development of other search algo-rithms, including genetic algorithms and neighborhood search algorithms (e.g. simulated annealing and tabu search). 3.2 fitness landscapes of combinatorial problems in combinatorial optimization, the number of (candidate) solutions of a given problem is nite. due to the fact that the complete enumeration of the search space is in many cases impractical (many combinatorial optimization problems are known to be np-hard only a small fraction of all solutions can be evaluated and thus the structure of the problem must be exploited to nd optimum or near optimum solutions. to identify the structure of a given problem, the idea of tness landscape analysis appears to be a promising approach."
Corne, D., Glover, F., & Dorigo, M.. (1999). New ideas in optimisation. New ideas in optimization

Plain numerical DOI: 10.1007/3-540-26341-1_4
DOI URL
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"Includes index. optimization is a pivotal aspect of software design. the techniques treated in this text represent research as elucidated by the leaders in the field. the optimization methods are applied to real problems, such as hilllclimbing, simulated annealing, and tabu search. ant colony optimization — differential evolution — immune system methods — memetic algorithms — scatter search and path relinking — emerging ideas and extensions."
Langrish, J. Z.. (2004). Darwinian Design: The Memetic Evolution of Design Ideas. Design Issues

Plain numerical DOI: 10.1162/0747936042311968
DOI URL
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"There seems to have been a recent slight increase in the number of design papers with the word, evolution in their titles. unfortunately, these papers are either vague about what is meant by this word, or they use the word in a non-darwinian sense which owes more to spencers version of progressive evolution than to the process of natural selection. one interesting example is a paper by a. can ozcan, who writes: lets assume that the one we know as darwin is born in our times and he is very curious not about species but designed objects and artifacts. instead of looking at birds he is looking at refrigerators, cars, kettles, microphones, bicycles. our number one question is whether he would come up with similar principles of evolution like selection of the fittest or progression from simplicity to complexity for designed objects.1 my short answer to that question is an emphatic no. …"
Sparkes-Vian, C.. (2018). Digital Propaganda: The Tyranny of Ignorance. Critical Sociology

Plain numerical DOI: 10.1177/0896920517754241
DOI URL
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“The existence of propaganda is inexorably bound to the nature of communication and communications technology. mass communication by citizens in the digital age has been heralded as a means to counter elite propaganda; however, it also provides a forum for misinformation, aggression and hostility. the extremist group britain first has used facebook as a way to propagate hostility towards muslims, immigrants and social security claimants in the form of memes, leading to a backlash from sites antithetical to their message. this article provides a memetic analysis, which addresses persuasion, organisation, political echo chambers and self-correcting online narratives; arguing that propaganda can be best understood as an evolving set of techniques and mechanisms which facilitate the propagation of ideas and actions. this allows the concept to be adapted to fit a changing political and technological landscape and to encompass both propaganda and counter-propaganda in the context of horizontal communications net…”
Armengol, G.. (2007). Daniel Dennett, memes and religion: Reasons for the historical persistence of religion. Pensamiento

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“In the work which appeared in 2006 titled breaking the spell. religion as a natural phenomenon (viking, new york, 2006) daniel c. dennett again explained his ideas on memes and the theory of memes, by applying it to the study of reli- gion from the perspective of evolutionary biology. his conclusions establish that religion is a meme and that its persistence in history is explained by the repli- cating processes of memetic structures. however, are there reasons of philo- sophical or scientific rationality for men having persisted in religion? dennett does not go into a deep rational analysis of religion. he simply states that it has a memetic structure and he considers that this is a sufficient basis to «break the spell».”
Stanovich, K. E.. (2006). Memetics and money. Behavioral and Brain Sciences

Plain numerical DOI: 10.1017/S0140525X06439042
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“Lea & webley’s (l&w’s) drug theory solves many puzzles surrounding money-related behavior. i explore supplementing the drug theory with ideas from gene-culture coevolution theory and memetic theory.”
Neri, F., & Cotta, C.. (2012). A primer on memetic algorithms. Studies in Computational Intelligence

Plain numerical DOI: 10.1007/978-3-642-23247-3_4
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“Memetic algorithms (mas) are population-based metaheuristics composed of an evolutionary framework and a set of local search algorithms which are activated within the generation cycle of the external framework, see [376]. the earliest ma implementation has been given in [621] in the context of the travelling salesman problem (tsp) while an early systematic definition has been presented in [615]. the concept of meme is borrowed from philosophy and is intended as the unit of cultural transmission. in other words, complex ideas can be decomposed into memes which propagate andmutate within a population.culture, in this way, constantly undergoes evolution and tends towards progressive improvements. strong ideas tend to resist and be propagated within a community while weak ideas are not selected and tend to disappear. in the metaphor, the ideas are the search operators: the fittest tend to be employed while the inadequate ones are likely to disappear.”
KANENGISSER, D.. (2014). HOW IDEAS CHANGE AND HOW THEY CHANGE INSTITUTIONS: A MEMETIC THEORETICAL FRAMEWORK.. Conference Papers — American Political Science Association

Plain numerical DOI: 10.1016/j.jcis.2010.01.077
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“We first succeeded in synthesizing ferrite nanoparticles containing nd and b elements by a chemical route using a polyol process. the lattice constants of the ferrite nanoparticles were equivalent to 8.39?? of the lattice constant for fe3o4 with the spinel structure in a bulk state independently of the size in diameter and composition (fe:nd:b). the size in diameter was actually dominated by the amount of ligands (oleic acid and oleylamine) coating the nanoparticles and easily tuned by changing refluxing-time under reaction. the spinel-structured ferrite nanoparticles containing nd and b elements showed large coercivity as compared to fe3o4 nanoparticles with the spinel structure, which were prepared by the same chemical method. by doping nd and b elements into the spinel structure of ferrite, magnetic anisotropy increased in comparison with fe3o4 nanoparticles. according to the analysis of magnetization curve using the modified langevin function, the ferrite nanoparticles displayed the coexistence of superparamagnetic and antiferromagnetic phases. the ferrite nanoparticles containing nd and b elements exhibited magnetic core/shell structure on the basis of various magnetic properties. the interface effect between the superparamagnetic core and antiferromagnetic shell might enhance the effective magnetic anisotropy of the ferrite nanoparticles containing nd and b elements. ?? 2010 elsevier inc.”
Yoon, S. A.. (2008). Advancing a new perspective on decision-making about socio-scientific issues: the study of memes and memetic processes. International Conference on Learning Sciences

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“The study seeks to advance the socio-scientific issues knowledge base by addressing the complexity of these issues using methodological and analytical tools that reveal information about individual, collaborative and situational outcomes. in this case study of a grade 7 classroom investigating the topic of genetic engineering, a memes analysis indicated that several memetic mechanisms potentially

affected how and why ideas were taken up in the learning system. mechanisms included processes such as ‘do as the smart students do’, friendship selection, and meme-coupling influences. implications for education in terms of student decision-making about socio-scientific issues are discussed.”
Lynch, A.. (1996). Thought Contagion: How Belief Spreads Through Society: The New Science Of Memes. The Kluwer international series in engineering & computer science

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“Fans of douglas hofstadter, daniel bennet, and richard dawkins (as well as science buffs and readers of wired magazine) will revel in aaron lynch’s groundbreaking examination of memetics—the new study of how ideas and beliefs spread. what characterizes a meme is its capacity for displacing rival ideas and beliefs in an evolutionary drama that determines and changes the way people think. exactly how do ideas spread, and what are the factors that make them genuine thought contagions? why, for instance, do some beliefs spread throughout society, while others dwindle to extinction? what drives those intensely held beliefs that spawn ideological and political debates such as views on abortion and opinions about sex and sexuality?by drawing on examples from everyday life, lynch develops a conceptual basis for understanding memetics. memes evolve by natural selection in a process similar to that of genes in evolutionary biology. what makes an idea a potent meme is how effectively it out-propagates other ideas. in memetic evolution, the ‘fittest ideas’ are not always the truest or the most helpful, but the ones best at self replication.thus, crash diets spread not because of lasting benefit, but by alternating episodes of dramatic weight loss and slow regain. each sudden thinning provokes onlookers to ask, ‘how did you do it?’ thereby manipulating them to experiment with the diet and in turn, spread it again. the faster the pounds return, the more often these people enter that disseminating phase, all of which favors outbreaks of the most pathogenic diets. like a software virus traveling on the internet or a flu strain passing through a city, thought contagions proliferate by programming for their own propagation. lynch argues that certain beliefs spread like viruses and evolve like microbes, as mutant strains vie for more adherents and more hosts. in its most revolutionary aspect, memetics asks not how people accumulate ideas, but how ideas accumulate people. readers of this intriguing theory will be amazed to discover that many popular beliefs about family, sex, politics, religion, health, and war have succeeded by their ‘fitness’ as thought contagions.”

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Author
web45