

Brierley, Gerry, Ozuem, Wilson and Lancaster, Geoff (2020) Subconscious marketing communication techniques and legal implications. *Journal of Decision Systems* . pp. 1-10.

Downloaded from: <http://insight.cumbria.ac.uk/id/eprint/5518/>

***Usage of any items from the University of Cumbria's institutional repository 'Insight' must conform to the following fair usage guidelines.***

Any item and its associated metadata held in the University of Cumbria's institutional repository Insight (unless stated otherwise on the metadata record) may be copied, displayed or performed, and stored in line with the JISC fair dealing guidelines (available [here](#)) for educational and not-for-profit activities

**provided that**

- the authors, title and full bibliographic details of the item are cited clearly when any part of the work is referred to verbally or in the written form
  - a hyperlink/URL to the original Insight record of that item is included in any citations of the work
- the content is not changed in any way
- all files required for usage of the item are kept together with the main item file.

**You may not**

- sell any part of an item
- refer to any part of an item without citation
- amend any item or contextualise it in a way that will impugn the creator's reputation
- remove or alter the copyright statement on an item.

The full policy can be found [here](#).

Alternatively contact the University of Cumbria Repository Editor by emailing [insight@cumbria.ac.uk](mailto:insight@cumbria.ac.uk).

## **Subconscious marketing communication techniques and legal implications**

**Gerry Brierley\*, Wilson Ozuem\*\*, and Geoff Lancaster\*\*\***

Cardiff Metropolitan University\*, University of Cumbria\*\* and London School of  
Commerce\*\*\*

### **ABSTRACT**

*The efficacy and appropriateness of current advertising laws are questioned as to how customers behave emotionally towards advertising. Contacts were made with world-renowned respondents from the advertising, legal and neuroscience communities. Their responses are documented along with apposite secondary sourced material. Neuromarketing shows that emotive and rational thinking are mutually controlled. The increasing regulatory landscape has forced some advertisers to be more creative and more covert in their communications. Controversy surrounds subliminal perception with some saying it is misjudged and groundless. Suggestions are made as to how the advertising industry should engage with broader application of consumer psychology processes to evaluate regulatory procedures to improve existing laws.*

## **Introduction**

Questions are raised of how marketing techniques may circumvent consumer regulations and distort economic behaviour of consumers. UK marketing regulations are intertwined through general regulations and have direct impact on professions, businesses and consumers. The evolution of marketing to the revolution of digital marketing disciplines has opened new opportunities for marketers. To understand rational and subconscious behaviour within legal frameworks, Incardona and Poncibo (2007) state that the European Unfair Commercial Practices Directive (UCPD) establishes information needed before purchasing including rights of withdrawal in a non-ambiguous way. Consumer perceptions vary; people do not objectively see and hear what surrounds them. Neuro-marketing studies reveal that brands have succeeded in by-passing Government regulations by creating stimuli powerful enough to replace traditional advertising. Heath (2012: 198) notes: “Being subconscious doesn’t mean it ceases to influence us; it means it influences us even better, acting as a marker that covertly directs our intuitive decision-making”. Subconscious marketing techniques are excluded under Prohibitions within CPR’s. Yet, ‘Misleading Actions and Omissions’ are prohibited.

Arkush (2008: 1275) affirms that unconscious behavioural processes are: “so ubiquitous, robust and effective that some are left wondering what purpose conscious reasoning serves.” In relation to rational marketing models Martin and Morich (2011: 483) confirm: “Conscious models of consumer behaviour do not accommodate the reality of the part that emotions, attitudes and beliefs play in decision making.” Rational choice theory which assumes decision making is emotionless has been replaced by the thought that decision making is fundamentally flawed, thereby following the theory of behavioural economics. Incardona and Poncibo (2007:21) discuss how the average consumer test reflects the economist’s idealistic paradigm of a rational consumer in an efficient marketplace: “This notion may be useful for

economists' calculations and projections but departs from unpredictable realities of human behaviour and is hardly an appropriate standard for legislative or judicial sanctions." We should re-evaluate legal doctrines that rely on assumptions that humans are mostly emotionless and re-examine areas of law that concern consent, states of mind and causes of behaviour. Emotional realism suggests we have no empirical definition of welfare on which to base policy. Céline Bérard, *et al.* (2017) suggest that systems thinking might trigger decision makers' perceptions of where problem boundaries lie. Psychologists accept that emotions act as a gatekeeper for decisions. The potential for neuro-marketing to reduce marketing failures and increase marketing successes seems promising, but controversial.

### **Legal protection and faulty suppositions**

Richards (2009: 174) claims how multidisciplinary authors of law and regulations, with limited legal training, create faulty suppositions that should be ignored with fears that regulatory bodies might be misled into adopting policies that create greater problems than solutions. Marketers and psychologists acknowledge this and call for collaboration (Cacioppo and Gardner 1999: 192) to advance emotional and behavioural theory and methodology to understand the role of subconscious marketing activity and effects of perception in terms of CPRs. reTrzaskowski (2011) links behavioural economics, neuroscience, advertising and regulations to discuss influences these disciplines have in uncovering oversights in the UCPD and whether specific commercial practices are unfair. This raises questions as to whether these disciplines can help draw the line between legitimate influence of commercial activities and illegal distortion of consumer behaviour. Researchers across multiple disciplines have improved understanding of unconscious behaviour, yet consumer research continues to rely on models that support consciously made, deliberate choices and decisions.

### **Homo economicus and the average consumer uncovered**

Neuroeconomics emerged as an extension of bio-economics and found cognitive biases like anchoring and framing which could not be governed by our emotions for fears or legislation (Vromen 2007). Behavioural economics challenges traditional economic views of human nature that people are rational, utility-maximising, cost minimising with stable preferences (Wood and Harrison 2011). The EU Directorate-General for Health and Consumers suggested that insights from behavioural economics could be considered when interpreting the Directive. This document is not legally binding; yet it shows that the Commission is interested in finding the real average consumer (Trzaskowski 2011).

Cultural cognition theory holds that emotion is rational and critical to decisions, positing that behavioural economics is mistaken to treat emotion as a distorting influence. Rational choice theory accepts that people choose without emotional outcomes. Behavioural economists employ the same structure, varying their recognition that many emotional decisions are irrational. Economists reverse this equation to infer preferences: people rationally choose the best means of satisfying preferences; people desire the results of their actions and their choices reveal preferences. Policy makers could determine the value of goods and services and define welfare simply by watching what people do in markets. This approach assumes people perceive, evaluate and pursue emotion without feeling. Although researchers originally thought non-conscious cognition was limited to simple mental processes, they now believe it dominates our lives. Non-conscious behavioural processes are so ubiquitous, robust and effective that some are left wondering what purpose conscious reasoning serves (Arkush 2008).

### **Subliminally Subconscious**

Theus (1994) agrees that brand choice behaviour is not influenced by subliminal suggestion, although some themes might be applied to advertising in the hope that these techniques make a difference in influencing consumer behaviour other than visual stimuli, which seems to have a greater effect than auditory stimuli. He suggests that traditional demographic targets might be less susceptible than targeting psychogenic need-based states of mind which could increase the effectiveness of advertising campaigns. The existence of unconscious and subliminal stimuli affecting consumers is why this causes controversy.

Heath (2012) mentions ‘subconscious seduction’ as a way in which advertising works and distances this from relationship to subliminal effects, and claims that subconscious seduction works in full view, unlike subliminal exposure which we cannot legislate against. Subconscious seduction happens because of how our minds work and make decisions; it is complicated because we are all different and susceptible to certain types of communication. His multidisciplinary approach used cognitive psychology, behavioural psychology, neurobiology and philosophy to form his theory about ‘subconscious seduction’. He believes that many have vested interests in proving his theory wrong as many have built careers and businesses on old models, with a degree of paranoia around the prospect that advertising might be sinister. On the contrary, everything we do as humans happens at a subconscious level. Our conscious mind is more like a computer monitor than a computer.

Emotions form a natural and necessary make-up of humans. To cease the effect on our emotions, one may need to stop advertising having any level of creativity to cease this implicit conditioning process. Consumers need to ‘feel’ the brand rather than ‘think’ it, thus creating long term associations rather than moments in time. However, for delivery of factual content such as company contact details, ‘attention’ based advertising, although hard to measure can work.

## **Methodology**

The sampling method was purposive in nature as this research approached the sampling problem with a specific plan in mind and target groups of the population were selected due to their direct or indirect influence relating to the research problem. A snowballing or ‘referral’ type of approach was adopted in requesting introductions from one interviewee to another trusted interviewee by formal introduction where necessary. Respondents were selected because of the intertwined web that forms interconnected relationships between the sample population, research objectives, research questions and contribution to knowledge. Sampling from senior professionals assists in providing expert validity of data gathered to identify if these experts within groups of the population such as Government and regulators are up to date with the opinion of consumer and marketing agencies in relation to the CPRs and subconscious marketing techniques. These experts are everyday consumers, and provision was made during semi-structured interviews to elicit not only expert opinions, but also their consumer experiences and compare this to their ‘professional’ responses. The sample size reflected depth of information. Table 1 details research sample population and sample groups.

<b>Sample Population</b>	<b>Sample Strategy</b>	<b>Justification</b>
Government Representatives (such as Politicians)	Purposive/Expert/Snowball	Influencers who have a responsibility to ensure good legislation
Institutions (such as CIM, IDM DMA)	Purposive/Expert/Snowball	Responsibility to their members for good practice and to ensure that new practices are adopted and to lobby

Including Practitioners		
Regulators (such as Trading Standards, ASA, OFT)	Purposive/Expert/Snowball	Industry regulators responsible for ensuring standards are maintained in particular with reference to CPRs
Marketing Agencies and behavioural experts and psychologists	Purposive/Expert/Snowball	Use techniques available for successful campaigns within guidelines of CPRs and techniques to go under the radar of CPRs
Neuroscientists and Neuromarketers	Purposive/Expert/Snowball	Lead the way in neuromarketing techniques and new knowledge around conscious and unconscious behaviour
Lawyers	Purposive/Expert/Snowball	Experiences and opinions relating to literature findings as to potential invalidity of CPRs in the presence of subconscious marketing techniques
Academics	Purposive/Expert/Snowball	The connectivity of findings in the literature review, relating to subconscious marketing, homo-economicus, and validity of rational marketing models in light of CPRs, coupled with identified knowledge gap and empirical data from other sample groups would form further expert opinion to research findings.



**Table 1 Research sample population and sample groups**

### **Commentary from Respondents**

The infancy of neuroscience as a research tool and germination of neuroeconomics, neurolaw and neuromarketing warrant theoretical commentary from the small number of specialist experts who provide cutting edge insights. Breakthroughs in which neuroscience and marketing in the 1990s created the conjoint term ‘neuromarketing’ began with a revelation in a Pepsi and Coke neuroscientific case study using the technique of fMRI scanning. It produced results that demonstrated customers had branded preferences within different regions of the brain associated with emotional memories by using a blind tasting test most respondents preferred Pepsi. Cups were changed, and Coke was put in all cups, yet some were marked Pepsi, and others marked Coke. Most respondents then preferred cups marked Coke. The conclusion was that the greater the incidence of exposure to Coke, the better the memory of Coke and emotional ties to Coke created brand recognition and this arousal preference for Coke overwhelmed any taste preference for Pepsi, and concluded that what one ‘knows’ about Coke is more important than what one ‘feels’ about Pepsi, proving brand development is probably more important than product development (Conejo et al 2007).

. Yet, less reliable methods such as qualitative and quantitative methods are used.

Fugate (2007: 386) says: “The potential for neuromarketing to reduce marketing failures and increase marketing successes seems promising; although not without controversy.” Subliminal marketing techniques are controversial, with academics divided over their potential existence and effect. Subliminal promotional techniques are now banned under a number of regulations including Product Placement and Electronic Communications. However, subliminal and subconscious are not prohibited under the CPRs. Heath (2012) forms a more

modern understanding of these techniques and separates the terms subliminal and subconscious with specific relevance to marketing techniques.

One of the researchers was privy to empirical evidence following a conversation with a senior expert psychologist who presented this information to an OFT lawyer, whereby a multidisciplinary team of neuroscientists and psychologists, excluding marketing representation, were invited to help launch and promote a new grooming product into the UK market. Priming was used in a quest to understand if subconscious marketing methods could go under the radar of legislation. The OFT Lawyer responded:

*“There is implicit assumption that consumers don’t want to buy this product and likelihood of a problem when they over-consume, or don’t need it or want it, but buy it anyway. In the case of the grooming product, there is a market for it, so the question is: Is it a product being sold at a price people want to pay and are consumers being encouraged to buy in an underhand or misleading manner? We might be concerned if people came up with cunning ways to get people to buy a product that is not very good.”*

The same circumstances were presented to an executive officer of the ASA: Refuting these claims that multidisciplinary experts can manipulate the consumer:

*“I think that’s an alarmist view. Marketing provides evidence of what works and what doesn’t. Marketing is hit-and-miss and there is an element of magic to it. I know of how often marketers fail in what they’re trying to do. I don’t think it matters whether you’re talking about marketers, psychologists or any expert professional. Anything that paints a picture of them being able to manipulate people is naïve.”*

A world-renowned neuropsychology expert describing and discussing historic landmarks and antecedents in neuromarketing research says:

*Al Smith, coined the term neuromarketing in 2002, and a lot of money was thrown at it: Nielsen put about £160,000,000 into it and set up worldwide laboratories to do this. The problem was it wasn't making them money they wanted. Nielsen's were used to doing surveys which you could scale up, so if you put people in laboratories and put electrodes on their head the number of subjects you can run is limited, and it's a time consuming, expensive way of researching. There was a surge of excitement generated by people who didn't know much about neuroscience. Claims were made for the power of neuromarketing which were not justified. I think you've got to be cautious and have some perspective about what you can tell at this stage. Marketing people made promises well beyond what the science was providing; they built a big edifice on shaky foundations."*

A world leading professor of cognitive neurology and neuroscience believes neuromarketing does not work in theory or practice:

*"What neuroscience can tell you about how people behave and what influences their behaviour is limited. The brain is complicated and works in a way that is different to any other machine we have. Brains aren't computers, apart from the fact that they run on pizza and computers don't; they're low-voltage, and computers aren't; they don't have a central clock or a central processor. They're a lot more complicated, each cubic millimetre of your brain has 100,000 nerve cells and a couple of kilometres of wiring stuffed inside.*

*Neuroscience is astonishing in explaining how people perceive the world and act differently. Most of that is done in laboratory artificial settings, and when it goes to*

*real-world questions like: ‘How do we increase the sales of Mars bars?’ neuroscience has little to say simply because we don’t have the kind of detailed knowledge of different influences on people’s behaviour; how they all interact and produce real-world outcomes. Neuroscience does not help the marketing process.”*

He thinks it better to measure human behaviour using traditional methods like ethnography, and does not think neuroscience can contribute to marketing or establish product preferences:

*“Non-invasive technology can record what’s going on inside people’s heads without having to poke them with needles or touch them. The signal is noisy and we’re trying to use these noisy signals. It’s a bit like having a detailed heat map of your computer that’s pulsing. The question is: ‘Can you tell me what word the subject is typing right now?’ That’s going to be a hard; presumably the word is somewhere in code in the computer. To all intents and purposes, it is usually better to measure behaviour than to go to the noisy brain signal.*

*‘Could it reveal a hidden preference?’ My intuition is that what a business is interested in is selling their product, which comes about through the consumer making a choice to purchase Persil rather than Ariel: an overt behaviour. Say this customer has chosen Persil over Ariel, but really, my brain imaging device has said you secretly prefer Ariel. It wouldn’t mean anything in the real world, because they had already chosen Persil. So, you wouldn’t believe it. You’d say: ‘Okay, they’ve got a hidden preference for Ariel.’*

*Maybe, in a fantasy world, you could uncover hidden preferences and design a covert marketing campaign to actualise those preferences, but it strikes me that what most people who come to see me from agencies are interested in, is improving the power of their predictions about what customers are going to do, targeting their*

*advertisement to influence and elicit particular behaviours and then all you have to do is fiddle with the advert, measure behaviour, and see what works. Neuroscience is interested in saying: 'How do people make decisions about the world?' .....everything from big, grand questions to more detailed questions like: 'Why do people buy alcohol and drink it and become addicted to it?' and 'Why do people make certain purchasing decisions?' So, it's a legitimate topic for neuroscience, but whether the current state of the art says anything sensible to help you adjudicate in legal matters is more complicated."*

Providing theoretical and practical reasoning in conversation with an international neuromarketing and neuroscientific expert disagrees with the professor of neurology on practical marketing applications:

*"We know most of our behaviour is driven by feelings and emotions that are deep seated; we're routine and habitual creatures so what we learn becomes automated and involuntary; yet our behaviour, because it's driven by subconscious reactions, is essentially the reason why marketing as a tool to find out what consumers want. Most behaviour is driven by subconscious responses; people don't do what they say. Some brands have been with us for so long we can't remember what the benefits are and why we buy one brand over another. What neuromarketing tries to measure and understand are perceived benefits of a product, a new idea, or advert. 90% of this stuff is subconscious, so what is the brain picking up? What things resonate and turn it on? Images we show? Colours we use. We try to find out how that's put together for manufacturers to have a better understanding of what we want, because economically if they don't make what we want, they lose billions each year, spent on confirmatory market research where people are running focus groups and questionnaires; fine up to a point, only capturing the tip of the iceberg of responses*

*that predict behaviour. All that stuff is subconscious, and they're missing that out.*

*Now we've got these tools to measure not only spoken words, but what's not spoken gives us deeper understanding of benefits of products and what people really feel."*

The world-renowned professor of neurology and neuroscience believes neuromarketing can be misleading and needs to be linked to other forms of research to authenticate results like ethnography to uncover underlying behavioural complexities. He provides an example of how technology and results can be misinterpreted:

*"I once showed, in work we did for the 'Today Programme', that people's political preferences are correlated with their brain structure. That is, certain parts of the brain are thicker or have more grey matter in people who describe themselves as right-wing, compared to people who describe themselves as left-wing.*

*One of those areas called the amygdala, an area in the temporal lobe of the brain, was bigger in those who described themselves as Conservative. So that was written up in the blogosphere as 'fear centre larger in Conservatives' because the amygdala also lights up when we show people scary faces, or fearful scenes. Does that mean that Conservatives are scaredy-cats, or have an exaggerated sense of fear? No. Because the amygdala does other things; it activates to happy faces. For example, they didn't write 'Happy centre bigger in Conservatives' and the actual link to behaviour is not shown."*

He goes onto discuss how focal psychology plays a part in research, how classical economics is a poor predictor of behaviour and how putting consumers under a scanner cannot reveal behaviour:

*“The area of focal psychology is what peoples’ beliefs are about how mental processes and the brain works, and how it affects views of what people happen to do next. The world of economics has been revolutionised by importing focal psychology. Classical economics is a poor predictor of what people do, whereas if you import loads of heuristics, biases and mental shortcuts, that explains a lot about how people misjudge risk and make random decisions.”*

It seems ‘impulse’ does not work in the real world. He goes on to say:

*“There is a neuroscience of impulsivity. If, as a neuromarketer, you want to say: ‘I want to understand what goes on in the brain when somebody makes an impulse purchase.’ The act of just recording brain activity can be done, but interpretation that might help you understand this demographic of a shopper means you have to dissect the activity you measure.”*

The international neuromarketing and neuroscientific expert disagrees, and counter argues:

*“The reality is academics don’t have access to data, because they haven’t asked for those experiments or questioned the techniques. There are limitations of some tools. We do most of our work online; it’s not using brain scanners or EEG equipment anymore. In 1999 we used brain imaging, so it was fMRI for years, but then we realised it wasn’t going to be scalable because not everyone can afford that, and it had limitations in terms of interpretation. In some experiments you must know what bits of the brain are doing and finding. The more complicated the question, when you move away from simple visual processing and auditory processing and move into brain areas that code for sense of value or conflict or refreshment, then it becomes interpretative and you lose some of the hard science as you get more complicated. Marketing and everyday life is complicated. The limitations of fMRI*

*relate to spatial resolution, because we can only see large bits of the brain. It's like looking at continents rather than countries. That may improve in time, more than likely they're going to get higher and higher resolutions, so if you can see smaller and smaller patches, and track the trajectory of what happens across the brain and how things are coordinated, then you get more specific about what brain areas are doing.*

*We started running behavioural reaction type studies like semantic priming and implicit association tests which came out of cognitive psychology. We adapted designs for commercial purposes and ran them alongside brain scanning experiments. After a while we said: 'Hang on, we're getting the same results from reaction times as we're getting from the fMRI, so now we've validated the tools with brain imaging alongside it, we don't need to fMRI everybody anymore'. This has completely revolutionised our business, and 90% of our revenue comes from online subconscious implicit reaction time studies. If you ask me: 'Where is neuromarketing going?' I can tell you because we work with some global market research clients. It turns out that the techniques have become scalable. Things like web tracking online, eye tracking, using webcams, and tests which we've developed which capture subconscious responses using reaction times that force you to respond in less than a second. Your conscious brain doesn't have time to interfere, and the one we're developing now uses webcams from people's laptops and computers they log into from home, so they don't have to go into a lab to capture micro expressions from the face. It's non-interpretive and subjective because you're capturing people's response times which you can't fake. It's better than simply asking people, as we know 80% of all new products fail in the first year. Frankly, you might as well toss a coin: at least you have 50% chance"*



He expands on comments made by the international neuromarketing expert:

*“Research companies are getting better at implicit research not involving asking direct questions. It’s what some neuroimaging is going towards by observing responses rather than asking direct questions. Only then can we uncover what our emotional response is. With focus groups, respondents work out what you want to hear or they’re listening to the opinion leader in the focus group. Or you’re trying to get them to scale an answer: you’re just self-editing.”*

## **Conclusion**

Consumer marketing regulatory frameworks trail behind knowledge of consumer behaviour, which underpins challenges faced in the dichotomy between marketing and law. Some consumers are easily led by communications, whilst others are led to products. Marketing communications can ‘distort’ economic behaviour of consumers, intentionally or unintentionally, whilst being unaware of such effects. Consumer perceptions of marketing communications vary between individuals who perceive messages differently from one mood to another.

Experts agree that ASA regulatory adjudication decision processes are right to consider likely effects of communication on individuals as opposed to intentions of marketers, whose communications can go under the radar of rationality to target emotions.

Some respondents considered subconscious or subliminal marketing methods as ‘science fiction’, whereas psychology and neuroscience experts confirmed various forms of susceptibility of certain people to sensory messages. Expert opinions gravitated with examples of restrictive advertising regulations making marketing messages in advertising more creative and smarter at messaging consumers under the scrutiny of regulations and fines for such

transgressions should be proportionate. The ASA asserts it is a matter of priority not proportionality. To some companies, fines are a cost of doing business and a balancing act of unfair influence with legitimate consumer communications.

Simple heuristics in human decision making seemed to be at the core of experts' opinions. The increasing regulatory landscape has forced some advertisers to be more creative and covert in their communications. Honest and decent brands don't want a reputational reflux from consumers and support the process of self-regulation.

## **References**

- Arkush, D. (2008), Situating emotion: a critical realist view of emotion and nonconscious cognitive processes for law and legal theory, *Brigham Young University Law Review*, 2008(5), 1275-1366.
- Cacioppo, J. and Gardner, W. (1999), "Emotion." *Annual Review of Psychology*, 50, 191-214.
- Céline Bérard, L., Cloutier, M. and Cassivi, L. (2017) The effects of using system dynamics-based decision support models: testing policy-makers' boundaries in a complex situation, *Journal of Decision Systems*, 26:1, 45-63.
- Conejo, F., Khoo, C., Tanakinjal, G. and Yang, L. (2007), "Neuromarketing: will it revolutionise business?" *International Journal of Business and Management*, 2(6), 72-76.
- Fugate, D. (2007), Neuromarketing: a layman's look at neuroscience and its potential application to marketing practice. *Journal of Consumer Marketing*, 24(7), 385-394.
- Heath, R. (2012). *Seducing the subconscious*. Chichester, UK: Wiley-Blackwell.
- Incardona, R. and Poncibo, C. (2007). The average consumer, the unfair commercial practices directive, and the cognitive revolution. *Journal of Consumer Policy*, 30(1), 21-38.
- Martin, N. and Morich, K. (2011). Unconscious mental processes in consumer choice: Toward a new model of consumer behavior. *Journal of Brand Management*, 18(7), 483-505.

Richards, J. (2009). Common fallacies in law-related consumer research. *Journal of Consumer Affairs*, 43(1), 174-180.

Theus, K. (1994). Subliminal advertising and the psychology of processing unconscious stimuli: A review of research. *Psychology and Marketing*, 11(3), 271-290.

Trzaskowski, J. (2011). Behavioural economics, neuroscience, and the unfair commercial practises directive. *Journal of Consumer Policy*, 34(3), 377-392.

Vromen, J. (2007). Neuroeconomics as a natural extension of bioeconomics: the shifting scope of standard economic theory. *Journal of Bioecon*, 9(2), 145-167.

Wood, B. and Harrison, T. (2011). The evolutionary context of the first hominins. *Nature*, 470(7334), 347-352.