Utrecht Law Review
igitur
Utrecht Publishing & Archiving Services

This article is published in a peer-reviewed section of the Utrecht Law Review

Integrating the Disciplines of Law and Biology: Dealing with Clashing Paradigms

Hendrik Gommer*

'*The competition between paradigms is not the sort of battle that can be resolved by proofs.*'[1]

1. Introduction

In 2010, PhDs who had completed interdisciplinary dissertations earned 1,700 dollars less on average in the year after their promotion than those who had completed dissertations in a single field. Assistant professors seem to avoid cross-disciplinary work and departments consider an interdisciplinary dissertation to be a liability when reviewing applications. These findings of Kevin Kniffin and Andrew Hanks are not exactly motivating for those about to start interdisciplinary research.[2] Additionally, interdisciplinary research is also challenging from a methodological point of view since standard methods do not always suffice. Although I will focus on my own field, which is the integration of biological mechanisms into normative theory, this article will be of interest to all scholars who want to know what difficulties a researcher on the border of normative and explanatory sciences may encounter. This article is about interdisciplinary research in general, focussing on the merging of the very distinctive disciplines of law and biology.

The risk of semantic confusion already exists within disciplines, is bigger in interdisciplinary research and is greatest with research integrating normative and explanatory sciences.[3] Especially social evolution theory has been 'famously dogged by semantic confusion and controversies.'[4] West et al. add to this that evolutionary biologists have solved the levels of selection debate that still rages in other areas because they 'have been able to apply theory to areas such as the sex ratio that are *not so loaded with preconceptions* of how individuals are expected (or ought) to behave'.[5] Preconceptions blur the debate of how we justify our preconceptions. It is very difficult to engage in a debate on evolution and justification, without questioning one's own existential preconceptions. Nevertheless, a dialogue between normative philosophers and evolutionary biologists may provide interesting new insights that can enlighten the

* Dr. Hendrik Gommer (e-mail: h.gommer@rug.nl), Science and Society Group, Faculty of Mathematics and Natural Sciences, University of Groningen (the Netherlands).

1 T.S. Kuhn, *The Structure of Scientific Revolutions,* 2004, p. 148.

2 K.M. Kniffin & A.S. Hanks, 'Boundary Spanning in Academia: Antecedents and Near-Term Consequences of Academic Entrepreneurialism', Cornell Higher Education Research Institute Working Paper 158, 2013, <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2341780> (last visited 12 June 2015).

3 A.F. Read, 'The evolution of virulence', 1994 *Tr. Microbiology*, no. 3, pp. 73-76; S.A. West et al., 'Social evolution theory for microorganisms', 2012 *Nat. Rev. Microbiology*, pp. 597-607.

4 A. Ross-Gillespie & R. Kümmerli, 'Collective decision-making in microbes', 2014 *Frontiers in microbiology* 5, pp. 1-12, cit. p. 9.

5 West et al., supra note 3.

study of law and ethics. Because of the ultimate perspective of evolutionary biology, this approach should bring about universal aspects, so that the conclusions can be used not only in European law, but as I showed earlier, also in other law systems.[6]

I will start this article with an introduction to my field of research. Then, using the dynamic model of disciplinarity of Sanne Taekema and Bart van Klink,[7] I will discuss the problems that occur in this type of research and I will present the particular problem of integrating disciplines as a phenomenon for introducing a new paradigm, which Taekema and Van Klink call 'a different notion of truth'. As Thomas Kuhn discovered, new paradigms are a special challenge for scholars and scientists.[8] Peer reviews in particular are difficult to obtain when paradigms clash. It therefore appears that interdisciplinary research is not only a challenge for the *researcher* himself, but also for his *readers*. Thus, this article is meant for those who like a challenge.

2. Biological foundations of law

In my opinion one of the biggest scholarly challenges of this century is the integration of evolutionary biology and law. The attacks of biologists on the bulwark of the alleged gap between the 'is' and the 'ought',[9] which is countered ferociously by philosophers,[10] seem to become more intense.

As I will show later, some biologists state that norms are essentially biological decision rules.[11] From this perspective, the gap actually concerns a semantic confusion. Frans de Waal shows in his work that animals also act in a moral way.[12] According to many philosophers of law norms cannot be derived from biological facts, whereas some biologists claim norms are no more than feedback systems that derive from the ultimate principle that all living organisms multiply. Norms make cooperation possible, enhancing the chances of multiplication. Before discussing the philosophical problems that arise from this assumption, I will explain the – controversial – idea of deriving norms from biological facts a little bit further.[13]

Recently Adin Ross-Gillespie and Rolf Kümmerli wrote an article on the biological fundamentals of organisms that cooperate. Conflicts destabilize cooperation and thus must be avoided. Cheating must be 'disincentivized'.[14]

> '[They] are intensely social organisms that routinely cooperate and coordinate their activities to express elaborate population level phenotypes. Such coordination requires a process of collective decision making, in which individuals detect and collate information not only from their physical environment, but also from their social environment, in order to arrive at an appropriately calibrated response. (…) Conflicts of interest among individuals will generally destabilize cooperative activities (…). To avoid conflicts and maintain collective actions, the interests of group members must be brought into alignment. In general terms, this can be achieved by (a) increasing relatedness, (b) disincentivizing cheating by introducing costs for potential dissenters, or (c) incentivizing cooperation by increasing the benefits associated with cooperation.'[15]

---

6 E.g. H. Gommer & P. Swales, 'Global aspects of the Aboriginal law system. A biological perspective', 2012 *Journal of Politics and Law* 5, no. 1, pp. 43-55.

7 H.S. Taekema & B.M.J. van Klink, 'On the Border. Limits and Possibilities of Interdisciplinary Research', in B.M.J. van Klink & H.S. Taekema (eds.), *Law and Method, Interdisciplinary Research into Law*, 2011, pp. 7-32.

8 Kuhn, supra note 1.

9 E.g. R.D. Alexander, *The Biology of Moral Systems*, 1987; F.B.M. de Waal, *The Bonobo and the Atheist*, 2013; E.O. Wilson, *The Meaning of Human Existence*, 2014.

10 E.g. H. Kaptein, 'Gommers natuurrechtsleer: no new fable of the bees', 2009 *Nederlands Juristenblad*, pp. 1734-1736; S. Blackburn, *Ruling Passions*, 1998.

11 D.T. Kenrick et al., 'Dynamical Evolutionary Psychology: Individual Decision Rules and Emergent Social Norms', 2003 *Psychological Review*, no. 1, pp. 3-28.

12 De Waal, supra note 9.

13 See also H. Gommer, 'From the "is" to the "ought"', 2010 *ARSP*, pp. 449-468; H. Gommer, *A Biological Theory of Law*, 2011; H. Gommer, 'The Biological Foundations of Global Ethics and Law', 2014 *ARSP*, pp. 151-175; H. Gommer, 'From Genes to Legal Norms: Cooperation as a pivot point', 2015 *Zeitschrift Rechtstheorie* (in press).

14 Ross-Gillespie & Kümmerli, supra note 4.

15 Ibid, p. 7.

It may be surprising to discover that this text is not about humans or other higher animals. 'They' here refers to microbes, single-cellular organisms like bacteria. The authors have deliberately chosen to use anthropomorphic terms like 'decision-making', 'conflicts', 'group' members, and 'interests', in order to show how very similar the behaviour of microbes is to that of humans. It turns out that the same concepts can be used in microbial cooperation and human cooperation. Still, there must be differences. I will explain that these differences mainly exist on a proximate level (how questions), but not at the ultimate level (why questions).[16]

Cooperation will enhance the reproductive success of the microbes if all individuals benefit.[17] They can jointly find new resources,[18] defend themselves against predators[19] or survive in harsh environments.[20] This ultimately *explains* why microbes that cooperate will be selected, will survive and will reproduce. Explaining is what biology is supposed to do. However, where does the explaining end and the justification start? In an earlier article I stated that groups of people and even states behave in the same way as microbes.[21] Variation in biological processes is not random, but a few simple mechanisms determine how processes develop. As small disturbances in the environment can cause major alterations, the exact outcome of these dynamical processes is unpredictable in the long term.[22] This dynamical process creates fractals, which are objects whose smallest particles have the same structure as the composite whole of these particles.[23] As the building blocks of humans and human groups are essentially cooperating single cells (10% body cells and 90% microbes), they might behave in a similar way. My theory is that at each level of cooperation (organ, organism, group, state, global society) their behaviour will be steered by the biological requirements of feeding, growth, reproduction, multiplication, spreading, stability and reciprocity. Therefore people have the 'desire' to grow and reproduce, a desire that can be recognised in people's behaviour, policy, norms and laws.[24] As people depend on cooperation, just as microbes do, they need to be reciprocal with other group members.[25] Members that are not reciprocal must be 'disincentivised'. Microbes use chemicals to do that, while people use norms and punishment. Are norms a kind of 'spoken chemicals' of human cooperation? And if so, are our norms justified by their function of enhancing cooperation?

At this stage, I may have lost some of the readers. Bacteria do not 'cheat', 'punish' or 'avoid'. They certainly do not have values or use norms. Or do they? The answer to this question depends on how one defines these concepts. Douglas Kenrick et al. speak of *biological decision rules* that organisms (microbes, animals, humans) follow when they adjust their behaviour to the physical and social environment they live in.[26] Norms are essentially decision rules that humans need to form societies. They 'emerge systematically out of the information-processing mechanisms of the individuals who interact within natural communities.'[27] People generate these 'norms' by oral and written communication, while microbes generate signals and cures.[28]

16 Also West et al., supra note 3.
17 West et al., supra note 3.
18 F. Harrison & A. Buckling, 'Cooperative production of siderophores by Pseudomonas aeruginosa', 2009 *Frontiers in Bioscience*, pp. 4113-4126.
19 A. Jousset, 'Ecological and evolutive implications of bacterial defences against predators',2012 *Environmental Microbiology* 14, pp. 1830-2843.
20 D. Daavies, 'Understanding biofilm resistance to antibacterial agents', 2013 *Nat. Rev. Drug Discov*. 2, pp. 114-122.
21 H. Gommer, 'The molecular concept of law', 2011 *Utrecht Law Review* 7, no. 2, , pp. 141-159.
22 Also N. Lesmoir-Gorden et al., *Introducing Fractal Geometry*, 2000, pp. 51-63; I.S. Liebovitch, *Fractals and Chaos*, 1998, p. 162.
23 C. Brown & L. Liebovitch, *Fractal Analysis*, 2010, p. 3.
24 Gommer 2011, supra note 21, pp. 141-159.
25 R. Axelrod & W.D. Hamilton, 'The evolution of cooperation', 1981 *Science*, pp. 1390-1396; West et al., supra note 3.
26 Kenrick et al., supra note 11.
27 Ibid., p. 22.
28 J. Maynard Smith & D. Harper, *Animal signals*, 2003; T.C. Scott-Phillips, 'Defining biological communication', 2008 *Journal of Evolutionary Biology* 21, no. 2, pp. 387-395.

Figure 1: Left, the map of Amsterdam (Jan Willem van Aalst, CC license, Wikimedia), right, a colony of bacteria in a Petri disk (Ben-Jacob, Tel Aviv University, CC license, Wikimedia). Amsterdam grew with the help of norms, the bacteria created a similar structure with the help of chemicals.

Far from being consciously aware of it, organisms are *ultimately driven* by adaptations that have been shaped by natural selection because in the past they were eventually beneficial for reproduction.[29] This biological principle permeates all actions of all organisms, but the *outcome depends on the circumstances*. As Rob Brooks stresses: 'serious academic research should be above the ancient laziness of pitting nature and nurture as competing alternative explanations.'[30] The 'outmoded all-biology-equals-determinism thinking' is at odds with the way biologists view behaviour.[31] For such ultra-social animals as human beings, it is *generally favourable to cooperate*.[32] From an ultimate perspective humans do not differ from microbes in that they 'punish' in order to stabilize cooperation, which increases group survival, and hence individual survival.[33] Accordingly, people must be reciprocal, for without reciprocity cooperation will not be possible. Human cooperation differs from microbial cooperation in the way the punishment and reward systems work.[34] People try to prescribe how others should behave. Microbes cannot do that. When we *value* events and situations, we express ourselves in moralised terms of what is 'good', 'bad', 'obligatory', 'right' or 'justifiable'.[35] These words facilitate group cooperation and only valuations that do so successfully will last. Like emotions, moral valuations seem to be a biopsychological phenomenon.[36] There is overwhelming evidence that emotions have been shaped by natural selection to promote survival and reproduction.[37] Morals, values, duties and legal norms will help promote an attitude among group members that may enhance group cohesion[38] and thus the survival and reproduction of group members.

Still, values seem to vary widely. If culture and, indeed, norms are the products of biological mechanisms and a changing environment, what norms follow from these principles in today's globalised culture? The number of situations that people may encounter may be too vast to expect an optimal decision

29 G.C. Williams, *Adaptation and Natural Selection*, 1966.

30 R. Brooks, 'Ovulatory overtures: do women's preferences shift with their fertility cycle?', *The Conversation*, 23 June 2014, <http://theconversation.com/ovulatory-overtures-do-womens-preferences-shift-with-their-fertility-cycle-10494> (last visited 12 June 2015).

31 Ibid.

32 E.g. Wilson, supra note 9.

33 A.S. Griffin & S.A. West, 'Kin selection: fact and fiction', 2002 *Trends Ecologic Evolution*, no. 1, pp. 15-21; West et al., supra note 3.

34 F. Fehr & U. Fischbacher, 'Third-party punishment and social norms', 2004 *Evolution and Human Behaviour*, pp. 63-87; West et al., supra note 3.

35 S. Blackburn, *Ruling Passions*, 1998, p. 49.

36 E.g. D.W. Pfaff, *The neuropsychology of fair play*, 2007; J.D. Green et al., 'An fMRI investigation of emotional engagement in moral judgment', 2001 *Science*, pp. 2105-2108; J. Haidt, 'The emotional dog and its rational tail: A social intuitionist approach to moral judgment', 2001 *Psychological Review*, no. 4, pp. 814-834.

37 R. Plutchik, *Emotions and life: Perspectives from psychology, biology and evolution*, 2003.

38 C. Boehm, *Moral Origins: The Evolution of Virtue, Altruism and Shame*, 2012; R. Cialdini, 'Crafting normative messages to protect the environment', 2003 *Current directions in Psychological Science*, pp. 105-109; S. Asch, Studies of independence and conformity, 1956 *Psychological Monographs: General and Applied*, whole no. 416.

to emerge for every situation. However, as McNamara and Houston state, 'it is likely that animals evolve rules that perform well on average in their natural environment.'[39] According to legal philosopher Joseph Raz, this is exactly what people do by using law: 'Law is intended as a practical guide for action by way of rules.'[40] The term 'practical guide for action' suggests that it must be possible to derive these rules using a biological system of decision rules that cause self-organisation in which society and culture develop.[41] The vast variation of cultural expressions may keep us from realizing that standard evolutionary theory already explains the enormous variation in species. The 'why' of social norms still appears to rely on the individual benefits to cooperation.[42]

Since a small number of mechanisms can create a complex ethical legal system,[43] it should be possible to develop a model that can explain how legal norms evolve. Given certain circumstances and the basic biological properties of people, the model should be able to predict what norms will likely occur (see Figure 2).

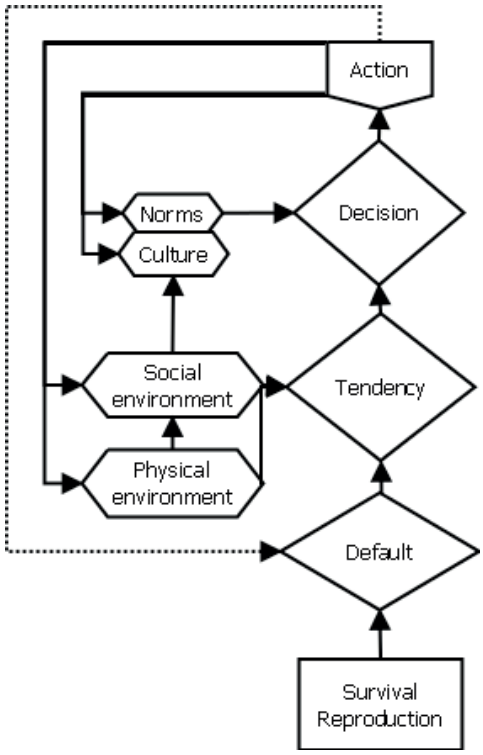

Figure 2: Preliminary dynamical model for the emergence and function of norms.

Dynamical simulations show that small variations in decision rules may have large effects at the community level. Norms may be caused by third party condemnation of actions that are detrimental to group cohesion.[44] Norms thus emerge from the interactions of individual decisions within societies.[45] Due to the inbuilt feedback system, self-organisation may occur. The biological default for all living creatures is (by definition) that they grow, multiply and spread. The physical environment will mould their behaviour. People will organise themselves into groups because it is safer and it will generate more food. Living with strangers in complex groups necessitates coordination and group rules that can be delivered by culture and norms. As social environment, culture and norms evolve from people themselves, it will be

39 J.M. McNamara & A.J. Houston, 'Integrating function and mechanism', 2009 *Trends in Ecology and Evolution*, pp. 670-675.
40 J. Raz, 'Reasoning with Rules', in M.D.A. Freeman (ed.), *Current Legal Problems*, 2001, pp. 1-18.
41 Kenrick et al., supra note 11.
42 West et al., supra note 3.
43 J.H. Holland, *Emergence from Chaos to Order*, 1998.
44 J. Weeden & R. Kurzban, 'What predicts religiosity? A multinational analysis of reproductive and cooperative morals', 2013 *Evolution and Human Behavior*, no. 6, pp. 440-445.
45 Kenrick et al., supra note 11.

easier to infer them as interactions, clarifying the biological default and the physical environment input. As R.C. Lewontin states, the process of adaptation is in a sense the wrong metaphor.[46] Darwin asserted the autonomy of the external world, but organisms also influence the environment. For what nature does, the metaphor of 'construction' would therefore be more appropriate. In my opinion, it is exactly this that people do when they make laws. They construct norms, policies and rules as feedback on the problems in their environment, thus changing the environment. This means that law can be considered a natural process of construction that abides by the evolutionary rules of fitness.

Kenrick speaks of *dynamical biological systems* that help to adjust behaviour to the physical and social environment organisms live in, where he actually means *fractal* systems.[47] In this way, he uses a concept that is familiar to biologists whereas the concept of fractals is pure mathematical science that even by biologists may be considered as 'practicing numerology and mysticism' (literal review citation).

3. The problem of defining concepts

An obvious objection to the idea that norms can be derived from biological mechanisms is that a biological theory of law is about *explaining* the origins of law. Such a theory cannot be turned into a normative theory. Taekema and Van Klink refer to this problem by describing the distinction between *explanation* and *understanding*.[48] If a scientist wants to integrate disciplines this only seems possible depending 'upon one's view of disciplinarity'. Integration 'touches on fundamental convictions about nature and science'. Taekema and Van Klink focus on five controversial issues:

A. How to distinguish between true and false statements?
B. Does science have to aim at explaining or at understanding phenomena?
C. Can facts and values be separated?
D. Is it possible to transfer concepts from one discipline to another?
E. Is science a quest for knowledge for its own sake or must it be socially relevant?

As the idea that norms can be derived from biological mechanisms by definition entails the integration of biology and law, convictions, or assumptions, on all these five issues must be addressed. I will now make some suggestions to answer these questions in the case of integration of law and biology. I will start with the issue of explaining and understanding (B).

By stating that microbes 'must avoid conflicts' to enhance the stability of collective actions in order to increase the benefits of cooperation, Ross-Gillespie and Kümmerli not only explain but also give *meaning* to the behaviour of the microbes. The microbes, as all living organisms do, act *in order to* grow, to multiply and to spread. The main principle behind evolutionary theory is that the number of offspring (better: 'fitness') ultimately determines which traits flourish and which traits vanish. So all traits that do not add to fitness will eventually disappear. Ergo, the traits that organisms have, have probably been beneficial for reproduction for a very long time. *That is how things are, but at the same time it is how things ought to be.* For if these microbes did not grow and spread, they would cease to exist. The point is that what 'ought to be' seems to be a semantic variation on the question of what is preferable for the microbe in order to survive and reproduce. This is generally accepted for microbes, but for humans this suggestion triggers a large number of questions that relate to one's own existence. However, the suggestion does not seem to differ from the justification in Deutoronomy 8:1: '*You* must (*ought to*) carefully *observe* everything I command you (*the law*) so that you may (*in order to*) live and increase (*survive and reproduce*)' (You ought to observe the law in order to survive and reproduce).[49] In order to exist, it is 'desirable' *for the microbes* to spread their genes. Therefore microbes disincentivise cheating, they 'punish' cheaters by killing them with secreted toxins.[50]

---

46 R.C. Lewontin, 'Genes, Environment, and Organisms', in B. Silvers (ed.), *Hidden Histories of Science*, 1997, pp. 115-138.
47 D.T. Kenrick, *Sex, Murder and the Meaning of Life*, 2011.
48 Taekema & Van Klink, supra note 7.
49 *The New English Bible*, 1979.
50 B. Raymond et al., 'The dynamics of cooperative bacterial virulence in the field', 2012 *Science* 337, pp. 85-88.

What is considered good depends on the perspective. What is good for one individual, may be bad for another. However, in order to maintain cooperation, group members have to find a common good. Large groups must even feel there is a *summum bonum*, i.e. a 'good' that rises above their individual interests. This will improve their cooperation. In a way, all living organisms will share the notion that spreading their own genes is *good*. For microbes and humans in general it is therefore good to spread their genes. However, for humans the spreading of some bacteria is not good. Cooperating organisms – all organisms in some way depend on cooperation – will also share the notion that cooperation is good.

While aiming at the issue of explaining and understanding phenomena, the transfer or translation of concepts turns out to be a problem (D). Philosopher of law Hendrik Kaptein wrote that only conscious organisms that can deliberately inflict pain are able to 'punish'.[51] If one adheres to this definition, microbes cannot punish. However, if one defines punishment as 'inflicting damage in order to disincentivise free riding' also microbes are able to punish.[52] In other words, 'punishment is favoured because it leads to an indirect fitness benefit' by making the punished individual more likely to cooperate (altruistic punishment) or by reducing the fitness of individuals who are competing (spiteful punishment).[53]

When evolutionary biologists and philosophers of law join in a discussion, even concepts like, for example, 'legal norms' and 'morals' turn out to be problematic. Whereas biologists do not hesitate to speak of the morals of a spider, ever since Hart's *The Concept of Law*[54] legal scholars make a strict distinction between rules and morals: morals may be rooted in biology, rules source back to society. 'Moral' is taken to refer to intentions that are difficult to repress. However, morals can be defined as 'basic principles of right and wrong'. As I see it, what is wrong can be derived *by the organism that it concerns* from what is reproductively successful, i.e. enhances its fitness. For humans, cooperation is 'good' because cooperation made our species extremely successful. However, for spiders cooperation may be less beneficial. They are evolutionarily successful due to their solitary way of living. For co-operators, it is necessary to be reciprocal. Robert Boyd and Peter Richerson consider cooperation to mean costly behaviour performed by one individual that increases the payoff of others.[55] Cooperation can therefore only last as long as the costly behaviour is compensated by a reciprocal benefit. Evolutionary thinkers explain human cooperation as the result of reputation, reciprocation and retribution.[56] Note that human cooperation did not start with the first humans (Adam and Eve so to say) but evolved gradually during the evolution of primates (and even earlier). Essentially, reciprocity and retribution flow through nature as a whole and are not exclusively human. From this perspective, reciprocity can be considered a moral principle. Reciprocation is good, for it allows for cooperation. In turn cooperation enhances multiplication of the genes of such ultra-cooperating animals as people are. From this moral principle legal norms can be derived. An example of such a legal norm is that people are not allowed to steal. They must pay for the goods that they get from others. Legal norms are a kind of decision rule that help people to cooperate more effectively. From this perspective, the constitution of a state prescribes how to cooperate within a state, contract law prescribes how reciprocal relations must take place and tort law prescribes how non-reciprocal freeloaders must be taken care of. Thus effective legal norms will correlate with biological mechanisms.[57]

A comparison with policy theories may offer further clarity. According to Swanborn, the realisation of human dignity can be reached by interventions 'aiming at increasing human well-being'.[58] Intervention is by definition a factual action. However, to decide what action is preferable, actors will discuss what problems have to be overcome. One of the theories of agenda setting is the theory of non-decision

51 Kaptein, supra note 10.
52 Raymond at al., supra note 50.
53 A. Gardner & S.A. West, 'Cooperation and punishment, especially in humans', 2004 *The American Naturalist*, no. 6, pp. 753-764; West et al., supra note 3.
54 H.L.A. Hart, *The Concept of Law*, 1997, (orig. 1961), pp. 191-198.
55 R. Boyd & P.J. Richerson, 'Review: Culture and human cooperation', 2009 *Philosophical Transactions of the Royal Society*, pp. 3281-3288.
56 R.L. Trivers, 'The evolution of reciprocal altruism', 1971 *Q. Rev. Biol*, no. 1, pp. 35-57; Alexander, supra note 9; Boyd & Richerson, supra note 55.
57 Gommer 2011, supra note 13, pp. 155-157.
58 P.G. Swanborn, *Evalueren, Het ontwerpen, begeleiden en evalueren van interventies: een methodische basis voor evaluatie-onderzoek*, 1999, p. 209.

making.[59] Decision makers with power obstruct the emergence of new issues in many ways, thus showing a bias towards the status quo. It is not in the (biological and economic) interests of the people with power to change the existing allocation of benefits and privileges. Thus, the acceptance of policy can be traced back to factual benefits. The human creature that can be studied by biology at the same time is the human we know from the inside. His thoughts are very complex, but still his decisions can be traced back to biological mechanisms. The apparent dualism turns out to be a deception of our mind. However, how can one prove that legal norms and biological decision rules are essentially similar? Can true and false statements be distinguished (A)?

4. Distinguishing true and false statements

Karl Popper's principle of falsification is widely known.[60] A good scientific model has to be able to predict the outcome of an empirical experiment. If the outcome is different from the prediction then the model has been falsified. The model therefore has to be rejected. Ad-hoc modifications of the model are not allowed.[61] According to this principle, I submitted the hypothesis that punishment for harm-doing correlates with the emotion of shock.[62] In other words, people will biologically, morally and legally reject behaviour that is detrimental to their health, growth and reproduction. The hypothesis was derived from my biological model of law. It turned out that actual prison sentences for crimes against life, rape, child abuse, abuse and theft highly correlate with the emotions that are caused by killing, involuntary sex, sex with children, harm-doing and taking away valuable objects of relatives and people we know well. In addition, regression tests showed that the duration of imprisonment and legal maximum penalties may be explained by the emotions people experience. The hypothesis had exactly predicted this outcome.

The results of my experiment were extremely clear and convincing. Still, my mission failed. Although I had falsified the idea that emotion and punishment are not related, I had not *proven* that there is no gap between the *is* and the *ought*. I had created a model. I had derived some hypotheses from that model. I had tested these hypotheses and they were not falsified. Yet still the results were not considered as proof by those who had other basic assumptions such as that there are *higher values* that come from *somewhere out there*. If one assumes values come from somewhere outside the empirical realm, no empirical proof that morals are inextricably linked to the organism or species concerned will ever suffice.

The paradigm theory of Thomas Kuhn can be of help here. Kuhn denies that falsification necessitates the rejection of a theory.[63] 'No theory ever solves all the puzzles (…) If any and every failure to fit were grounds for theory rejection, all theories ought to be rejected at all times.'[64] Kuhn states that scientists consider reality according to some assumptions. Within the framework of these assumptions – Taekema and Van Klink say 'convictions' – normal empirical research is perfectly possible.[65] The rules of the game are possible 'only so long as the paradigm itself is taken for granted'.[66] However, this framework itself, which is called a paradigm, cannot be tested. 'Though each may hope to convert the other to his way of seeing his science and its problems, neither may hope to prove his case.'[67] Such a paradigm is adhered to by a group of scientists. Young scientists learn to conform to the assumptions of their own peer group. The paradigm functions as a disciplinary matrix that limits the scientific questions a researcher may ask.[68] As long as the researcher stays within these boundaries, his peers can understand him and he will be honoured for his achievements. As Taekema and Van Klink explain, if you go outside the boundaries of your discipline 'you may encounter the problem that you have to "prove" your claims according to different, possibly incompatible, notions of truth'.[69] The truth of scientific theory is determined by

59 P. Bachrach & M.S. Baratz, *Power and poverty: theory and practice*, 1970.
60 K.R. Popper, *The Logic of Scientific Discovery*, 2002 (orig. 1935), esp. pp. 57-73.
61 Kuhn denies this: Kuhn, supra note 1, p. 78.
62 Gommer 2011, supra note 13, pp. 142-157.
63 Kuhn, supra note 1.
64 Ibid., p. 148.
65 Taekema & Van Klink, supra note 7.
66 Kuhn, supra note 1, p. 145.
67 Ibid., p. 148.
68 Ibid., p. 182.
69 Taekema & Van Klink, supra note 7.

checking the facts, whereas legal theory asks for a coherence theory that also accepts beliefs as a basic input as long as the model stays inherently consistent.

Thus *legal* scholars can avoid the question by starting with a *self-evident* norm. The main task of legal scholars is to describe the structure and coherence of norms. The mainstream study of law continues to focus on the systematisation of law.[70] It is this systematisation that legal scholars consider academic.[71] The *autonomy of law* refers to claims that legal reasoning and decision-making are different and are sufficient in themselves.[72] Statutes and case decisions are seen as authoritative.[73] Reference to its own sources traditionally seems to be sufficient.[74] Smits suggests that the better answer depends on the doctrinal system that has its own 'internal morality'.[75] Smits claims that arguments always have to pass the (empirical) test of the system. The legal system is closed by seeking out convergence of argumentation within the normative framework that changes along with the local systems of law. Still, answers are to be found within a closed reference circle.[76] However, although the requirements for an academic discipline (systematisation, explanation, a generally accepted research method and creation of universal knowledge) are met, the connection with other scientific disciplines seems to be lost and new knowledge from these disciplines cannot easily be integrated in an autonomous discipline of law. In addition, extra-legal arguments are needed to complete legal reasoning in the material world.[77]

One of the founding fathers of the idea that law cannot be reduced to morality, let alone to genes, is the German philosopher of law Hans Kelsen.[78] Law is an autonomous coherent system in which legal norms relate to each other, institutionalise their own changes, and organise their applications.[79] This system starts with an authority that formulates a *Grundnorm* (basic norm) from which all other norms can be derived by *blosse Gedankenoperation* (pure thought). Kelsen condemns natural law theory mainly because 'aus dem Sein kein Sollen, aus Tatsachen keine Normen gefolgert werden können' (an ought cannot be derived from an is).[80] Kelsen solves this problem for other legalists by simply cutting off norms from empirical causes. It is the *will* – thought itself – that makes law.

Although not fully satisfactory, one could thus circumvent the problems of explanation versus understanding and transferring concepts by avoiding the temptation of integrating natural sciences and humanities. Law theory and science theory are just two coherent systems that can exist peacefully together. A dualistic thinker could probably take this statement for granted, but a monistic thinker certainly will not. For monistic thinkers, which most biologists are, it looks as if norms and law still come from an undefined entity and, in this respect, this kind of dualism does not differ much from metaphysical theories. *Divine will* is substituted by *human will*, but questions remain: What is this will? Where does it come from? Why does it want what it wants? What is thought? Does our thought process really work as systematically as Kelsen supposed? Can thought really operate as autonomously as Kelsen wished? Evolutionary and neurobiologists do not think so. Note that biologists consider the 'will' to be a consequence of biological processes in the brain. As a consequence, if the concept 'will' is translated in this way, it is *the biological processes* that make law. Arthur Dyevre remarks that Kelsen wants to focus on legal norms themselves, 'although legal norms are there to regulate human behaviour.'[81] Studying law as an autonomous system is trying to study an inherently human phenomenon while ignoring human behaviour itself. Law does not consist in and of itself, but instead as a means to create stability so that

70 B. Bix, 'Law as an Autonomous Discipline', in P. Cane & M. Tushnet (eds.), *The Oxford Handbook of Legal Studies*, 2003, pp. 975-987, available at <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1010995> (last visited 15 June 2015).

71 J.M. Smits, 'Redefining Normative Legal Science: Towards an Argumentative Discipline, 2009 *TICOM Working Paper* No. 2009/7.

72 Bix, supra note 70.

73 Smits, supra note 71; R.A. Posner, *The Problems of Jurisprudence*, 1990, p. 83.

74 Smits, supra note 71.

75 Ibid.

76 G. Teubner, *Recht als autopoietisches System*, 1989, pp. 27-49; H. Albert, *Rationaliteit in wetenschap en samenleving*, 1976, pp. 181.

77 E.A. Engle, 'The Problems of Indeterminacy and Autonomy of Law', 2009 *India Law Journal* 2, no. 4; S.L. Schwarcz, 'Introduction: Is law an autonomous discipline?', 1997 *Harvard Journal of Law & Public Policy* 21, no. 1, pp. 85-88.

78 H. Kelsen, *Introduction to the Problems of Legal Theory*, 1967.

79 H. Kelsen, 'Kausalität und Zurechnung', 1960 *Archiv für Rechts- und Sozialphilosophie*, pp. 321-333.

80 H. Kelsen, *Reine Rechtslehre*, 1976 (orig. 1960).

81 A. Dyevre, 'Legal Positivism and Evolutionary Psychology: Can Legal Positivists Learn Something from Darwin?', 2010 *Studies in the Philosophy of Law*, no. 5, pp. 103-124.

people survive, reproduce and prosper.[82] The underlying assumptions differ so widely that one has to speak of different paradigms.

The solution most legal theorists adhere to is to cut off law from empirical sciences. However, for the monistic-thinking biologist the old paradigm of dividing empiric and normative systems no longer suffices. Reason and the biological brain cannot be separated. In the same way, separation of facts and values does not hold (C). Anomalies are piling up and some researchers start to rebel. Kuhn predicts what will be the consequence.[83] The scientific community becomes divided, which causes uncertainty and instability. Like microbes, scholars and scientists do not appreciate group instability and they will try to fix the problem. This will initially be achieved by denying the anomalies, later on by denying new assumptions (e.g. 'the explanatory power of evolutionary theory does not say anything about the normative appropriateness'). For a very long time, competing models will coexist. Eventually a new paradigm will convince the majority of scientists because it best addresses the anomalies. The old paradigm will never be falsified, but most scientists simply adjust their assumptions and start conducting research within the new paradigm. In short the solution Kuhn offers for the problem of integrating systems with different notions of truth (paradigms) is to see what system will last in the long term.

The normative scholar could become uncomfortable with the use of Kuhnian 'paradigm shift' language. Paradigm shifts occur in explanatory frameworks that accumulate anomalies: objective phenomena that consistently resist integration with theoretical frameworks. The normative framework cannot be considered to be in this sort of crisis, for it is not that kind of framework; it is not explanatory but generative. If there is a normative crisis between religious and scientific frameworks, it would be one of erosion and displacement rather than crisis and revolution. This is not a paradigmatic shift but a shift in worldview. Using Kuhn for this kind of shift seems to be misguided, at least according to some normative scholars. However, this was exactly what Kuhn was saying. As soon as people start to see the rabbit and the duck, the idea that there is only a duck will *erode* (see Figure 3).[84] A change of vision, indeed a change of worldview, will occur, which is exactly what happens when paradigms shift.[85]

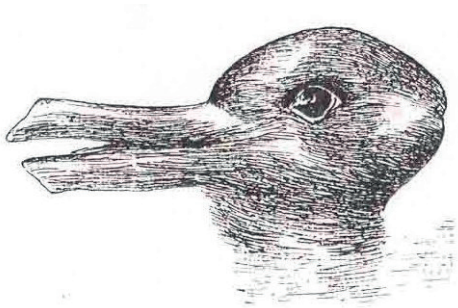

Figure 3: Kuhn's Rabbit-Duck Illusion (public domain).

5. A new paradigm cannot be proven

The paradigm theory explains why a biological model of law cannot be proven. Biological theory certainly makes different assumptions than legal theory. Both disciplines have different paradigms. For example, Toby Kiers states that microbes reach a fair system not by using reason but by secreting chemicals,[86] whereas Rawls considers reason necessary to find a fair system.[87] Biologists assume that factual mechanisms change behaviour, whereas Rawls introduces the philosophical concept of reason that changes human behaviour. However in both cases the key principle is that behaviour is influenced

82 Gommer 2010, supra note 13.
83 Kuhn, supra note 1, pp. 67-68.
84 Kuhn, supra note 1, p. 214.
85 Ibid., p. 119.
86 T. Kiers, *The Punitive Wars*, Oration VU Amsterdam, 25 June 2014.
87 J. Rawls, *A Theory of Justice. Revised Edition*, 2003 (orig. 1971), p. 207.

by neighbouring organisms. This principle was also described by Kenrick et al.: each individual's decision will have direct effects on his/her immediate neighbours.[88] This triggers self-stabilising patterns. 'Normal' scientists (as Kuhn calls them) may find this search for universal principles 'superficial' and 'without an argument', whereas there is actually a change of paradigm.

Even within disciplines, different paradigms may occur. An interdisciplinary model may itself become a new paradigm. Such a new paradigm initially has very few adherents and peers. Scientists that adhere to another paradigm, and thus have other basic assumptions, will not approve or understand the new interdisciplinary model. It does not fit their assumptions. They probably will not even recognise that there are different paradigms at work. In other words, every paradigm has a different notion of truth. As a biologist, one would like to answer normative questions on the basis of empirical facts. However, according to legal philosophers one has to derive norms from the verdicts and articles of authoritative judges and scholars of the law. The notions of truth in normative legal science and natural science differ too widely. Scientists who claim that norms can be derived from biological facts are actually introducing a new notion of truth, a new paradigm, with its own assumptions. One of the assumptions is that scientific theories must evade black boxes like 'God', 'reason' and 'self-evident norms' that cannot be proven empirically.

But how do scientists become convinced? Very often they are not. Copernicanism only achieved a few converts during its first one hundred years. Newton was not generally accepted for more than half a century.[89] Einstein could not find work at the university and had to do his ground-breaking research while working at a patent office. And even Darwin noted: 'I by no means expect to convince experienced naturalists whose minds are stocked with a multitude of facts all viewed, during a long course of years, from a point of view directly opposite to mine.'[90] Moreover, almost always the scientists 'who achieve fundamental inventions of a new paradigm have been either very young or very new to the field whose paradigm they change (…) being little committed by prior practice to the traditional rules of normal science'.[91] No proof will help, because the proof is only viable within the paradigm, within the truth system.

This may explain why most interdisciplinary scientists stick to research that uses other disciplines heuristically, auxiliarily or comparatively.[92] By incorporating useful material from other disciplines (heuristic), or by using information from other disciplines as input (auxiliary) or by treating disciplines as equally important (comparatively), one need not abandon paradigmatic assumptions. Even the *perspectivist* who switches between the concepts and methods of two or more disciplines need not give up the framework of the existing disciplines.[93]

The real challenge is if one wants to *integrate* two disciplines. Not only do the concepts differ, but, more importantly, the assumptions and questions differ as well. Most biologists are not interested in the is-ought problem. Many of them do not even believe that such a problem exists. Primatologist Frans de Waal, for example, states: 'The bonobo laughs at the intellectual torture of trying to separate "is" from "ought".'[94] Freeloading amongst chimpanzees does not pay because freeloaders will be ignored when there is food to be shared. Even monkeys have an aversion to inequality. If two monkeys are offered food when handing in a pebble and one monkey receives a grape in return while the other receives a cucumber, the second monkey will reject the cucumber. Cucumber is less nutritional. Inequality is wrong in the eyes of the monkey. It is wrong because it will be detrimental to its reproductive fitness.[95] According to evolutionary psychologists, for humans there is no gap either. Human cooperation is based on the same biological principles.[96] The main difference is that human brains are much bigger and their cooperative relations and tactics can therefore be much more complex. The details differ but integrating disciplines

88 Kenrick et al., supra note 11.
89 Kuhn, supra note 1, p. 150.
90 C. Darwin, *On the Origin of Species*, 2006, (orig. 1859), p. 302.
91 Kuhn, supra note 1, p. 90.
92 Taekema & Van Klink, supra note 7.
93 Ibid.
94 De Waal, supra note 9, p. 239.
95 S.F. Brosnan & F.B.M. de Waal, 'Monkeys Reject Unequal Pay', 2003 *Nature* 425, pp. 297-300.
96 E.g. G. Geher, '10 Rules to Live by Based on Evolutionary Psychology', *Psychology Today*, 23 June 2014, <https://www.psychologytoday.com/blog/darwins-subterranean-world/201406/10-ancient-rules-we-should-all-live-today> (last visited 15 June 2015).

also requires scientists to see the forest for the trees. Again, for the monodisciplinary researcher the devil may well be in the details, but by focusing on the details one may fail to see the big picture.

On the other hand, many philosophers do not think about the is-ought problem anymore because they assume it cannot and indeed does not need to be solved. For instance, Blackburn concludes that people can know what is good and what is bad simply because that is the commitment they received from the past. 'Across large tracts of human affairs, we know what to think. We can be fairly confident about the standards we use.'[97]

As most scientists do, one can lie back and accept the gap between normative and empirical science and conduct research within the framework of those paradigms. However, this indifference may have an important consequence. Ethics and law do not use the building blocks of mathematics and biology, but instead start somewhere in the middle, i.e. at the level of how to improve cooperation in a larger society (e.g. legislation by humans) without bothering about how humans function. Without filling the gap of 'is' and 'ought', it seems fairly impossible for legal scholars and biologists to work together on this subject. It will be impossible to use biological models that are used to predict the behaviour of microbes and animal groups to predict norms.

6. Applying the new model

The last controversy in interdisciplinary research that Taekema and Van Klink mention arises from the question of whether research should be fundamental or applied (E). Looking for basic mechanisms that generate human morals and norms is fairly fundamental, whereas law is mainly an applied discipline. The effect is that lawyers frequently ask how a biological model of law could be applied in practice. For the practising lawyer it may be interesting to know that people have a universal drive to punish cheaters, but they also want to know why some countries have a death penalty and others do not. Or even: is the death penalty normatively right from a biological point of view?

Recently, Brooks showed how difficult it is to draw conclusions from new research results.[98] Amongst evolutionary psychologists, it is commonly thought that women might profit, in evolutionary terms, from pairing up with a hard-working and protective male partner, while mating with a different highly masculine man in secret. It is only worth taking the risk if the chance of conceiving is good. So the idea is that females will shift preferences during their menstrual cycle. However, two meta-analyses showed contradictory results. Brooks concludes that, particularly when ideologically infused issues are at stake, data may not instantaneously give us the definite answers we seek. Resistance to the notion of ovulatory shifts may not be caused by concrete problems of proof, but may 'spring from the fear that if hormones influence behaviour, then that robs women of their capacity to act independently'.[99] Although this way of reasoning shows ignorance regarding how biology really shapes behaviour, this fear may well be the source of resistance against models that try to integrate explanatory and normative sciences.

Nevertheless, a new paradigm in which norms are considered a product of human cooperation that is necessary for the multiplication of genes may become inevitable on the boundaries of normative and explanatory sciences. For a long time, law was a national enterprise. Every country had its own legal system, its own specialised lawyers and its own national legal scholars. Integrating legal systems not seldom seems to be an exercise in combining all rules without knowing the basic nature of human cooperation that underlies these rules. As world society is developing into a new order, national laws are being integrated into international legal systems. This also causes anomalies. For if the better answer depends on the doctrinal system that has its own 'internal morality', as Smits states, how can we find the better answer in a system with as many doctrines as there are states?[100] There is a danger that the most powerful states will force weaker states to submit to their doctrinal system. In turn, this may lead to global instability. In fact, this instability can be perceived in the clash between Western standards and standards of the Arabic world, standards in Africa, in Russia, in China, etc. Moulding these doctrinal systems into

97 Blackburn, supra note 35, p. 306.
98 Brooks, supra note 30.
99 Ibid.
100 Smits, supra note 71.

one global system with its own 'internal morality' will be difficult as long as we do not know what the essence of morality is. Studying the biological essence of humans and organisms in general could tell us what universal human mechanisms underlie the creation of norms.[101] Once we know and understand people's universal biological mechanisms and the circumstances they live in, we should eventually be able to predict what more or less basic norms they have, need or think they must have. In fact, computer simulation games like *Civilization* are already using this principle.

7. The method: anything goes

An additional problem of conducting research during a paradigm shift is that there are no methods that are generally accepted. The philosopher who enters the field of law and biology will use other methods than the evolutionary psychologist who starts studying the subject. This can have dire consequences. Oliver Sacks describes how many discoveries were ignored and forgotten because they did not use a standard method.[102] He tells the story of J.F. Herschel, who discovered the hallucinatory patterns that migraine patients experience. Herschel, however, was not a physician and had no professional status. His observations were seen as irrelevant and were ignored. His discovery was rediscovered only 120 years later.[103] Louis Verrey, a Swiss neurologist, delineated the exact area of the visual cortex in 1888. However, at the time a centre for chromatic sensation in the brain was thought to be *self-evident nonsense*. His ideas were dismissed out of hand. Colour was thought to be an integral part of the visual image and so could not be studied on a neural basis. Mistaken assumptions killed the entire subject for three quarters of a century.[104] According to Sacks, the first difficulty with new ideas lies in bringing them into full consciousness.[105] New ideas may undermine one's existing beliefs and theories and this process may be painful because 'mental lives are sustained by theories.' For example, astrophysicist Subrahmanyan Chandrasekhar's initial theory of stellar degeneration was fiercely attacked in 1930 by his own patron, Arthur Eddington, who prevented him from developing and publishing it. The theory was held back for thirty years.[106] According to Sacks, 'in extreme cases scientific debate can threaten to destroy the belief system of an entire culture.' This is why there is one inevitable method for all scientists who develop paradigm changing ideas. They have to believe that others are wrong and so have to 'react against others'.[107]

What the best methods will be for studying new ideas cannot be predicted beforehand. It will greatly depend on the scholars and scientists who will successfully work out the new concept. If evolutionary psychologists master the problem first, their methods will probably become the standard of the newly arisen discipline. Likewise, if sociomicrobiologists are there first, their methods will dominate the field.[108] But the necessary step to be taken first is to defend, accept and uphold the assumption of the new paradigm that the *ought* is to be derived from the *is*. I therefore agree with Paul Feyerabend that applying fixed methodological rules in cases of paradigm shift, which often occur when disciplines are integrated, may prevent scientific progress.[109]

It will be clear that my method aims to show that biological concepts and normative concepts do not differ at an ultimate level. Then it becomes possible to use ultimate mechanisms to predict what norms will be justified under what circumstances.

8. Lack of peers

Finally, I would like to mention a problem of paradigm-changing interdisciplinary research, which is the social aspect of doing interdisciplinary research. As Bruno Latour (1987) found, scientists need to establish

101 In Gommer 2014, supra note 13, I formulated four basic biological principles for global law.
102 O. Sacks, 'Scotoma: Forgetting and Neglect in Science', in B. Silvers (ed.), *Hidden Histories of Science*, 1997, pp. 141-179.
103 Ibid., pp. 144-145.
104 Ibid., pp. 152-153.
105 Ibid., p. 159.
106 Ibid., pp. 161-162.
107 Ibid., p. 165; P. Feyerabend, *Against Method*, 1993.
108 E.g. Kiers, supra note 86.
109 Feyerabend, supra note 107, pp. 18 et seq.

alliances in order to be successful. What they accept as truth also depends on their joint constructing efforts. Investors and even politicians may influence what research will be done. Without allies, even the best ideas may not survive. The scientist who embraces a new paradigm at an early stage must therefore 'have faith that the new paradigm will succeed with the many large problems that confront it, knowing only that the older paradigm has fails with a few. A decision of that kind can only be made on faith'.[110] At the outset, a new candidate may have few supporters. Reviewers frequently show a lack of knowledge of one of the disciplines, which makes the rejection of research proposals or article manuscripts likely. For example, an anonymous reviewer of one of my articles commented that the term 'microbes' is so outdated that it undermines credibility. He proposed concepts like spores, bacteria, paramecia etc. The reviewer clearly did not know that in 2014 the term microbe still was a collective noun. An anonymous historian of law wrote to me that my manuscript consisted of a superficial comparison between 'prehistoric humans, apes and lionesses', thus caricaturising my ideas. The existence of various paradigms was nicely illustrated by an anonymous philosopher of law: 'According to the author we are motivated by the desire to spread our genes. I understand this statement, but I do not believe it.' The integration of biology and law turned out to be a clash of belief systems.

In addition, monodisciplinary scholars nearly always have the advantage of having more knowledge in their particular field of research, whereas they do not always appreciate the knowledge of the interdisciplinary researcher in other disciplines. In the eyes of a straight monodisciplinarian, the research of an interdisciplinary researcher is by definition an effort that is not sophisticated enough.

Due to the lack of supporters, articles that make it to publication despite the resistance of non-peer reviewers will probably get few citations, whereas nowadays citations are necessary for the recognition of the scholar. A scholar who wants to integrate disciplines therefore has to be tenacious, financially independent and completely convinced of the new perspectives his ideas have to offer. A good example is the anthropologist John Tooby, one of the founders of evolutionary psychology. In the seventies, he applied biological evolutionary theory to psychological problems. In the beginning, only a few colleagues appreciated his line of research, but fortunately his wife, Leda Cosmides, helped pioneer the field. After his PhD research, Tooby was unemployed for five years. Then in 1992 Tooby and Cosmides wrote *The Adapted Mind*, in which they popularised evolutionary psychology. Nowadays evolutionary psychology is one of the pillars of social psychological research. It has become a discipline of its own. Even now, evolutionary psychology has not answered all the questions of critics, but the new paradigm has convinced many researchers in psychology.[111] However, one never knows if a new paradigm is destined to win its fight and if one's work will be fully appreciated. The story of Tooby and Cosmides turned out to be a story of success, but there are many stories of interdisciplinary research that do not end so well. Notorious in the Netherlands is the case of Wouter Buikhuisen. He did research on criminality from a biosociological perspective. Buikhuisen received fierce attacks from columnist Hugo Brandt Corstius. His presentations were interrupted and he also received threatening letters. Because of this, he had to give up his scientific career. Research on the biological aspects of criminal behaviour was therefore delayed by 15-20 years. Georg Cantor, who developed the famous infinite sets, making him one of the founders of fractal theory, was persecuted by Felix Klein and became psychotic.[112] Ludwig Boltzman, a theoretical physicist, was driven to suicide by being misunderstood and being attacked.[113]

Thus, if a researcher is not convinced of the new possibilities of his model, if he is not tenacious and he cannot bear doing research on his own, if he does not do research just for the fun of it and if he is not financially independent, he *ought to* think twice before starting to integrate interdisciplinary research. However, although the risks are high, the potential scientific – and biological – gain is probably even higher.

110 Kuhn, supra note 1, p. 158.
111 E.g. G. Geher, *Evolutionary Psychology 101*, 2014.
112 Sacks, supra note 102, p. 162.
113 Ibid., p. 162.

9. Conclusion

Assistant professors seem to avoid cross-disciplinary work. Their intuition may well be justified since interdisciplinary research has many caveats. On top of this, those who like the challenge of *integrating* disciplines may encounter a paradigm shift, which may lead to a frustrating confusion of notions of truth. This will leave the scholar or scientist alone on an island. Concepts are not understood, assumptions differ, 'peers' are not really peers and the new paradigm cannot be proven. It takes much effort to translate concepts. However, in this article I showed that it is possible, even for normative concepts. Academic isolation may also hamper the spreading of their ideas. Translation of concepts can help find a connection. Science is not only about having the best ideas, but also about having peers. Without peers, achieving a breakthrough turns out to be very difficult. The effort of integrating disciplines may turn into a kind of battle, as Kuhn acknowledged. This is sad news for interdisciplinary researchers, but also seems dire news for science as a whole. Major scientific breakthroughs will be significantly delayed. On the other hand, it is also a biological principle that cooperating communities need some stability and cannot reward every rebellious new idea that has the potential to become a new paradigm. Science needs paradigm shifts, but not every day, like society needs rebels, but not too many. ¶