

The revolutions that didn't occur (or didn't we notice?)

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I – Preliminaries

Intro

I first met Richard de Mulder during Bryan Niblett’s Advanced Workshop on Computer Science and Law held during September 17-27 at Clyne Castle near Swansea, in 1979. As the Castle was (and presumably still is) located in the middle of nowhere, it sensibly sported a snooker room. Richard taught me the rules of the game there, before consistently beating me at it during hours otherwise lost, between workshop participation, socializing, meals and sleep.

We, Richard and I, and all the other participants in the Workshop had the feeling to be present at a Big Moment. To use modern speak,¹ we felt to be at the tipping points of big events that would make the complex systems we were interested in (legal practice and legal theory) race towards new equilibria with computer-science results as the main attractors.

Since 1979, thirty-one years have passed. Over the years, our paths crossed irregularly, mainly at conferences, in far-away locations. And somehow we never found ourselves drawn towards *the* widely shared equilibrium paradigm for a law-and-computer-science discipline induced by a strong, attracting, relevant collection of computer-science results – as our shared expectation was, back in 1979. Why not? This is the big question I will attempt to answer.

Such questions are difficult in themselves, but especially so when they are to be addressed in an essay, meant to celebrate a scholar and his career, at the occasion of his formal retirement.² So let’s first get rid of any misgivings the rest of the argument might otherwise induce. Richard’s contributions to legal expert systems have been significant and his contributions to conceptual retrieval systems are significant to the foundations and seminal to the application of jurimetrics in an impressive manner. In short: I respect and applaud Richard’s work and career. So let no one read disrespect in the questions I will discuss, nor critique *ad hominem* in the arguments I present.³ My unhidden agenda is to contribute, to the best of *my* knowledge, to *our* understanding of why our dreams from 1979 haven’t come true yet by 2010. Such is my reply to Richard’s recent appeal: “Jurimetrics, Please!”⁴

At any moment in time, at any “now,” we can, while we exist, concurrently look back and look forward. And that is usually what we do, performing an

¹As for instance used by Miller and Page [30] and Mitchell [31].

²I assume Richard will materially continue to be scientifically productive, long after reaching his 65th birthday.

³Doing so would be foolish anyway, as such disrespect and critique would be directly applicable to myself.

⁴As the title of de Mulder et al. [8] reads.

unsquare dance, facing the past while facing the future, muddling through as best as we can. Let us assume that “muddling through” implies having both dreams and the ambition to (help) make them come true. If we picture doing so for the 31 years under investigation, we picture a dynamic process; in our imagination we may represent it by a line (let’s call it the dream-realization line), currently reduced to a line segment starting at 1979 and ending at 2010, while “now” can be any point on it. Considering “muddling through” to be scientifically inclined, we need to combine the results of two different methods, one method for facing the past and one to face the future. Looking at the past requires an apparatus to explain how “now” has evolved, looking at the future requires an apparatus to design how our dreams can be realized. At any “now,” while “muddling through,” we have to make and combine the etiology⁵ of the current state of our dream’s realization and the blueprints⁶ for how to realize what is left of them.⁷

I will reduce the discussion to a few selected dream states and to a few simple questions and will be using the dream-realization line to dance along it at will, to the virtual “nows” (or “dream-realization states”) that I can use for my argument.

Perspectives

Imagine driving a car through Greece as a complete stranger, e.g., a Dutchman. Every now and then you see a “50-kilometer sign” on a national road. At first you comply. This leads to dangerous situations and honking and scolding Greeks speeding by at least at a hundred kilometers per hour. Imagine you are both puzzled and scared, and position your car behind a coach to find out how the traffic signs in Greece are understood by a professional. This way, you compose a small collection of rules describing generalities in Greek traffic behavior. After, you know that when a Greek driver meets with a 50-kilometer sign, it can be expected that he will speed on. And that, after about one kilometer, an insignificant side road (or a similar source of danger) will appear. And that, at that point, the Greek driver tends to reduce his speed, only to immediately push down the throttle again once the danger point has been passed. And imagine that you have come to realize by experience that

⁵I will be using Calvin’s “Darwin Machine” (see Calvin [4] and Calvin [5]) in conjunction with Wright’s functional teleology (see Wright [48] and Wright [49]) as the most general apparatus for etiologic reasoning.

⁶I will be using parts of Schmidt and Corvers [39], based on Wieringa [47] and Schreiber et al. [40] as the general apparatus for design.

⁷In this paragraph I have employed the imagination (or: fiction) in the way Fuller [15] read Vaihinger, that is: introducing and (later) getting rid of it during argumentation, avoiding it in the conclusions.

this small-scale knowledge collection showed life-saving functionality. My claim is that knowledge of this type, that knowledge about regularities in behavior by law subjects in the face of expressed laws, belongs in the domain of legal theory.

The law-science perspective in legal theory

My perspective on science finds its foundation in the following assumption

*Science, including “law theory,” can describe and can predict, but it cannot prescribe.*⁸

The assumption is self-evident to me and may be so to many: very few people consider the work done by politicians, contracting parties, judges, legislators or policymakers to be of scientific nature. Yet the assumption is controversial among legal theorists. I will evade the issue as much as I can. In the meantime I will try to show where the assumption may lead. My second and third assumptions provide the key:

Law theory shows that regularities in behavior (of individuals, groups and institutions)⁹ can be described in rules, that it is possible in principle to describe the etiology of these rules and that it is possible in principle to rationally guess where they lead to.

and:

*Rules describing regularities in behavior provide insight into the external coherence of the legal rules we create as institutional facts.*¹⁰

Let me now try and apply “law theory” to the “driving through Greece” case mentioned above.

⁸I will use the term “law theory” for “legal theory under assumption 1” as mainstream legal theory does not accept assumption 1. I consider this (combined with the necessity to avoid Moore’s “naturalistic fallacy”) to be the main reason why legal theory does not and cannot explicitly relate to the sciences. Law theory aims to describe and predict how normative questions are answered and why, it does not aim to answer them; legal theory aims to answer normative questions and, by doing so, does not accept the authority of description and prediction (or from science). Mainstream legal theory considers “law theory” to be external, and to belong to the social sciences (see Weinrib [46], for instance). Reversely, “law theory” considers mainstream legal theories as (often wonderfully coherent) sets of beliefs that find their (contingent) authority in its measure of popularity among fellow legal theorists. “Law theory” is not popular among mainstream legal theorists.

⁹Greif [21] made me aware of the attention, due to the concept ‘generalities in behavior,’ also in law science.

¹⁰‘Institutional facts’ as discussed in Searle [41].

Greece has proportionally the most traffic fatalities in Europe. It is conceivable that the Greek authorities, aiming to reduce this problem, ordered the fifty-kilometer signs to be placed well in advance. It is equally conceivable that Greek drivers see through this design and apply their brakes only where necessary. And it is also conceivable that the Greek traffic police are loathe to worsen their reputation by booking drivers for not driving fifty or less at places where it is not really necessary. We have a set of propositions about generalities in behavior that fall under the scope of expressed law; their descriptive accuracy may be tested; they are not of a normative nature: they belong to the domain of law theory.

Why would we want to consider such propositions (when validated) to belong to the domain of the legal discipline? Because we have laws that serve goals. Law theory may inform about mechanisms and conditions that will help to bring these goals about and about mechanisms and conditions that have the opposite effect. Setting the goals for the law is not a law-science issue. Informing the legislators and the judiciary about the efficacies of the mechanisms employed is. So getting to know about them as much as possible is part of the discipline – even if it makes us turn to art, sociology, economics, biology, computer science and math. To mention an example: I consider the mechanisms Antanas Mockus used as mayor of Bogotá to be in the domain of such law theory.¹¹

The mainstream legal-theory perspective

Yet law theory is currently seldom explicitly applied in Dutch legal scholarship. Much more common, Dutch legal scholars investigate what the law says and what that means when we interpret it in the light of a case, and how the judiciary tends to interpret legal provisions. The heuristic research methods employed focus analytically on how the complex network of knowledge objects within our legal system and their application by the judiciary can maintain *internal* coherence.¹² AndL this type of knowledge is indispensable as a foundation for any attempt to apply law theory.

For, whoever thinks of the legal problems we have in 2011, for instance

- with regularities in ICT-service provider behavior and
- with regularities in ICT-service user behavior and

¹¹See <http://www.youtube.com/watch?v=fX7HBxLBZ28>.

¹²Mainstream legal theory has an internal focus mainly because it treats validly promulgated laws like axioms, and does not investigate their quality. Apparently Hart won the Hart [23]-Fuller [16] debate in the long run. My hypothesis is that law theory and legal theory can only merge when legal theorists accept to consider valid laws as useful fictions, or theories, in stead of axioms. Rather in the vein of Aumann [3].

- with ICT services for legal institutions

might, in the vein of Lessig's *inherent ambiguity*,¹³ point out that ICT-services have become a radically new part of our institutions, our systems *and* our environments and that the exclusive positivist approach may, from its principled internal position, simply fail every now and then *because solving these problems attack the internal coherence of our legal systems as they were*. Then, we find our legal systems in between consistent states, and this is the subdomain suited for law theory.

The efficacy of law stands and falls with how the law is respected and accepted by individuals (or not). Consequently, the extent to which the law is *externally* coherent, coherent with the regularities in the actual behavior of individuals and with its environments, is simply invisible when looked at through a positivist lens. I therefore argue (with Richard de Mulder, I believe) that the mainstream legal-theory perspective *in general* needs to grow towards scientific adulthood by merging with the law-theory perspective as mentioned.¹⁴

Inclusive¹⁵ legal theory

For such an inclusive legal theory - law theory approach, three types of knowledge are needed :

- About what the law says and what it was intended to mean (mainstream legal theory).
- About how the law is usually applied by the judiciary (mainstream legal theory).
- About what the regularities are in the (strategic) behavior of individuals, where these regularities come from and where they are likely to lead to (law theory, aspiring to be part of mainstream legal theory).

When we apply all this to the Law and Computer Science subdomain, we again get three types of knowledge that are needed:

- About what the law says to *the users of ICT services* and to *the providers of ICT services* and what it was intended to mean.
- About how the law is usually applied by the judiciary *when adjudicating issues involving users of ICT services or the providers of ICT services* and where these regularities come from.

¹³Lessig [27].

¹⁴Schelling [37] seems to provide an example.

¹⁵Inclusive as to include both the legal-theory and the law-theory perspective.

- About what the regularities are in the (strategic) behavior of *the users of ICT services and of the providers of ICT services*, where these regularities come from and where they are likely to lead to.

Now this is the subject matter for the law and computer science domain. But we are currently not looking at this domain directly. In this essay I focus on how the law and computer science discipline (that studies this subject matter) did *itself* evolve during a certain stretch of time. Consequently, for the current argument I have to re-instantiate differently the three types of knowledge required:

- About what the law says to *academic teachers and researchers who wish to establish and maintain a new discipline* and what it was intended to mean.
- About how the law is usually applied by the judiciary *when adjudicating issues involving academic teachers and researchers who wish to establish and maintain a new discipline* and where these regularities come from.
- About what the regularities are in the (strategic) behavior of *students choosing courses and colleagues looking for disciplinary or interdisciplinary cooperation*, where these regularities come from and where they are likely to lead to.

The positivist analysis

The first two issues are of the positivist kind. I can be very brief about them. Dutch law allows universities to decide by themselves about what subdomains they pursue, what courses for these subdomains they establish and what research they support, provided courses and research are funded in a proper way and are evaluated to be performed at a sufficient high standard of quality. Let me assume that these standards are met routinely and need no further discussion. Then, the law does not say anything specific on the subject under investigation. Apparently, there is quite some leeway for self regulation by academic institutions and groups. The regulatory environment wherein law and computer science evolved as an academic discipline in the Netherlands is, accordingly, determined by the regularities in behavior of University and Law School administrations. Enters the law-science perspective.

Dream statement

Thinking a moment about how to rephrase our expectation from 1979 into a dream statement that is so general, that we may have some hope to carry it through the dream-realization states we may expect to encounter during the time segment under discussion, I suggest the following:

Our dream is to find a widely shared, vital legal-theory paradigm (including the law-theory approach), fit to address scientifically the legal issues accompanying the use and the provision of a strong, attracting and relevant collection of ICT-services.

The hypothesis is that the attractor force of computer science services would ‘naturally’ bully law theory to create such a paradigm. In hindsight we can say it didn’t. I will be looking for reasons why such a paradigm has not emerged, and for remedies in case we proceed pursuing this dream in the future.

II – 1979

Imagine “now” to be 1979¹⁶ and let us look at the collection of ICT services available to Dutch academics, a collection which apparently radiated sufficient attracting power to lure us into joining the Swansea Workshop.

The collection of 1979

Anno 1979 we can be comprehensive. Computers are scarce (most universities have only one ‘mainframe’ computer). They have brand-¹⁷ and type specific *operating systems* [that do not need updates for removing vulnerabilities]: standardization of services and interfaces is virtual nonexistent. *Information storage* is provided by *databases* and *file systems*. For those happy few who want to use them, there are tool kits for *statistical computing* (SPSS, SAS) and *computer languages to create applications*. *E-mail*-, *file transfer*- and *remote computing services* are finding their feet, a process that is hampered by the absence of adequate network connectivity. Anno 1979 computer services are

¹⁶I am working straight from memory here, without indulging in verification. I believe to remain close to the original – close enough to guard the integrity of my argument. Yet, as memory tends to play tricks over time, I must claim the reader’s lenience whenever fact has been replaced by imagination.

¹⁷IBM, CDC, and Digital were then visible on the market for computers.

scarce, expensive and local. Commercial use is restricted to the administration of big companies – important to legal theory is that the big publishers of legal material have changed their production processes so, that computer services are employed to prepare printing texts. Consequently, legal texts are becoming available in digital form, ready to be analyzed automatically. Government agencies also use computer services to support administrative tasks. Universities have computer services available, mainly to perform ad hoc computing tasks in order to support scientific research.¹⁸

Attractor functions anno 1979

Anno 1979 we have a small, weak base of computer services, which nevertheless proves attractive to at least some legal scholars. If I remember correctly, the attraction is based on a combination of expectations about what computers may accomplish.

One: legal theorists opened up to sociology and economics and their empirically oriented methods: in Leiden both disciplines (legal sociology and legal economics) had gained prominent institutional places in the faculty at the time. The Leiden law school even boasted a local Computing Centre (which I headed at the time), mainly providing services for statistical analyses performed by legal sociologists and by legal economists.

Two: some discontent was felt in legal-theory circles about possible inconsistencies in legal practice – inconsistencies that might become visible through computer services that analyze the digitized legal information, stored by publishers.

Three: legal theory was deeply interested at the time in making explicit motives and argumentation techniques, explaining how case law was in fact decided and how its coherence was guarded and maintained, especially in the face of seminal cases, heralding dogmatic changes. Besides the

¹⁸Anno 1979 we have no wide area networks, no personal computers, nor mobile telephones, we have no web servers that publish web pages and can communicate with automated, ‘crawling’ web information collectors that in their turn communicate with services that support access to individual pages through browsers. Neither are there web services to publish blogs and twitters and to support social software services (like Hyves, Facebook, LinkedIn). Nor do we have Wikipedia, Wikileaks, Sourceforge or any other co-operative ICT-supported services. We do not have computer games, no streaming media services, no ip-based telephony and no videoconferencing services. We have no web-based commercial and financial services and we have no active content. And we have no commercial surveillance of our behavior for profiling and for better targeted advertizing. We do not yet have spam or malware. We are living in a different world.

opening up of statistical analyses directed to legal texts, especially the expectations raised in the discussions on artificial intelligence were significant. Hofstadter [24] published his bestseller in 1979; Loevinger [28] and Turing [45] had paved the way earlier.

Four: the administration of legal research was very lean in 1979. What was researched when was still decided by individual professors and guided by their personal scientific interests, and hardly constrained by financial guidelines. I had no problem whatsoever finding support for taking part in Niblett's workshop at the time.

Thus, the genuine attraction of a small, weak computer-services base in 1979 is explained by the theoretical expectations accompanying them, and the academic climate of the time. Both (expectations and climate) relate to perceived values: *openness* (one), *consistency* (two), *transparency* (three) and a combination of *scientific curiosity* and *freedom* (four).

Emerging interdisciplinarity before 1979

Now allow me to stop focusing on ICT and Law for a moment, in order to look around and discuss a few characteristics of the Dutch legal theoretical climate in relation to multi disciplinary work.

Snow and Anderson

Snow [43] delivered his famous Rede lecture in 1959, discussing the widening gap between what we now call the sciences and the humanities. The problem was and still is widely recognized. In 1972, Anderson [1] suggested a certain hierarchy in academic disciplines which may help to bridge the cultural divide brought to the fore by Snow. My version of Anderson's 'more is different' is as follows.¹⁹

Hierarchical interdisciplinary relations

Anderson proposes that a hierarchy of scientific disciplines can be constructed, depending on object-aggregation level: more is different. Crudely put: thermodynamics is different from elementary particle physics, because the objects of thermodynamics are generalities in behavior of energy in working systems,

¹⁹I adapted Anderson's idea to my purposes here. I do not think I have abused it, yet I cannot be sure about that as my knowledge of the sciences is weak.

rather than generalities in behavior of elementary particles; chemistry is different from both elementary particle physics and from thermodynamics, because it is interested in the behavior of interacting atoms and molecules, rather than generalities in behavior of elementary particles or of working systems. We can assume a hierarchy: thermodynamics looks at the behavior of aggregated (in systems) objects that chemists investigate, and chemists look at the behavior of aggregated (in atoms and molecules) objects that particle physicists investigate. The laws of thermodynamics are different from the laws of chemistry from the laws of elementary particle physics. In such a hierarchy there is a necessity for interdisciplinary coherence (or downward compatibility): the laws of thermodynamics need be coherent with the laws of chemistry need be coherent with the laws of elementary particle physics.

Anderson suggests that these hierarchies may reach into higher regions. Medicine, biology and psychological function theory operate at a higher level than (are more than) physics, chemistry and thermodynamics; economics, sociology and anthropology operate at a higher level than (are more than) medicine, biology etc. I assume that law-theory operates at the level of economics and sociology.

Consequently, law theory is more than, yet must be coherent with, the sciences whose objects it aggregates for study.

[Of course, what is stated above is an idealized state of affairs. For one: most disciplines are fuzzy, and span several levels. And second: the models and theories of disciplines at lower levels may be open to improvement].

Lateral interdisciplinary relations

Anderson does not discuss this, but hierarchies may have different nodes (disciplines) at the same level. Between them there can exist lateral relationships that may constrain and/or support lateral interdisciplinary co-operation.

My assumption is that lateral inconsistencies (anomalies between law-system theories with accepted theories in the lateral sciences like economy, sociology and anthropology) require attention and explanation.

Scale-free models

Anderson's hierarchy does not imply that at every level in the hierarchy the methods and models applied are different too. Anno 1979 we considered

- *first order predicate logic* to be a universally acceptable reasoning mechanism, or, when looked at the scaling levels represented in the hierarchy, a scale-free reasoning model.²⁰
- *number theory* to be a universally acceptable formal system for modeling theories and for simulating theoretic behavior in computer programs at any level of the hierarchy.
- *statistical analysis* to be universally acceptable as instrument to descriptively investigate regularities in (relationships between) phenomena at any level, provided that the null hypothesis refers to an explicitly acceptable distribution.²¹

And although available at the time, were not to my knowledge conversant with

- *agent-based modeling* as suggested by Von Neumann in the 1940s and early on applied and reported on by Schelling [36] and, again, applicable at any level.

Also in Dutch universities, we were opening up towards interdisciplinary work at the time.

Observations for 1979

Anno 1979 the *academic climate* of Dutch Law Schools showed as relevant characteristics

- *individual scientific curiosity* as main driving force,
- professional *autonomy* as main administrative force and
- *openness* to multi disciplinary cooperation as a resulting attitude, yet limited by an *extortion attitude towards Darwinian analysis* in legal theory.²²

²⁰Some caution is necessary here: when first order predicate logical reasoning would mix objects of different hierarchical levels in one system, it would open itself to category errors.

²¹Quite recently, the upsurging interest in power laws as an important group of distributions to be found when researching objects that may be linked in networks has rattled the cage guarding the 'standard distribution' somewhat. See also: Frank [14].

²²In 1979, the publication of a bio-social research program yielded a huge moral panic around prof. Buikhuizen, resulting in public disturbances and eventually in abandoning the program.

Anno 1979 *computers* were huge and expensive.

The *attractor collection of computer-science services* was small, weak and only accessible to the happy few (corporations, government and universities).

The *attractor collection of added values* for law-scientific attention consisted mainly of

- *expected contributions to transparency of legal theory* through modeling *legal consultation machines*, and
- *expected contributions to consistency of legal theory* through modeling, accessing and analyzing *legal documentation machines*.

Anno 1979, computer science and law was *not institutionalized* as a discipline in any Dutch Law School.

Researchers attracted can be counted in *dozens*.

III – 1987

Let me now jump to another spot in the dream-realization line segment. Imagine “now” to be 1987²³ and let us again look at the collection of ICT services available to Dutch academics, a collection which, apparently, radiated sufficient attracting power for each and every Law Faculty in the Netherlands to have departments for law and computer science (I use this term as a family concept - these departments all had different names and slightly different focuses).

The collection of 1987

Compared with 1979 there was one big difference: personal computing and text processing. We still didn’t have networks.

Attractor functions anno 1987

The attractor functions of 1979 still apply, by 1987 appended by two forces.

²³I am working straight from memory here, without indulging in verification. I believe to remain close to the original – close enough to guard the integrity of my argument. Yet, as memory tends to play tricks over time, I must claim the reader’s lenience whenever fact has been replaced by imagination.

Five: personal computing was spreading quickly and everybody wanted to get educated enough to be able to take part. By 1987 I ran the Law and Computer Science department at Leiden, and on days when students could enroll in a course we gave, they queued for several blocks, hoping to get in (we had limited capacity).

Six: The feeling of urgency was rather general: students undoubtedly queued all over the country and government had two years earlier (in 1985) started to fund the creation of Law and Computer Science departments in each and every Dutch Law school. The mechanism behind this funding marks a change in the administrative freedom of Dutch law schools: due to *political steering* the main funding was decreased, while the reserve thus created was made available under the condition of being invested in innovation.

Thus, the genuine attraction of a still rather small computer-services base in 1987 is reinforced by personal computing, making the computer-sciences services accessible to virtually everyone. ICT-access was (and is) related to expectations of innovation and welfare. This force relates to another perceived value: *welfare* (five). The other attraction force is more complex and marks the introduction of *political influence* into Dutch academia. Law School research innovation was made mandatory, its funding detrimental to the traditional departments, a mechanism that need not have done much for law-and-computer-science popularity within their Law School settings.

Modeling elephants and modeling non-elephants in 1987

Around 1987 a debate on identity occurred within the law and computer science community. One half promoted ‘legal informatics’ to form the kernel, the other promoted ‘legal theory on the use of ICT-services’ to be the kernel. The debate was never resolved; the law and computer science community simply adopted both. The legal-theory part focused on questions like what the legal status is of computer programs, and how privacy (‘data protection’) might be guarded. The ‘legal informatics’ part congregated in the Jurix foundation, focusing on expert systems, defeasible logics, computer service design methods and formal linguistics. Richard and I belonged in Jurix. We both worked on our PhD research, and somewhere around 1984 our paths forked. Richard went for modeling linear phenomena (modeling elephants), and I got tangled in the questions that must be faced when modeling non-linear phenomena (modeling

non-elephants).²⁴

I think Richard and I both recognize that linear modeling is (and was) well within our grasp. Neither do we have disagreement about the proposition that many legal phenomena simply are not fit to be modeled with linear means (mainstream statistics, first (or rather: single) order formal systems and such). Richards approach was and is, I think, that we should focus on those legal phenomena that are fit for linear modeling, like rule-based legal expert systems for ‘frozen’ interpretations, or for comparing legal texts and trying to identify and compare their subject matter statistically. The work done in the law and economics movement, finding its feet at the time, belongs in this category also.

I had chosen a research subject that didn’t allow for the linear modeling approach and crashed into the problem that modeling a legal practice in its ‘evolution’ can be reduced to modeling series of first order systemlets, but that their overall evolution (guiding how one evolved into the next) faces the non-linearity of the non-elephant. My local solution was to investigate how, at the level where systemlets were considered objects, their evolution could be explained linearly, and how this knowledge could be integrated into the systemlets in order to generate a simulated evolutionary process spanning and explaining 70 years of probation-adjudication policies in the Netherlands.²⁵

Observations for 1987

Anno 1987 the *academic climate* of Dutch Law Schools showed as relevant characteristics

- *individual scientific curiosity* as main driving force,
- professional *autonomy* as main administrative force,
- *political regulation* as additional administrative force, and
- *openness* to multi disciplinary cooperation²⁶ as a resulting attitude, yet still limited by an *extortion attitude towards Darwinian analysis* in legal theory.

²⁴Modeling non-elephants’ is, so rumor has it, Von Neumann’s famous metaphor for modeling non-linear phenomena, yet I could not get hold of a reference.

²⁵My work had been focusing so much on formal systems and was so much steered by the completely misguided way we pictured ‘artificial intelligence’ as a working fiction at the time (I’ll discuss this elsewhere), that I didn’t notice the symmetries between my results with the theories of Anderson [1] and Dawkins [7]. I also simply wasn’t aware of them at the time.

²⁶The introduction of *political influence* into Dutch academia by making Law School research innovation mandatory, while making its funding detrimental to the traditional departments may have had a chilling effect on the openness mentioned.

Anno 1987 *computers* were a mixture of huge and expensive mainframes and personal computers. In universities they were connected in *local area networks*. The *attractor collection of computer-science services* was small, weak, yet no longer exclusively accessible to the happy few (corporations, government and universities), but accessible to virtually everyone through personal computing. The *attractor collection of added values* for law-scientific attention consisted mainly of

- increased and ordered use of ICT-services is related to (economic) *expectations of innovation and increased welfare*.
- increased adaptive attention of traditional departments for *the legal questions accompanying mass use of computer science services*.
- *expected contributions to transparency of legal theory* through modeling *legal consultation machines*, and
- *expected contributions to consistency of legal theory* through modeling, accessing and analyzing *legal data bases*.

By 1987, the law and computer science discipline (further: LACS) had been institutionalized in the Netherlands – its birth taking place around 1985.

Researchers attracted can be counted in *dozens of dozens*.

IV – Looking back from 2011

Let us change our “now” forward again, to the beginning of 2011. And let me try to describe how the current situation has evolved using an etiologic reasoning technique. Such a technique builds on the notion of what Calvin²⁷ coined a ‘Darwin machine.’ It (or rather: my adaptation) allows for the identification of the data structure needed for etiologic reasoning. What we will need are instantiations for a *genotype* (a pattern), that metabolizes and can *variate*, and can *transform* into a *phenotype* that metabolizes and can *work*, that can *replicate*, that has a replicative *cycle* and that lives in an *environment* which can *select* (influence) its replicative success. *Survival* and adaptation of the pattern as a *species* is an emergent phenomenon. The phenotypes may be grouped either as a species or in communities (institutions). These are the standard elements of generalized evolutionary reasoning – for looking at how

²⁷Calvin [4]

LACS got to be what it is we need to instantiate these elements and track back into history.

I suggest that our LACS researchers are²⁸ a species and that our LACS departments are institutions that are populated by LACS researchers, who can replicate when students choose to be so transformed²⁹ *and* when they are selected to become new LACS researchers. LACS researchers come in two varieties, all academic: the law-science (LS) variety³⁰ and the legal-theory (LT) variety. LACS success is *replicative* success, leading to a growing population of LACS researchers, or a substantial amount of LACS researchers with “influx/birth” and “outflux/death” rates in some equilibrium. LACS-institutional success is also replicative success, but dependent on willingness to participate (by LACS researchers) *and* on willingness to continue providing an environment by Law Schools.

At LACS’ birth, LACS researcher varieties were evenly spread over the LS variety and the LT variety. Anno 2011 the distribution of LS and LT researchers in LACS is skewed, strongly favoring LT researchers. As a matter of fact can further be noticed that the amount of LACS departments is less in 2011 than in 1987, and that the amount of LS researchers has steadily grown from 1987 till around 2000, and has remained more or less stable thereafter. How this came about is what I will try to argue. Arguments are related to (changes in) the environment, variation, transformation, work, selection and replication

The environment

- *Openness of and to the legal discipline.* For reasons mentioned before, the legal discipline has remained an outsider in the most vital movements of interdisciplinary research: concerning (1) generalized Darwinism,³¹ (2) adaptive complex systems³² and (3) network theory.³³ By 2011, legal theory is virtually isolated from important interdisciplinary networks.³⁴

²⁸I will be speaking in terms of ‘is/was’ in stead of ‘can/could be interpreted as’ in Part V for readability.

²⁹Employing education.

³⁰Actually this variety represents a whole class of varieties, I lump them together for simplicity.

³¹Of course there are exceptions (see for instance Jones [25], the *German Law Review* 2008, Vol. 9 No. 4, the *NJB* 2009, 1009, afl. 21 and Zaluski [50]).

³²Of course there are exceptions (see for instance Ruhl [35]).

³³The effect was (unwillingly, I presume) inforced by economic mechanisms (to be discussed elsewhere).

³⁴Neither the Santa Fe Institute, nor the “third culture” network of the Edge Foundation, nor Gintis, in his discussion of a unified social science (o.c.) mention legal theory or any other name for legal discipline.

- *Carrying capacity for LS and LT researchers.* In 1985, the Dutch landscape changed again, with the comprehensive government funding of LACS departments everywhere. The ‘carrying capacity’ for LACS researchers became larger. From 1995-2000, the landscape changed again, when NWO (the Dutch national science foundation) substantially funded law and information technology research projects. The amount of LACS researchers peaked around 2000. From 1995 onwards, the dominance of LT researchers over LS researchers became marked.
- *Mass computing.* Since 1993, the landscape changed in so far as internet started to become ubiquitous (first in the West). As a result, some computer-science results turned into mass services and started to dominate the legal scenery. With it, the value of answering positive-law questions gained in number and weight. From 2000 onwards cooperative, (semi) peer to peer services drew huge audiences (like Google, BitTorrent), and somewhat later several very successful instances of social networking software (Hyves, YouTube, Skype, Twitter etc.) started to emerge.
- *ICT-abuse.* With mass computing, mass abuse entered into the scenery, creating a demand for legal work.
- *Surveillance material galore.* During the same period, it became increasingly clear that the intrinsic value for the providers of such services was to be found in analyzing and employing the digital traces left by the internet behavior of the users, mostly for targeted advertizing. In its wake, government institutions started to access these data for the detection and prevention of crimes, while cybercriminals used them for their purposes. And halfway through the period cloud computing³⁵ began its raise. All phenomena mentioned create an additional demand for professional legal attention.
- *Law-School willingness to provide an environment* was initially more or less arranged by government funding in 1985. From that year onwards, Law School funding became increasingly problematic in general. LACS institutional replication became widely dependent on the additional selective force of *cost-effectiveness*.
- *Relationships with legal theory institutions.* There is an additional issue related to Law-School willingness to provide an environment: it concerns the question whether or not the LACS LT-issues would not better be allocated to LT-institutions for research. The issue seems to have remained

³⁵Essentially: computing under surveillance.

unclear for many issues of legal-theory interest. Understanding the ins and outs of the (dynamics of the) “information society” has not been a priority in many LT-institutions, except perhaps in those where intellectual property rights or criminal law are focal.³⁶ Consequently, many LACS issues have been allocated to LACS institutions. Traces of a LS-LT divide remain though. Often it is found difficult for those institutions to cooperate on projects concerning their shared domains. Knowledge about Computer Science services does not come naturally or easy to many LT institutions.

- *The Bologna process.* After 2000, the academic education has been subject to a harmonization effort. This resulted in the Netherlands to make the curricula more compact and to reduce the space for non-mandatory courses severe, thus limiting the possibilities for the ‘extra’ education required to prepare future LACS researchers.

All in all the changes in the environment do not seem to have made a decisive negative impact on the evolution of LACS researchers and LACS institutions. Relative to the other legal sub-disciplines, there does not seem to be much difference.

Variation (individual and institutional)

Pre-academic education received. I assume that the predisposition for the LS- and LT-approaches more or less coincides with the type of pre-academic education received. In law schools, this education tends to be on the ‘soft’ side. Consequently, the LT-inclined students substantially outnumber the LS-inclined. Again, this need not be a decisive factor against LACS evolutionary development towards a stable state. A stable state may also be reached when a stable minority of new students is LS inclined, and it is a steady minority of LS-inclined students (students who gained a decent science background) that enters the Dutch Law Schools.

Transformation

Transformation equals education when focusing on researchers. Back in 1979, LS and LT researchers qualified themselves. In other words, they were intrinsically motivated and auto didactically educated. There was no LACS education anywhere, and computer science education was really scarce. Around 1985,

³⁶Of late, the WikiLeaks panic has rattled the cage of those focusing on the freedom of the press.

these early adopters (who often earned their existence through university by programming computer services) manned the new LACS departments and offered LACS-LS courses (for the LS-inclined students) and LACS-LT courses (for the LT-inclined students). From 1993 onwards, the number of the LT-inclined students of LACS institutions grew steadily, while the number of the LS-inclined students remained more or less stationary. In Leiden, anno 2011, the ratio is currently something like 6:1.³⁷

Work

I think that looking at the feedback cycles between LACS work and the environment there can be observed a trend towards a change in the *demand* for LS-LACS professionals: towards an in-between discipline supporting a niche market. It must be further assumed that the growing demand for the LT-LACS variety supports a growing market for them.

Selection for success

The discussion of the role of selection concerning the evolution of LACS researchers and LACS institutions spans at least five levels:³⁸

1. the motivations³⁹ for LACS research (internal to individual *frames of mind*, yielding the emergence of individual frames of mind),
2. individual frames of mind of LACS researchers (internal to *regularities in LACS-researchers' frames of mind*, yielding the emergence of varieties of LACS researchers and providing external feedback to individual frames of mind),
3. regularities in LACS-researchers' frames of mind (internal to *LACS-researcher varieties*, yielding the emergence of varieties of LACS researchers and providing external feedback to individual frames of mind),

³⁷We have approximately 120 LT students and approximately 20 LS students each year.

³⁸Thus modeling tentatively LACS-institutional requirements for etiologic reasoning in patterns that may vary, be selected and replicate, while keeping in mind Anderson's 'more is different' observation, and while interpreting Anderson's hierarchy to change levels when the higher-level pattern is a phenomenon, emerging (as understood in complexity theory) from grouping behavior at the level below.

³⁹'Motivations' here refers to those (both conscious and subconscious) mechanisms that we imagine to urge individual behavior, yet are not rational. They refer both to what Smith [42] calls sentiments and Gigerenzer and Gaissmaier [17] call heuristics. They supposedly are the results of what we imagine to be meant by Gintis [19] with gene-culture co-evolution.

4. regularities in the behavior of LACS-researcher varieties⁴⁰ (internal to *LACS institutions*, yielding the emergence of LACS institutions, providing external feedback to LACS-researcher varieties) and
5. the general environment (providing external feedback to LACS institutions, to LACS-researcher varieties and to the frames of mind of individuals; partly emerging from their work and its inherent entropies, partly just being there).

These levels and their interactions suggest a theoretical frame for an ‘ecologic’ system in Dutch academia where the focus is on the etiology of LACS researchers and LACS institutions. Its tractability in action is undoubtedly rather complex. I will nevertheless try and apply it intuitively to the question at hand in the paragraph concluding our looking-back position. But before doing so I want to suggest that at least the behaviors of the theory implied may be an interesting subject for agent-based modeling simulation experiments.⁴¹ Not doing so makes this an essay, rather than a research paper.

Replication

Replication of LS-LACS researchers operates through education. There is, however, a serious difficulty in the education of LS-inclined students in LACS-LS subjects, when the subject matter is of the Computer Science kind. It requires a lot of effort in a time where the Bologna process has reduced leeway for students to gain education in subjects that are not considered to be in the kernel of a discipline. In Leiden no more than 3.5 ECT can be made available. *This can be considered a severe handicap for adequately educating LACS researchers of the LS variety.* On the other hand, many high-level books and video courses have come available for basic introductory courses on several disciplines that do enhance greatly the possibilities for any LS-inclined student to enter the field.⁴²

⁴⁰Which, I imagine, may be expressed in institutional value frames. I expect coherence and rationality to be also part of them.

⁴¹See for instance Gilbert and Terna [18], Niazi et al. [32] and Macal and North [29].

⁴²I would suggest for instance:

Basic literature: Hofstadter [24], Aumann [3], Frank [13], Ridley [34], Schreiber et al. [40], Fehr and Gächter [12], Teulings et al. [44], Miller and Page [30].

Preparatory videocourses: Grimson and Guttag on computer science:
<http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-00-introduction-to-computer-science-and-programming-fall-2008/>;

Stearns on evolution, ecology and behavior:

http://videlectures.net/yaleeeb122f07_principles_evolution_ecology/;

Bloom on (evolutionary) psychology:

http://videlectures.net/yalepsyc110s07_introduction_to_psychology/;

Replication of LS-LACS at the institutional level operates paradigms as its patterns. And here, I think, we touch the main reason why our dream is in trouble. It is hardly possible to think in terms of a coherent field when thinking about LT-inclined LACS research. If each Dutch LT-inclined LACS professor were to describe our research efforts as contributing to a *shared paradigm* in terms of seminal publications, we would all come up with very different lists. After 31 years we are still very much in what Kuhn⁴³ would qualify to be a preparadigmatic phase.

Looking back: conclusions

Etiologic reasoning is a form of teleological reasoning which may be construed to have the structure (applying Wright [48]): patterns are that way because they got that way, yet might have turned out completely different. Etiologic reasoning discusses contingencies in the past, leading to contingencies that are currently there.

The current state of LACS in the Netherlands may be as it turned out to be because the emergence of ICT-services in the environment created a strong demand for LS-LACS and LT-LACS researchers, which initially was answered by a variation towards the LS-LACS inclined and a variation towards the LT-LACS inclined. Within the dancing landscape created by continually innovating ICT-services becoming ubiquitous and comprehensively connected, the LT-LACS variety flourished by sticking to its already mainstream paradigm, leaving adaptation to the legislator. Concurrently, the LS-LACS variety explored several paths (some of them proving to be dead ends), resulting in a large, rather haphazard collection of very small sub-varieties. Replication of these sub-varieties is considerably more costly than the mainstream variety due to additional educational investments. Yet the demand in the environment seems strong enough for some of them to be selected for replication and to survive in small niches. The emergence of a strong paradigm (of effective, cooperative regularities in LS-LACS researcher behavior) might help make the LS-LACS variety more resilient. Such a paradigm *not* being there may impede survival of LS-LACS institutions, even where the environment also produces a strong and attractive demand.

Assuming the current stable Dutch LS-LACS institutions to be at the law schools of Amsterdam (VU, UvA), Groningen, and Tilburg, while those at Lei-

Page on coplexity theory:

http://www.teach12.com/tgc/courses/course_detail.aspx?cid=5181;

Polak on game theory:

http://videlectures.net/yaleecon159f07_game_theory/.

⁴³Kuhn [26].

den, Rotterdam and Nijmegen are less stable due to either leadership-succession or to diminishing size, the overall conclusion must be that LS-LACS survival is becoming critically vulnerable. In terms of etiologic argument the cause seems to be that the LS-LACS institutions' work did not lead to an emerging and viable paradigm that generates theories that support comprehension and that actually functions as a pattern, sustaining coherence of and co-operation between institutions. This impedes both effective replication ('fitness') and selection for survival by the environment.

V – The remains of our dreams anno 2011

Our dreams of 1979, of legal practice and legal theory racing towards new equilibria with computer-science results as attractors have only partially come true.

Legal practice is adapting to these results, no doubt about that. Yet most of the work involved is selected to be done by computer-science institutions. The frequency of problems in this area, however, seems so create room for an in-between discipline which LS-LACS researchers might fill, as many already do. Consequently, I consider LS-LACS, LT-LACS and legal practice to be reasonably compatible with our first dream. I will leave it at that.

Legal theory, on the other hand, has hardly moved an inch. It seems in a stable evolutionary state, serving the replication of mainstream legal professionals, demanded by a greedy market. The amount and the size of the LS problems involved are hardly noticed inside the worlds of the LT-inclined discipline.⁴⁴ As a result we see other disciplines move and adapt to fill the gap. Biology, medicine, economics and the behavioral sciences have become the most important players. As mentioned earlier, serious cooperation between these disciplines is flourishing, while cooperation between these disciplines and LT is almost entirely nonexistent. Consequently, I consider LS-LACS to be seriously incoherent with current mainstream legal theory, and our second dream to be largely unfulfilled.

Neither the blind watchmakers emerging behind the Darwin machine and, neither the invisible hand emerging behind the price mechanism, neither we have

⁴⁴Examples galore: we have no scientific LT theories addressing global warming, the north-south, the east-west, the urban-agricultural or the digital divides. Later I will be using the example of the huge amount of research cooperation, needed for gaining comprehension of the relations between genetics and cancer, which seems to be incoherent with a world dominated by current intellectual-property habits.

managed our LS-LACS institutions towards instantiating the image we dreamt, back in 1979. Lets make a plan.

VI – Looking forward

It still is now, the beginning of 2011. The most ambitious part of our dreams remains to be realized. Thus it makes sense to turn to the future and ask ourselves whether it still is worthwhile to pursue, and if so, how we can imagine how the forces of LS-LACS institutions can be combined with the forces of the two blind watchmakers in order to at least bring a part of it about. Lets find out how we might design in order to make our dream come true at least partially. Looking backwards is applying etiology, looking forward is applying design. I will apply a method described elsewhere without further reference⁴⁵ and I will follow some of its milestones when discussing the design questions related to our dream statement.

The dream

In fact, the whole of our old dream statement remains open:

Our dream is to find a widely shared, vital legal-theory paradigm (including the law-theory approach), fit to address scientifically the legal issues accompanying the use and the provision of a strong, attracting and relevant collection of ICT-services.

So we are talking about a paradigm shift, towards a vital legal-theory paradigm for scientifically approaching legal issues. We have to be clear about what this means. My definition – combining notions by Kuhn [26], Popper [33] and Aumann [3] – of such a thing would be as follows:

A legal-theory paradigm for scientifically approaching any legal issue is understood to be a shared, coherent collection of scientific theories that serves comprehension of the law in relation to regularities in behavior of the judiciary, of institutions and of the public.

Working towards a design implies modeling. Any form of modeling and any form of reasoning – also scientific reasoning – implies the employment of representation, and thus the employment of fiction. In this, modeling and reasoning,

⁴⁵See for this:Schmidt and Corvers [39].

when written down, are parts of literature. We need then to distinguish between several kinds of fiction,⁴⁶ of course I focus on scientific theories:

Scientific theories. I tend to agree with Aumann⁴⁷ when he stipulates that it makes little sense to think about scientific theories or models in terms of truth. Successful scientific theories have one goal: to serve comprehension. And comprehension is served by

- connectedness (the capacity to recognize patterns),
- unification (the capacity to explain many different things) and
- simplicity (its sparseness in basic structure and its applicability).

I add two additional well known characteristics that respectively serve the legitimacy and the authority of scientific theories:

- falsifiability (à la Popper) and
- paradigmatic (à la Kuhn).

Thus: legal fictions may be scientific theories. E.g., Dutch law counts an unborn baby for a person in inheritance contexts. This can be considered to be a *scientific* theory as it serves our observation and understanding of certain generalities in behavior of the Dutch judiciary in a way that connects, unifies and remains simple. And can be falsified. And belongs to the Dutch LT paradigm.

All in all, transforming our dream into reality is a daunting task. It not only requires the specification of a substantial adaptation to an existing scientific paradigm. With this, it requires to convince at least a substantial and evolutionary stable variety of LS-inclined researchers to adopt it and to sustain it.

⁴⁶Other types of fiction may be *lies* and *mental images*. Lies are fictions employed to cheat. The lyer knows an inherent proposition not to be true, yet hopes and expects that the fiction presented will lead to unexpected and often unpleasant results for whom it concerns. Framing evolutionary theory to claim behavior be predestined is such a lie in an interesting sense. It employs the social-scientific theory of framing to gain popular support via a simple, intuitively appealing lie. *Mental images*. I use this as a container family concept for all results of modeling and reasoning that are neither scientific theories or models and neither are lies. Usually, invoking mental images is an objective for the arts. Often, imagery is employed in scientific argument, as metaphores may support comprehension. Of course the line between the three types mentioned in this context may not always be clear.

⁴⁷Aumann [3].

The demand

As mentioned, we have no inclusive, legal theories addressing many of the social phenomena that rattle the cage of the external consistency of our legal system. Let me mention just one:

- the huge amount of computer-science supported, distributed research is needed for gaining comprehension of the relations between genetics and cancer, yet yielding a quandary in a world dominated by current pharmaceutical-industry and intellectual-property habits.

The issue is high on our political agendas. The interests are global (or transnational). The demand is huge. But they are not being addressed by or towards LT-inclined researchers. Many ideas about how to adapt our legal systems are suggested by common sense, economists and (social) scientists, are decided upon by political institutions and are the work of armies, police forces and a kaleidoscopic, dispersed mangle of public and private institutions founding most of their competences and powers in nation-state arrangements.

All in all, the demand is there, be it diffuse. It is not directed towards the LT-inclined and there is no well-defined industry or institution (other than LS-LACS institutions) to formulate requirements and deploy the results, other than the invisible hand and the blind watchmaker. From our perspective, their designing abilities are currently severely hampered by the results of our naïve design efforts, polluting the workings of the environment and filtering basic moral notions from the regularities in our market-oriented behavior. Reversely, at the side of the potential producers, the LT-inclined are hardly interested scientifically. A tall order indeed.

Institutional analysis

Productive institutions. Our dream has to be realized and organized by one or more LS-LACS institutions. These may be linked to each other and to interested institutions from different disciplines in a goal oriented network. All of them are supposed to be manned by LS-inclined researchers. All these institutions are (1) elements of or Foundations related to Faculties and Universities, who are parts of the academic systems of their countries and (2) subject to peer-review mechanisms for their work to gain authority and influence.

Demanding institutions. We need not expect our direct environmental institutions, the Law Faculties, to exert strong demanding forces: their mainstream focus is on positive law and they are in an evolutionary stable state due to market demand for their students. Yet their relative openness makes them willingly

provide an environment for LS-LACS institutions, provided they are cost effective and provided they are not incoherent with the mainstream paradigm. To convince them that LS-inclusive LT is an important adaptation will be one of our objectives. But for strong and focused demand we will have to look elsewhere. Most likely it can be found where (private or public) administrations are both interested in innovation and face persistent computer science and law problems, resistant to be effectively solved by mainstream legal practice. The innovative, cooperative, computer science supported research into the relationships between genetics and cancers may serve as an example project.

Task-dependency sketch

The task-dependency sketch is a preliminary affair, presenting the contours of a possible solution based on intuition. We can divide the tasks involved in two phases: one for actually describing and implementing a new paradigm and one for maintaining it and keeping it in production.⁴⁸

Design, specification and implementation of the new paradigm. Design and specification of the new paradigm is decided in the LRE phase. Were I the project initiator, I would suggest that the organizations and the interdisciplinary approaches of both the Santa Fe institute and the Edge foundation show a way worthy of imitation, *mutatis mutandis*. Thus I would try to organize a network, embracing a paradigm focusing on inclusive, scientific legal-theory with attention for the differences between the regularities in behavior of the legislator, the judiciary, the corporations and the public – a paradigm that further investigates and employs the forces as provided by (subsets of) etiology, network theory, complexity theory and game theory – all supporting comprehension (as described before) and interdisciplinary cooperation.

Implementation of the resulting paradigm is an especially difficult issue, considering the stable state that mainstream legal theory currently seems to be locked in, especially where it may well prove to be incoherent with mainstream legal theory. Douglas' analysis provides a theory about how conceptual anomalies with axiomatics of an institution may lead to conflict (see Douglas [9], Douglas [10] and Douglas [11]). Cohen [6] unraveled powers of 'moral panics' and Gitlin [20] researched how 'framing' communication technique can help defend against a new paradigm intruding yet also can help rattle the cage of stable states.

Assuming institutions with stable states to (internally) have shared interests and values, one might consider these to be 'institutional value frames.' Some of the values involved get a special status; they become the heart of the network,

⁴⁸Arthur [2] might consider them to be the phases of combinatorial evolution and of the Darwinian bottleneck respectively. Anyway, that seems a useful way to think about the two phases.

keeping the institution together. When institutional cohesion is voluntary (participants do not fight or flee it),⁴⁹ part of the institutional value frame may be called ‘morality.’⁵⁰ Social psychologists notice why the parts of paradigms we consider to be moral are resilient to change:

“Morality, by its very nature, makes it hard to study morality. It binds people together into teams that seek victory, not truth. It closes hearts and minds to opponents even as it makes cooperation and decency possible within groups.”⁵¹

It is not difficult to see that institutional value frames vary all over the world. Most relevant to the LS-inclined is the research for basic, universal ‘emotional functions’ or ‘receptors’ that may be tuned by cultural operation in order to provide individuals with the moral ‘taste’ considered appropriate by the institutions they participate in. Knowing about these receptors and about the mechanisms that may and may not change them will be important to the LS-inclined.

VII – Conclusion

When I accepted the invitation to write an essay for the volume, celebrating the 65th birthday of professor Richard de Mulder, I decided to try and understand our joint history in Law and Computer Science. My discussion took considerably more time and considerably more space than expected or offered to be available. If the essay is accepted for publication anyway, I am grateful.

While writing it, I made use of the methods and techniques available to us now, and unavailable to us when we were needing them most. My main conclusion is that we are currently entering an era where effective interdisciplinary work has come within our reach. My analysis has shown how a relevant project might be approached. Writing it down has made me decide to actually try and realize such a project. This cannot be done solo. So here is my appeal to anyone feeling the urge to participate.

Tell me.

Oegstgeest, January 23

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⁴⁹See for instance Schmidt [38].

⁵⁰In the sense used by Haidt [22].

⁵¹From Jonathan Haidt’s home page <http://people.virginia.edu/~jdh6n/>

References

- [1] ANDERSON, P., “More is different,” *Science* 177 (1972), 393–396.
- [2] ARTHUR, W., *The nature of technology: What it is and how it evolves* (Free Pr, 2009).
- [3] AUMANN, R., “What is game theory trying to accomplish?,” in *Frontiers of Economics, edited by K. Arrow and S. Honkapohja* (Citeseer, 1985).
- [4] CALVIN, W., “The six essentials? Minimal requirements for the Darwinian bootstrapping of quality,” *Journal of Memetics-Evolutionary Models of Information Transmission* 1 (1997).
- [5] ———, “Competing for consciousness: A Darwinian mechanism at an appropriate level of explanation,” *Journal of Consciousness Studies* 5 (1998), 389–404.
- [6] COHEN, S., *Folk devils and moral panics* (MacGibbon and Kee, 1972).
- [7] DAWKINS, R., *The extended phenotype: The long reach of the gene* (Oxford University Press, 1982).
- [8] DE MULDER, R., K. VAN NOORTWIJK AND L. COMBRINK-KUITERS, “Jurimetrics please!,” *European Journal of Law and Technology* 1 (2010).
- [9] DOUGLAS, M., *Purity and Danger: an Analysis of the Concept of Pollution and Taboo* (Routledge (Classics 2002), 1966).
- [10] ———, *How institutions Think, The Frank W. Abrams Lectures* (Syracuse University Press, 1986).
- [11] ———, *Risk and Blame: Essays in Cultural Theory* (Routledge, 1992).
- [12] FEHR, E. AND S. GÄCHTER, “Altruistic punishment in humans,” *Nature* 415 (2002), 137–140.
- [13] FRANK, R., *Passions within reason: The strategic role of the emotions* (Norton New York, 1988).
- [14] FRANK, S., “The common patterns of nature,” *Journal of evolutionary biology* 22 (2009), 1563–1585.
- [15] FULLER, L., “Legal Fictions (pts. 1-3),” *Illinois Law Review* 25 (1930), 877.
- [16] ———, “Positivism and fidelity to law—A reply to Professor Hart,” *Harvard Law Review* 71 (1957), 630.

- [17] GIGERENZER, G. AND W. GAISSMAIER, "Heuristic Decision Making," *Annual Review of Psychology* 62 (2011), 451–482.
- [18] GILBERT, N. AND P. TERNA, "How to build and use agent-based models in social science," *Mind & Society* 1 (2000), 57–72.
- [19] GINTIS, H., "Gene-Culture Coevolution and the Nature of Human," (2010).
- [20] GITLIN, T., *The Whole World is Watching: Mass Media in the Making and Unmaking of the Left* (Univeristy of California Press, 1980).
- [21] GREIF, A., *Institutions and the Path to the Modern Economy: Lessons from Medieval Trade* (Cambridge University Press, 2006).
- [22] HAIDT, J., "The emotional dog and its rational tail: A social intuitionist approach to moral judgment," *PSYCHOLOGICAL REVIEW-NEW YORK*- 108 (2001), 814–834.
- [23] HART, H., "Positivism and the Separation of Law and Morals," *Harvard Law Review* 71 (1957), 593.
- [24] HOFSTADTER, D. R., *Gödel, Escher, Bach: an Eternal Golden Braid* (Basic Books, 1979).
- [25] JONES, O., "Behavioral genetics and crime, in context," *Law and Contemporary Problems* 68 (2006), 81–100.
- [26] KUHN, T. S., *The Structure of Scientific Revolutions* (University of Chicago Press, 1962).
- [27] LESSIG, L., *Code and Other Laws of Cyberspace* (Basic Books, 1999).
- [28] LOEVINGER, L., "Jurimetrics, the next step forward," *Minnesota Law Review* 33 (April 1949), 455–493.
- [29] MACAL, C. AND M. NORTH, "Tutorial on agent-based modelling and simulation," *Journal of Simulation* 4 (2010), 151–162.
- [30] MILLER, J. AND S. PAGE, *Complex adaptive systems: An introduction to computational models of social life* (Princeton Univ Pr, 2007).
- [31] MITCHELL, M., *Complexity: a guided tour* (Oxford University Press, USA, 2009).
- [32] NIAZI, M., A. BAIG, A. HUSSAIN AND S. BHATTI, "Simulation of the research process," in *Proceedings of the 40th Conference on Winter Simulation* (Winter Simulation Conference, 2008), 1326–1334.

- [33] POPPER, K., *Conjectures and Refutations: The Growth of Scientific Knowledge* (Routledge, 1963).
- [34] RIDLEY, M., *The Origins of Virtue* (New York, Penguin Books, 1996).
- [35] RUHL, J., “Law’s Complexity: A Primer,” *Georgia State University Law Review* 24 (2008), 885–1097.
- [36] SCHELLING, T., “Dynamic models of segregation,” *The Journal of Mathematical Sociology* 1 (1971), 143–186.
- [37] ———, “An astonishing sixty years: The legacy of Hiroshima,” *The American Economic Review* 96 (2006), 929–937.
- [38] SCHMIDT, A., “Radbruch in cyberspace: about law-system quality and ict innovation,” *Masaryk University Journal of Law and Technology* (????).
- [39] SCHMIDT, A. AND S. CORVERS, *Aanbesteding en innovatie - Juridisch handboek functioneel specificeren van aanbestedingen* (Sdu uitgeverij, 2009).
- [40] SCHREIBER, G. ET AL., *Knowledge Engineering and Management: The CommonKADS Methodology* (MIT press, 2000).
- [41] SEARLE, J., *The Construction of Social Reality* (Allen Lane The Penguin Press, 1995).
- [42] SMITH, A., *The Theory of Moral Sentiments* (Oxford University Press 1976, 1759).
- [43] SNOW, C., *The Two Cultures: and A Second Look, An expanded version of The Two Cultures and the Scientific Revolution* (Cambridge University Press, 1965).
- [44] TEULINGS, C., L. BOVENBERG AND H. VAN DALEN, *De cirkel van goed intenties: de economie van het publiek belang* (Amsterdam University Press, 2005).
- [45] TURING, A., “Computing machinery and intelligence,” *Mind* 59 (1950), 433–460.
- [46] WEINRIB, E. J., *The Idea of Private Law* (Harvard University Press, 1995).
- [47] WIERINGA, R., *Requirements Engineering: Frameworks for Understanding* (Wiley, 1997).

- [48] WRIGHT, L., "Explanation and teleology," *Philosophy of Science* 39 (1972), 204–218.
- [49] ———, "Functions," *Philosophical Review* 82 (1973), 139–168.
- [50] ZALUSKI, W., *Evolutionary Theory and Legal Philosophy* (Edward Elgar, 2009).