

Changing Maps: Empirical Legal Autopoiesis

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I.

The idea of self-organisation was invented simultaneously in different fields of knowledge, in the natural as well as in the social sciences. Theories such as self-referential processes,¹ autopoiesis² and second-order-cybernetics,³ among many others, spontaneously emerged and began to influence each other in a trans-disciplinary discussion and to form a common web of theoretical constructs. And in due course these theories stimulated empirical research. But while such projects have flourished in areas as diverse as economy, psychotherapy and flamenco, in “law and society” there has so far been a paucity of empirical research on self-organisation. This anomaly can perhaps be traced back to certain peculiarities of legal sociology as a field of knowledge. It seems that the long-lasting and deep hiatus between theory construction and empirical research is actually deepened by the emergence of theories of self-organisation and autopoiesis. This is our first thesis. Secondly, if we look more closely at concrete, detailed, historical research carried out in the name of autopoiesis, we can discern clear discontinuities with “normal” practices of empirical research. Autopoiesis calls for a redefinition of empirical work and requires different empirical tools—tools that are capable of analysing *the transformational dynamics of recursive meaning processes*. As a consequence, everything changes: research questions, the phenomena to be identified, the concepts to be made operational and the analytical instruments. But, as if that weren’t enough, there are even stronger anomalies in the socio-legal relationship between the empirical and the theoretical. The constructivist orientation of legal autopoiesis, we submit in our third thesis, works against the fantasies of omnipotence inherent in the process of empirical falsification. Legal autopoiesis is not anti-empirical, but it does suggest a role for empirical research that is different from straightforward Popperian theory-killing. It suggests, instead, a quasi-therapeutic relationship between the speculators and the data collectors. But who, then, is the therapist and who is the patient?

II.

Why is there a structural hiatus between theory and empirical research in law and society? In the classics of legal sociology, Marx’s historical methods, Durkheim’s *choses sociales* and the ideal-typical method in Weber’s

¹ D R Hofstadter, *Gödel, Escher, Bach: An Eternal Golden Braid* (New York, Basic Books, 1979)

² H R Maturana and F J Varela, *Autopoiesis and Cognition* (Boston, Reidel, 1980)

³ H von Förster, *Observing Systems* (Seaside, California, Intersystems Publications, 1981)

interpretive sociology were guarantees of the unity of empirical research and grand theories of law. But then disaster struck for theory with the introduction of modern empirical methods.

The dissolution in data and their recombination with the help of newly developed methods of data analysis destroyed the high level of theorising which had been built up in the classics without being able to substitute it adequately.⁴

Today, the field is still suffering from this deep hiatus, which renders theory rather empty and empiricism rather blind. Or to put it more mildly, empirical research in law and society has developed a highly sophisticated methodology which is, however, based on poor and rather ad hoc theorising, while theorising about law and society has become more and more philosophical and speculative relying, however, on poor and rather ad hoc empirical support.

And today the hiatus is deepening. Empirical legal sociologists are giving in to the temptation of trying economic models and theories for their data with the predictable result that they are losing their sociological identity. Meanwhile, legal theorists are tempted to follow the famous “linguistic turn” in sociology and thus to question the validity of systematic data collection and patient data analysis.

Usually it is the micro-macro problem that is held responsible for the empirico-theoretical gap. Empirical methods are good at gathering individual data at the micro level of legal action and aggregate data at the macro level of socio-legal relations. But they fail when it comes to analysing law’s “organised complexity” which good theory regards as central to understanding law as a social phenomenon. Without denying the importance of the micro-macro difference, we prefer to identify another famous *petite différence* as responsible for the great hiatus: the difference between law as operation and law as observation,⁵ which has sharply divided socio-legal theoreticians and empiricists. Empirical analysis has opted for first-order observation of the law. It takes legal action as simple operations, as spatio-temporal events, which can be correlated in their empirical models with other social events. This drives empirical analysis of law in two directions: towards models of logical and mathematical formalisation on the one hand and towards attempts at causal explanation and prediction on the other.⁶ In contrast, ambitious sociological theories of law are usually second-order observations. They see legal action itself as observation, as a trinity of utterance, information and understanding, as the recursive transformation of differences, as constructing a special space of meaning and an autonomous world of knowledge. This drives socio-legal theories deeper and deeper into the hermeneutic tradition, which allows for sophisticated analyses of the “operation called *Verstehen*”, but which ridicules attempts at formalisation, causal explanation and prediction. And attempts to combine both traditions are sucked into the black hole bounded by formalisation, causal explanation and hermeneutics.

⁴ N Luhmann, *Die Wissenschaft der Gesellschaft* (Frankfurt, Suhrkamp, 1990) p410

⁵ von Förster, *supra* n.3

⁶ D Black, *Sociological Justice* (Oxford, Oxford University Press, 1989)

If this is an adequate sketch of the intellectual map, how does self-reference and autopoiesis change the somewhat desperate outlook for law and society? At first sight it looks like Columbus's egg, as François Ewald has called it.⁷ It nourishes hope for a recombination of both the empirical-analytical and the normative-hermeneutic traditions. It seems to promise a bridge between law as operation and law as observation since it compels us to combine first- and second-order analysis. Since law is defined as a closed system of self-reproductive observing operations, legal action is seen as being at the same time both operation and observation. This requires the normative tradition to leave Popper's World III and to search for "law in action" as its social base, and it requires the empirical tradition to include in its observations the complex chains of normative observations of the "law in the books".

But a closer look reveals that autopoiesis offers no easy synthesis. It burdens the three traditions—the hermeneutic, the formal and the causal orientation—with an almost unbearable task. How to cope with self-reference? Hermeneutics, with its long tradition of dealing with self-referential relations, reflexivity, paradoxes and hermeneutic circles, is obviously in the best position. This explains the rapid development of autopoiesis in hermeneutically oriented theories of law. In a view of law as a concatenation of communicative events based on a code which deparadoxifies a basic self-referential relation autopoiesis has strong (s)elective affinities with discourse analysis as developed by the *maître-penseurs* of poststructuralism: Foucault, Lyotard and Derrida.

The tradition of formalisation in legal theory has much greater difficulties with autopoiesis. The reason is that the paradoxes of self-reference pose an enormous challenge for a formal calculus. It is true that Hofstadter's famous book on the enigmas of reflexivity and self-reference has had a certain impact on legal theory.⁸ However, sophisticated attempts to come to terms with self-reference, such as Spencer-Brown's *Laws of Form*,⁹ the development of a multi-value logic by Günther¹⁰ or "A Calculus for Self-Reference" by Francisco Varela¹¹ have up to now only found one resonance in legal sociology which is Niklas Luhmann's discussion of the legal paradox and the binary coding of law.¹²

⁷ F Ewald, 'The Law of Law' in G. Teubner (ed.), *Autopoietic Law: A New Approach to Law and Society* (Berlin, de Gruyter, 1987)

⁸ Hofstadter, supra n.1, pp692ff; D R Hofstadter, 'Nomic: A Self-Modifying Game Based on Reflexivity in Law' in D R Hofstadter (ed.), *Metamagical Themas: Questing for the Essence of Mind and Pattern* (New York, Bantam, 1985) pp70ff; P Suber, *The Paradox of Self-Amendment: A Study of Logic, Law, Omnipotence and Change* (New York, Peter Lang, 1990)

⁹ G Spencer-Brown, *Laws of Form*, (New York, Julian, 1972)

¹⁰ G Günther, 'Cybernetic Ontology and Transjunctive Operations' in G. Günther (ed.) *Beiträge zur Grundlegung einer operationsfähigen Dialektik I* (Hamburg, Meiner, 1976); 'Life as Poly-Contextuality' in G. Günther (ed.) *Beiträge zur Grundlegung einer operationsfähigen Dialektik I* (Hamburg, Meiner, 1976)

¹¹ F J Varela, 'A Calculus for Self-Reference', 2 *International Journal of General Systems* 5-24 [1975]

¹² N Luhmann, 'The Third Question: The Creative Use of Paradoxes in Law and Legal History', 15 *Journal of Law and Society* 153-165 [1988]; 'The Coding of the Legal System', in G Teubner and A Febbrajo (eds), *State, Law and Economy as Autopoietic Systems: Regulation and Autonomy in a New Perspective* (Milan, Giuffrè, 1992); 'Operational Closure and Structural Coupling: The Differentiation of the Legal System', 13 *Cardozo Law Review* 1419-

However, the situation for causal explanation and prediction, the precious hope of orderly empirical work in law and society that would transform it into a real science, is disastrous. For causal analysis, self-reference is an explosive. The blast comes from a theory of recursive systems and from a concept of non-trivial machines; and the blast is so strong because these explosive concepts were developed not just from the hermeneutic softies of the *Geisteswissenschaften* but also from the hard-liners of the exact sciences. According to the sociologists Krohn and Küppers, who deal with problems of the legal regulation of social fields, the results look like this:

[i]n non-linear systems with a recursive dynamics...there are only few cases in which prediction of the system's development is possible, even if their mechanism is known, the systems are deterministic and disturbances do not occur...Due to recursion, even very small deviations in the initial conditions are reinforced in such a way that similar starting constellations lead after a very short time period to totally opposite system developments...In the case of a non-linear and recursive system dynamics...no prediction of the system's development is possible.¹³

And if law as a social system is correctly defined as one of these “non-trivial machines” (that is, as one of the deterministic systems whose input-output relationship is not invariant, but is determined in a self-referring way by the machines' previous output), then, in the words of von Förster,

for all practical reasons they are unpredictable: an output once observed for a given input will most likely not be the same for the same input given later.¹⁴

The only hope for causal explanation and prediction is a trivialisation of law and society, their social construction as trivial machines—something that happily coincides with the triviality of certain results of attitude and impact research, results that everyone familiar with the fields already knew in advance.

So what does this mean for the chances of empirical research in the autopoietic framework? Well, they look excellent for all kinds of historical analysis, for genealogical and archaeological digging in historical texts, and for qualitative research techniques, case studies of formal organisation, ethnomethodological types of socio-legal interaction, discourse analysis, for “critical empiricism”. And indeed these are the research techniques that are mainly used in the empirical projects. For static correlations (of “the more *x*, the more *y*” variety), however, the chances look rather bleak.

III.

But before we get carried away, is it not the case that autopoiesis is simply incompatible with the dominant working orientation of orderly empirical

1441 [1992]; *Das Recht der Gesellschaft* (Frankfurt, Suhrkamp, 1993); ‘The Paradox of Observing Systems’, 31 *Cultural Critique* 37-55 [1995]

¹³ W Krohn and G Küppers. ‘Selbstreferenz und Planung’, 1 *Selbstorganisation* 101-127, 114ff [1990]

¹⁴ von Förster, *supra* n.3, p201

research, where the task of theory is causal explanation and prediction of empirical facts, and the task of empirical research is the reality test of hypotheses derived from theoretical constructs? Indeed, it is incompatible. Viewed from the constructivist position of autopoiesis, every element of this statement about the empirico-theoretical relationship—causal explanation, prediction, reality tests—is flawed.

To put the counter-position bluntly:

1. Empirical research is by no means closer to the reality of the outside world than theory. Even from empirical experience we know that often the opposite is true. The hard facts about the external world that empirical research pretends to produce are in reality highly artificial constructs, excessively selective abstractions, mere internal artefacts of the scientific discourse that are both as real and as fictional as are theoretical constructs.
2. The real role of empirical research does not lie in dull falsification. It is in the “surprise value” of its self-produced data. Empirical world constructions in law and society do not need to be destructive of theories. Rather, they could play a maeutic role in the birth of theories in the spirit of empiricism.
3. Causal explanation and prediction are grossly overestimated in law and society. They are only special cases of theoretical work, which are indeed very rare, and—what is more important—they by no means exhaust the potential of theoretical explanation.
4. For autopoiesis, theoretical explanation of empirical results means that the theory reformulates these artefacts of perception in new contexts in order to analyse—let us repeat the central formula—the transformational dynamics of recursive meaning processes.

Let us take a concrete example of the social effects of legislation in order to discuss this counter-position. Occupational health and safety in Britain’s offshore oil industry constitute a well-defined area that has seen considerable regulatory development over its 35-year history. Traditional empirical research on the effectiveness of law and implementation research suggest the construction of a network of dependent and independent variables among which we can identify correlations and find out their causal connections.¹⁵ The usual causality chain—as Renate Mayntz, for example, tells us—works like this: political goal definition → legislative act → legal norm → motivation of implementation staff → motivation of actors in the field → deviation/sanction/incentive → social behaviour → social effects.¹⁶ In our concrete example of offshore health and safety regulation, it is possible to trace this sort of causality chain as follows.

During the early days of the offshore industry in the mid-1960s there was no detailed regulation of occupational health and safety, simply an instruction from the government that those involved should follow an industry

¹⁵ For example, H Rottleuthner, *Einfuehrung in die Rechtssoziologie* (Darmstadt, Wissenschaftliche Buchgesellschaft, 1987) pp54ff

¹⁶ R Mayntz, ‘The Conditions of Effective Public Policy: A New Challenge for Policy Analysis’, *2 Policy and Politics* 1 [1983]

code of practice. When a serious accident occurred in 1965, the inadequacies of this approach became evident and an Inquiry chaired by a lawyer recommended that “a statutory code with credible sanctions” be implemented to provide for the safety of workers in the industry.¹⁷ This recommendation was accepted by the government of the day, which introduced a Bill to Parliament that eventually became law as the Mineral Workings (Offshore Installations) Act 1971. This provided a framework for the development over a period of years of detailed regulations by the regulators (mainly the Petroleum Engineering Division of the Department of Energy) covering every aspect of the industry from the design and construction of offshore installations to the content of first aid kits. These regulations were then implemented and the oil companies they were aimed at complied or deviated from them ultimately producing an effect on the level of safety that existed in the industry.

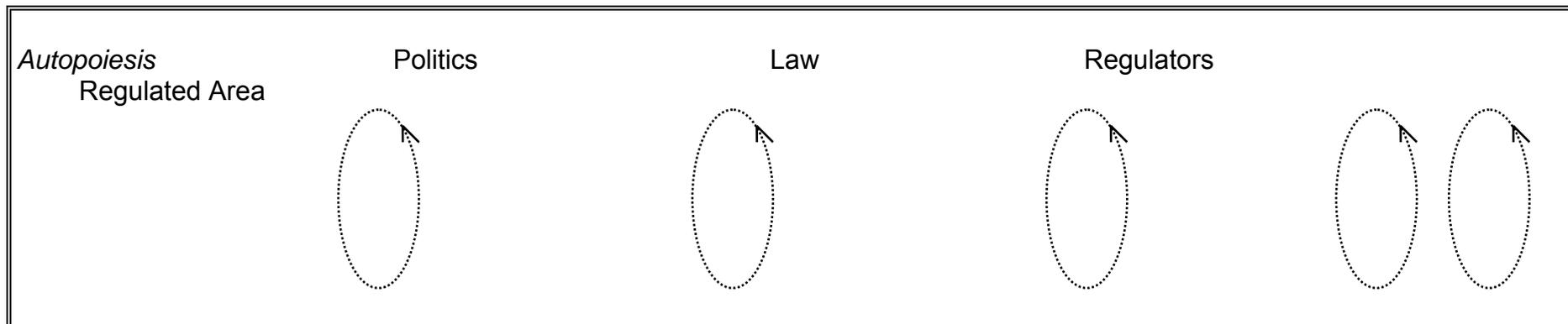
We might summarise this on the basis of the foregoing causal chain as: political goal definition by the Ministry of Power Inquiry → introduction of a Bill to Parliament by the government → passing of the Mineral Workings (Offshore Installations) Act 1971 → development and implementation of detailed regulations by the regulators → compliance/deviation by the industry → effects on safety. In accordance with this understanding of the regulatory chain, when questions are asked about continuing safety problems in the industry, we find concern about delay in getting detailed regulations into place and about the toughness of the regulators’ enforcement.¹⁸ In other words, control of safety will be achieved when detailed regulations are in place telling the industry what it must do and when these are being enforced by the regulators.

Autopoiesis, however, forces us to break up this causal chain of events and to replace it by—let us condense everything into one formulation—a *multitude of autonomous but interfering fields of action in each of which, in an acausal and simultaneous manner, recursive processes of transformation of differences take place*. To put it more simply, a single *horizontal* chain of causal relations is replaced by a multitude of *vertical* chains of recursions. We can indicate this shift graphically in Figure 1.

¹⁷ Ministry of Power, Report of the Inquiry into the Causes of the Accident to the Drilling Rig Sea Gem (Cmnd. 3409) (London, HMSO, 1967) para. 10.2(i)

¹⁸ W G Carson, *The Other Price of Britain’s Oil: Safety and Control in the North Sea* (Oxford, Martin Robertson, 1981)

Figure 1: The Shift from a *Horizontal* Chain of Causal Relations to *Vertical* Chains of Recursions



Moreover, our framework gives us a new understanding of social regulation through law. Understanding these vertical chains of recursions as operationally closed means that each constructs information internally: there are no input-output relationships between, say, the regulators and the industry. As a consequence, attempts by the regulators to steer the industry by means of prescriptive regulations backed by sanctions and incentives must be understood in a fundamentally different way. Such attempts can only ever be a multitude of *self-steering* processes. More specifically, this self-steering must be understood as the *minimisation of a difference*, an attempt to reduce the difference between the current situation and the desired one. This definition is consistent with all forms of steering but in the context of a recursively closed system of communicative operations the difference is itself internally constructed. Thus, offshore safety regulators construct the current situation according to their own code and similarly construct a desired situation and apply their own *programme of difference minimisation* in an attempt to arrive at it. Given that the industry constructs reality according to its own code and steers according to its own difference minimising programme, the limits of regulatory ambition become clear. In other words, regulation is possible only as self-regulation within each of these recursive processes. Regulation over the boundaries of action fields is impossible. Chains of causality need to be replaced by simultaneous events of structural coupling. This is not to say, of course, that regulatory attempts produce no effects, only that those effects cannot properly be regarded as steering in the sense implied by traditional theories. Instead, these effects arise from the construction of differences by the regulators and their attempts to minimise them but depend on the internal construction of differences by the industry and its attempts to minimise them.¹⁹

This is a suggestive idea, but can it be made empirical? The task for empirical research in these circumstances would become one of inquiring into several chains of difference minimisation and into their interferences. We would have to retell in detail several divergent stories of self-regulation in the political arena, in the legislative chambers and courtrooms, in the offices of the regulatory agencies and in the managerial suites of corporate actors, and on the drill-floors of offshore installations. The question would be one of how, in each of these stories, the events common to them are idiosyncratically reconstructed and processed in the meaning context of their specific difference minimisation programmes. To be clear, such a division of the regulatory chain into divergent stories does not imply that autopoiesis is bound to discover regulatory failure. Autopoiesis is not in some sense the opposite of regulatory success, as Nahamowitz seems to believe.²⁰ Instead, understanding steering as self-steering means that the theory accounts for regulatory failure and success in ways different from theories where linear causality is assumed. So, if we find that our different stories of recursive operations travel together for a time in a common direction instead of diverging then we can readily speak of regulatory success.

¹⁹ N Luhmann, 'Limits of Steering', 14 *Theory, Culture and Society* 41-57 [1997]

²⁰ P Nahamowitz, 'Difficulties with Economic Law: Definitional and Material Problems of an Emerging Legal Discipline' in G Teubner and A Febbrajo (eds) *State, Law and Economy as Autopoietic Systems: Regulation and Autonomy in a New Perspective* (Milan, Giuffrè, 1992)

The crucial question, then, is how to disentangle the connections of these multiple cascades of concatenated differences. To repeat, we do not mean causal influences, but the acausal synchronisation of ongoing parallel processes. And our theory tells us that there is not one magic formula of structural coupling; rather there are several types of synchronisation. In order to find out how the different recursive processes are interrelated we need first of all to find out how they are closed to each other. *L'ouvert s'appuie sur le fermé*²¹—this is not a matter of theoretical definition but a matter of empirical variation. Autopoiesis theory suggests a variety of closure mechanisms in the relations between meaning systems to which correspond a variety of ways in which they are open to each other: from ad hoc contacts to systematic linkages and long-term co-evolution. Success or failure of regulation depends—this is our guiding hypothesis—on the specific qualities of interwovenness of several recursive meaning processes, which in turn depend on the qualities of their mutual closure.

This compels us to ask a twofold question when it comes to detailed empirical research:

1. How can we identify concretely the multitude of elementary acts—meaning operations—that constitute the autopoietic closure of the various processes involved?
2. How can we identify the different types of mutual recontextualisation that are responsible for a meeting of these closed discourses?

Applying the first question to our example: are the legislative process and the implementation field autopoietic systems? Although we have so far spoken as if they are for the sake of the argument, this is not in fact a question we can answer theoretically but only by empirical observation. Autopoiesis theory does not impose a set of pre-existing systems but rather compels us to observe the concrete interactions in legislative chambers, lobby halls and the technological processes in our implementation field in order to discover the systemicity of our research object. Strangely enough, this reliance on empirical knowledge runs counter to the opinion of empirically-minded researchers who tend to treat this as an “analytical” question, namely the identification of a “system” as the somewhat arbitrary conceptual selection of the field of inquiry according to the concrete research interests. In contrast, the system concept of autopoiesis is much closer to empirical reality than the abstract models of empirical research.

Unlike the semi-autonomous fields, which, as Griffiths tells us, owe their systemic character only to the research designs of legal sociologists,²² our decision about their systemicity is dependent upon observable self-organising processes in the social world. Autopoietic systems are produced by self-organising processes in the social world, not by scientific observers. We need careful empirical observation, therefore, in order to find out which operations are recursively linking up to other operations in our field so that in their concatenation they gain the autonomy of an autopoietic system. In the area of the social effectiveness of law, we researchers are by no means free to define

²¹ E Morin, *La Méthode: 3. La Connaissance/1* (Paris, Seuil, 1986) pp203ff

²² J Griffiths, ‘What is Legal Pluralism?’, 24 *Journal of Legal Pluralism* 1-55, 35 [1986]

the concrete legislative process as a “system”. Empirical observation would rather compel us to split it up into four or five more or less loosely coupled recursive processes: the ongoing power game of the political actors, the quasi-scientific policy-talk of the experts, the profit-oriented calculations of the lobbyists and the doctrinal arguments and constructions of the lawyers. If we are interested in regulation we have to identify not only the concrete binary codes that are used in each of these processes and the concrete rules of the game which they have developed over time but especially the specific programmes of difference minimisation that they follow at any given moment: strategies of interest and power, reputational gains, policy objectives, risk minimisation and the reduction of deviance.

In addition, we will also have to split up our regulated field into a similar multitude of recursive processes. For example, when the object of regulation is a specific technology in economic organisations, such as offshore installations, does the concrete technology form a system? Autopoiesis would qualify the usual definitions of technology as “man-machine-systems” as irresponsibly loose talk.²³ Can we identify in the real world elementary operations like “legal acts”, “theoretical statements” or “economic transactions” that would process technological differences in a binary code? Probably not. What we will find is a concrete technology as a social field in which formal organisation ties together—with varying degrees of strength—the scientific, economic and political processing of distinctions related to technical artefacts.²⁴ And as regards regulation, it would again be important to investigate each of these processes to discover their established difference minimisation programmes: organisational goals, accumulation of knowledge, profit orientation and so on.

IV.

The question arises, however, as to just how we might go about an empirical study guided by autopoiesis. What sort of systematic observation must we carry out? What sort of tools can we use? What sort of methodology could be envisaged that could accommodate more broadly the analysis of several systems operating on the basis of different codes and steering by distinct difference minimising programmes?

It is probably the case that only through consideration of individual concrete examples can researchers decide upon a methodology that is appropriate to each case. If a narrative style seems appropriate, then perhaps techniques such as multi-voice or reflexive texts may provide an answer,²⁵ but the ideal would be to find something that could represent more *graphically* what it is that autopoiesis claims to offer to legal sociology.

Santos provides us with a compelling graphical metaphor for law when he describes it as a “map of misreading”,²⁶ distorting reality systematically

²³ See N Luhmann, *Die Gesellschaft der Gesellschaft* (Frankfurt, Suhrkamp, 1997) pp517ff

²⁴ See R Grundmann, *Marxism and Ecology* (Oxford, Clarendon Press, 1991) pp147ff

²⁵ S Woolgar and M Ashmore, ‘The Next Step: an Introduction to the Reflexive Project’ in S Woolgar (ed.), *Knowledge and Reflexivity: New Frontiers in the Sociology of Knowledge* (London, Newbury Park, Beverly Hills, New Delhi, Sage Publications, 1988)

²⁶ B de Sousa Santos, *Toward a New Common Sense: Law, Science and Politics in the Paradigmatic Transition* (New York, Routledge, 1995) pp456ff

through the mechanisms of scale, projection and symbolisation. Depending on the scale employed, different features of the landscape which law attempts to map will appear or disappear; the particular projection used will emphasise some features over others; and the symbolisation will say much about the cultural background of the law and its intended purpose. Now, whereas Santos believes that laws misread reality in order to establish their exclusivity, understanding law as an autopoietic system reveals that the misreading is not calculated in this way but is rather the *inevitable* result of law's autopoietic nature—reality is constructed on the basis of the selections made by law according to its code (legal/illegal) as it seeks to achieve order from complexity. In other words, it is impossible to avoid a misreading and law can only observe what its code allows it to construct. But the map metaphor remains useful since, in much the same way, a map, because it cannot reproduce the world, must offer a selective and incomplete view of that world and consequently there is a sense in which that which is not included on the map is not real.²⁷ Indeed, there is in cartography an analogue of the binary code of autopoietic systems, namely the *tectonic code* “which configures graphic space in a particular relation to geodesic space”.²⁸

The map metaphor is, then, a powerful one, but its true potential is only released when the following points are taken into account.

1. Law's map is but one of a potentially very large number of similar maps arising from the selections of different recursive systems according to their own codes, their own attempts to achieve order from complexity.
2. Because law (and other recursive systems) are in a state of constant change, we must not see the map metaphor as introducing an unwarranted element of stasis but rather think of changing or evolving maps.
3. The second consideration should not, however, lead us so far away from the idea of a map that we lose the insight that maps are multiply connected; once a particular tectonic code is employed, local changes cannot easily be made without having knock-on effects globally; there are, therefore, built-in constraints limiting the extent to which changes can be made unproblematically—a fact recognised by cartographers who concentrate on redundant information thus over-determining the main features.²⁹

If we can, then, see the different autopoietic systems as maps evolving through time with the codes and programmes represented by different tectonic codes, constraining by this internal multiple connectivity the changes that can be made as the maps are recursively redrawn, then we can perhaps get a first idea of what the results of autopoiesis research might look like. Such results would allow a comparison of the ways in which the same events (whether, for example, new regulations, a fall in the price of oil or a major accident) appear on the maps of the different systems in our concrete example. Equally, they

²⁷ D Wood, *The Power of Maps* (London, Routledge, 1993) pp85-87

²⁸ *Ibid.* p124

²⁹ See J Ziman, *Reliable Knowledge: An Exploration of the Grounds for Belief in Science* (Cambridge, Cambridge University Press, 1978) p82

would allow examples of closer communication between systems to be identified. If such results could be attained, then what Luhmann calls second-order observation would be achieved; that is, the observation of “what others observe and what they cannot observe”.³⁰ But can the map metaphor be made more concrete?

One existing technique (suitably “stripped down”) appears singularly appropriate in this regard, not least because it allows us to retain the graphical metaphor of the map. More importantly, it is appropriate because it maintains an insistence on systematic empirical observation while allowing a representation of the multitude of autonomous but interfering fields of action into which autopoiesis proposes to break the causality chain: *cognitive mapping*.

This technique was developed from graph theory by Robert Axelrod,³¹ primarily as a means of examining decision-making processes with a view to improving the performance of policy-makers, and it possesses many features that render it useful in the present context. The basic idea is extremely simple. In analysing, for example, a text or a series of texts, the concepts or constructs employed are represented as points, while the causal assertions used to link the concepts or constructs are represented as arrows between the points.³² Positive and negative causal assertions are signified by the addition of a positive and negative sign respectively to the arrow concerned.³³ The basic format of the cognitive map is, therefore, as shown in Figure 2.

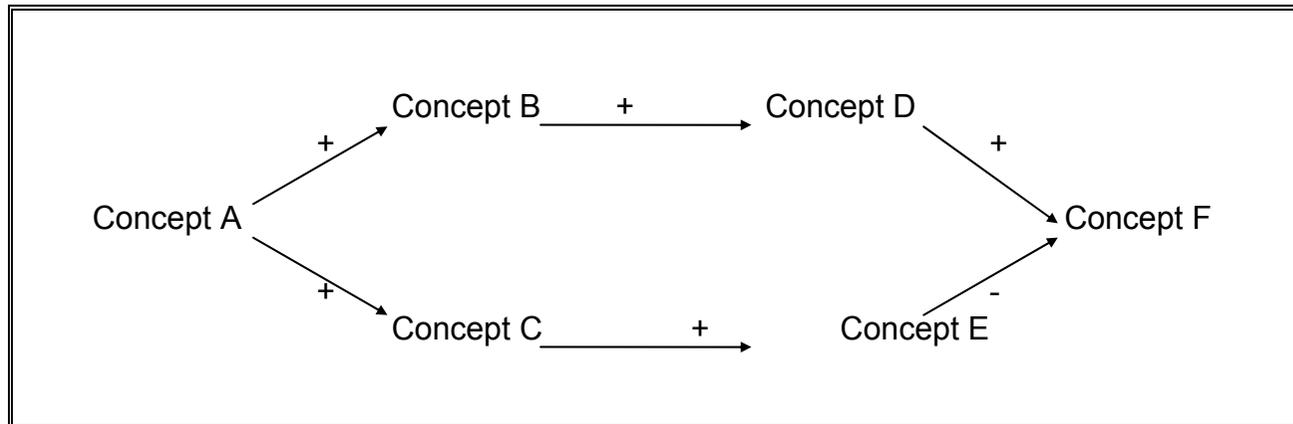
³⁰ N Luhmann, *Risk: A Sociological Theory* (Berlin and New York, Walter de Gruyter, 1993) p108

³¹ R Axelrod (ed.), *Structure of Decision: The Cognitive Maps of Political Elites* (Princeton, New Jersey, Princeton University Press, 1976)

³² R Axelrod, ‘The Cognitive Mapping Approach to Decision Making’ in R Axelrod (ed.) *supra* n.31, p5

³³ R Axelrod, ‘The Analysis of Cognitive Maps’ in R Axelrod (ed.) *supra* n.31, p 60

Figure 2: Format of a Cognitive Map



The cognitive map is thus for Axelrod a graphical representation of a belief system. In other words, concept or construct A is an explanation of B and is an answer to the question “How or why did (or does) B happen?” Similarly, concept B is a consequence of A and answers the question “What were (or are) the consequences of A?”³⁴ The details of the technique as developed by Axelrod (for example, the mathematical approach to the process) are not being discussed here because the value of the technique in the present context does not depend on the exact methodology proposed by him but rather on its ability to provide a graphical representation of autopoietic systems. Indeed, the mathematical element of Axelrod’s methodology implies a view of information and its transferability that is at odds with that of autopoiesis.³⁵

In the context of autopoiesis research, cognitive mapping provides a means of representing graphically the world which a system has constructed, the concepts its code gives it access to as well as the causal relations which complete its model of reality. In other words, it allows a picture to be produced of the order that a system has created by means of its selections from the noise of complexity. In this way, one could imagine cognitive maps being produced in our concrete example for legislators, regulators and for different sectors of the industry which would allow us to observe not only the economic and power relations which other approaches impose on the situation but rather the world construction of each system—what each can and cannot observe as a result of the application of its code. Similarly, perhaps even finer detail can be resolved in the form of the programmes by which each system steers itself, which differences it constructs and seeks to minimise. If this could be achieved then a potentially rich account of the development of occupational health and safety offshore would emerge. Our explanation of regulatory success or failure would not be restricted to the dominant rationality of more traditional empirical tools but would depend much more upon what the regulators and the regulated could and could not observe.

In this spirit, we can now understand Figure 1 above as displaying the cognitive maps respectively of traditional implementation theories of law and of autopoiesis. But what about the concrete example of health and safety in the offshore oil industry? It is to that example that we now turn.

V.

The brief discussion of this topic which follows is drawn from a larger study³⁶ and due to the present space restrictions necessarily presents a rather truncated and incomplete picture of the subject. The intention, however, is primarily to demonstrate the usefulness of cognitive mapping in carrying out an empirical study guided by autopoiesis and to demonstrate how a more

³⁴ See M Jones and L Brooks, ‘Addressing Organisational Context in Requirements Analysis Using Cognitive Mapping’, University of Cambridge Research Papers in Management Studies, 1993-1994, No. 17, 6

³⁵ Cf. J J Savelsberg, ‘The Making of Criminal Law Norms in Welfare States: Economic Crime in West Germany’, 21 *Law and Society Review* 529-561 [1987]

³⁶ J Paterson, *Behind the Mask: Regulating Health and Safety in Britain’s Offshore Oil and Gas Industry* (Aldershot, etc: Ashgate-Dartmouth, 2000)

adequately complex picture of the study area can emerge in terms of different codes and individual difference-minimising programmes.

As was mentioned earlier, occupational health and safety in Britain's offshore oil industry was initially not the subject of any detailed state intervention. Only in the aftermath of a serious accident and a Public Inquiry³⁷ were moves made to introduce prescriptive regulations. Again as was seen previously, the Inquiry criticised the lack of a clear code of statutory authority regulating the question of safety offshore and this was precisely the issue that the government attempted to address in drafting the legislation. The process which saw the passing of the Mineral Workings (Offshore Installations) Act 1971 together with subsequent parliamentary debates provide us with a view of how politics constructed this issue and how it sought to improve safety in what it saw as a technologically complex and rapidly developing industry operating in a hostile environment.

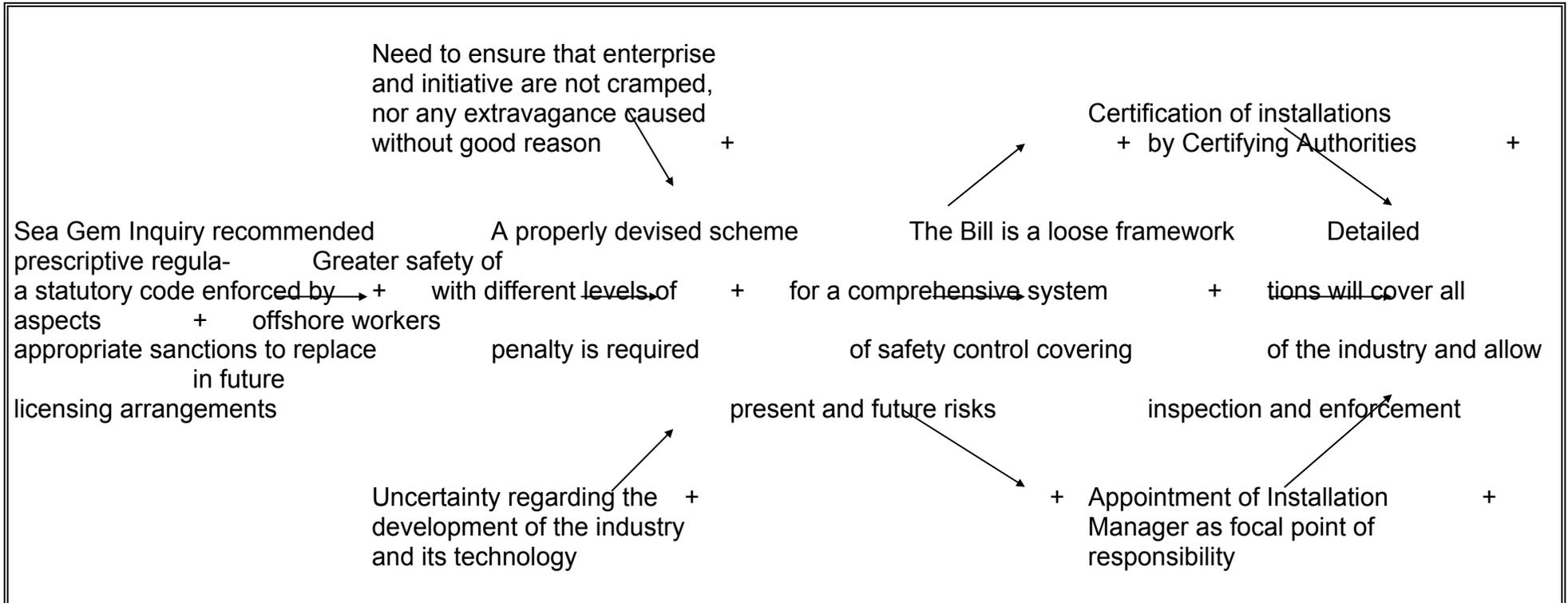
These sources reveal that the discussions of the legislators are very much influenced by the findings of the Public Inquiry.³⁸ In place of the previous non-interventionist stance, a detailed enforceable code is envisaged. Requirements are to be set out clearly and penalties are to be graded. The fact that the industry is comparatively new and developing rapidly means that there must, however, be flexibility. A comprehensive set of regulations is to be made in due course within the framework of the Act. These regulations are seen as being more easily adaptable than primary legislation and can thus keep pace with technological change. They are envisaged as providing the basis for detailed inspection and enforcement by the regulators. Equally, concern is expressed that the regulations should not cramp development nor lead to excessive expenditure.

From these deliberations we can construct a cognitive map for legislators at the time of the passing of the 1971 Act (Figure 3).

³⁷ Ministry of Power, *supra* n.17

³⁸ Earl Ferrers, Hansard HL (Debs) 18 Feb. 1971, cols 741-746; Hon. Nicholas Ridley (Under Secretary of State for Trade and Industry), Hansard HC (Debs) 28 April 1971, cols 645-649.

Figure 3: Cognitive Map for Politics



From the cognitive map emerges a fairly standard view of regulation and its impact on the area of society at which it is aimed. Perceiving a need to act on this issue as determined by the political power code, legislators set up the framework for a detailed regulatory response. In other words, they deploy a programme of legal instrumentalism. A difference is constructed between the current unregulated situation where a number of accidents have occurred and the desired situation of improved occupational safety. The programme by which this difference is to be minimised, is one of detailed regulatory intervention. Regulators will develop detailed norms of action that will tell the industry what to do. Provided these norms are followed—and if they are not then the regulators can impose sanctions—the difference between the current problematic safety situation and the desired situation can be minimised.

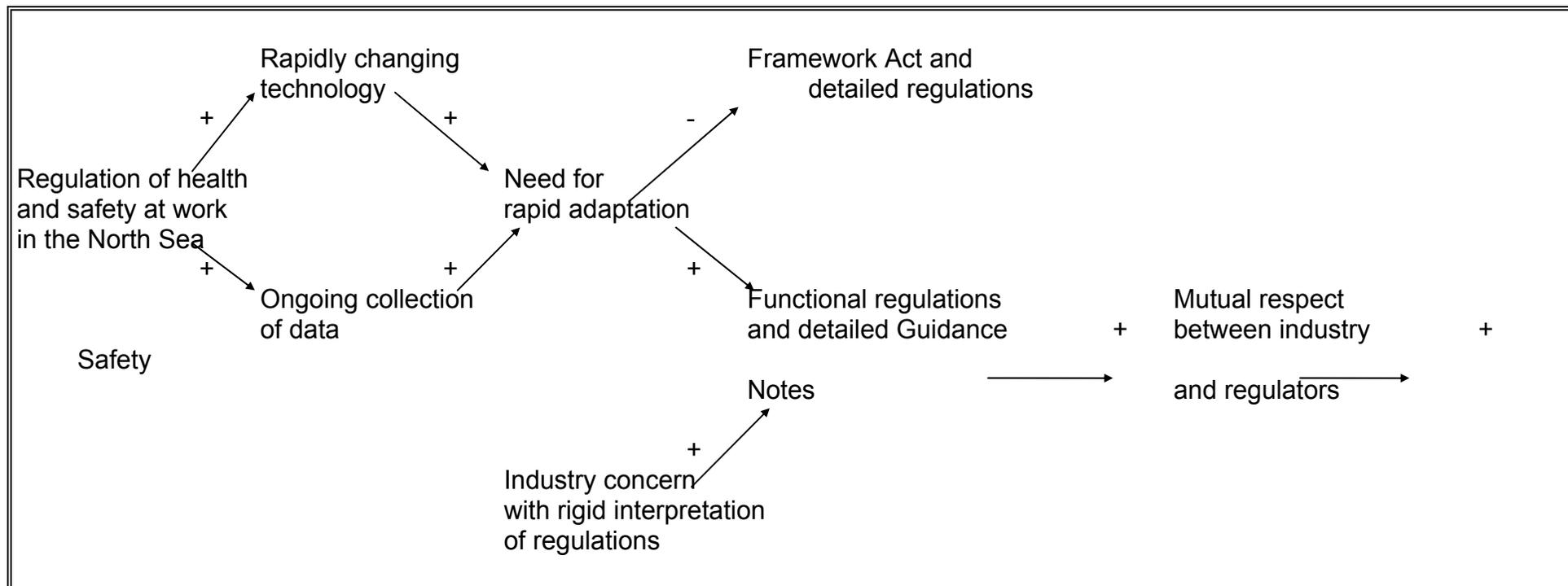
There is nothing particularly surprising here. Not only could we expect to find this basic code and programme repeated in many legislative chambers, but they are also of course the code and programme which underlie many legal theoretical and sociological approaches. Thus, it is not surprising to find that in subsequent debates on the issue of offshore safety, legislators maintain very much the same code and programme and thus construct a relatively stable picture of the problems they confront and the range of appropriate solutions.³⁹

But if this was the understanding of the legislators, what was happening when the task was passed on to the regulators? Drawing on material produced by the regulators,⁴⁰ it is possible to construct the following cognitive map shown in Figure 4

³⁹ For example, Hansard HC (Debs) 16 January 1974 cols 669-696 following the sinking of the *Transocean 3* and the disabling of the *Transworld 61* in the winter of 1972-73; and Hansard HC (Debs) 6 November 1980, cols 1472-1546, following the publication of the Burgoyne Report into Offshore Safety.

⁴⁰ Especially W R Street, 'United Kingdom Regulations for Permanent Offshore Structures', Offshore Technology Conference III; 731-736 [1975]

Figure 4: Cognitive Map for Regulators



In place of the legislators' ongoing optimism about the capabilities of a programme of detailed regulatory intervention, the regulators are aware, from the very earliest stages, of the struggle they will have in keeping up with the industry. On the one hand there is continual development of the technology, and on the other there is a lack of environmental data from the untried waters of the North Sea. Both of these factors make even the most rapidly adaptable detailed regulations difficult to achieve. Consequently, at a comparatively early stage, the regulators abandon the idea of providing detail at the level of the regulations as these are simply too cumbersome to adapt to new data and new technology. This is a telling point given that the regulations would be subject only to minimal negative resolution procedure, which would see them pass into law in the absence of active intervention by legislators. But instead, the regulations are described as "functional", laying down only the broad principles, with detail being provided at the level of non-mandatory guidance notes, which can be withdrawn, replaced or amended with even less formality.

The regulators are thus operating in a way that would probably trouble the legislators. The very fact that the detail is to be at the level of guidance notes means that failure to comply with such a requirement would not constitute a breach of the law unless it could be shown that the failure to comply also contravened the broad principle laid down in the regulation. Dubious though this might appear to legislators, it can be seen to be a step that is based on the same sort of rationale that motivated them. In other words, in the same way that the legislators were unable to provide detail at the level of the 1971 Act, so the regulators, faced with a rapidly developing technological industry and ever greater refinement of models based on the ongoing collection of environmental data, found that even the relatively broad confines of negative resolution procedure did not provide the speed and flexibility they required. Their response was to develop detail at the yet lower level of guidance notes.

But the programme of legal instrumentalism envisaged by the legislators has very clearly become something quite different in the hands of the regulators. Faced with technical problems in the form of a lack of data and rapidly developing technology, the regulators are also trying to minimise the difference between two safety situations (the current and an improved one) but the programme of legal instrumentalism no longer appears appropriate. Instead, lacking the cognitive resources to develop regulations with any degree of certainty and in any event unable to keep pace with developments, they adopt a programme of fostering the respect of the industry as a means of ensuring that the requirements of guidance notes are complied with. The ongoing lament of a variety of commentators about a lack of tough enforcement of detailed regulation⁴¹ now appears in a rather different light.

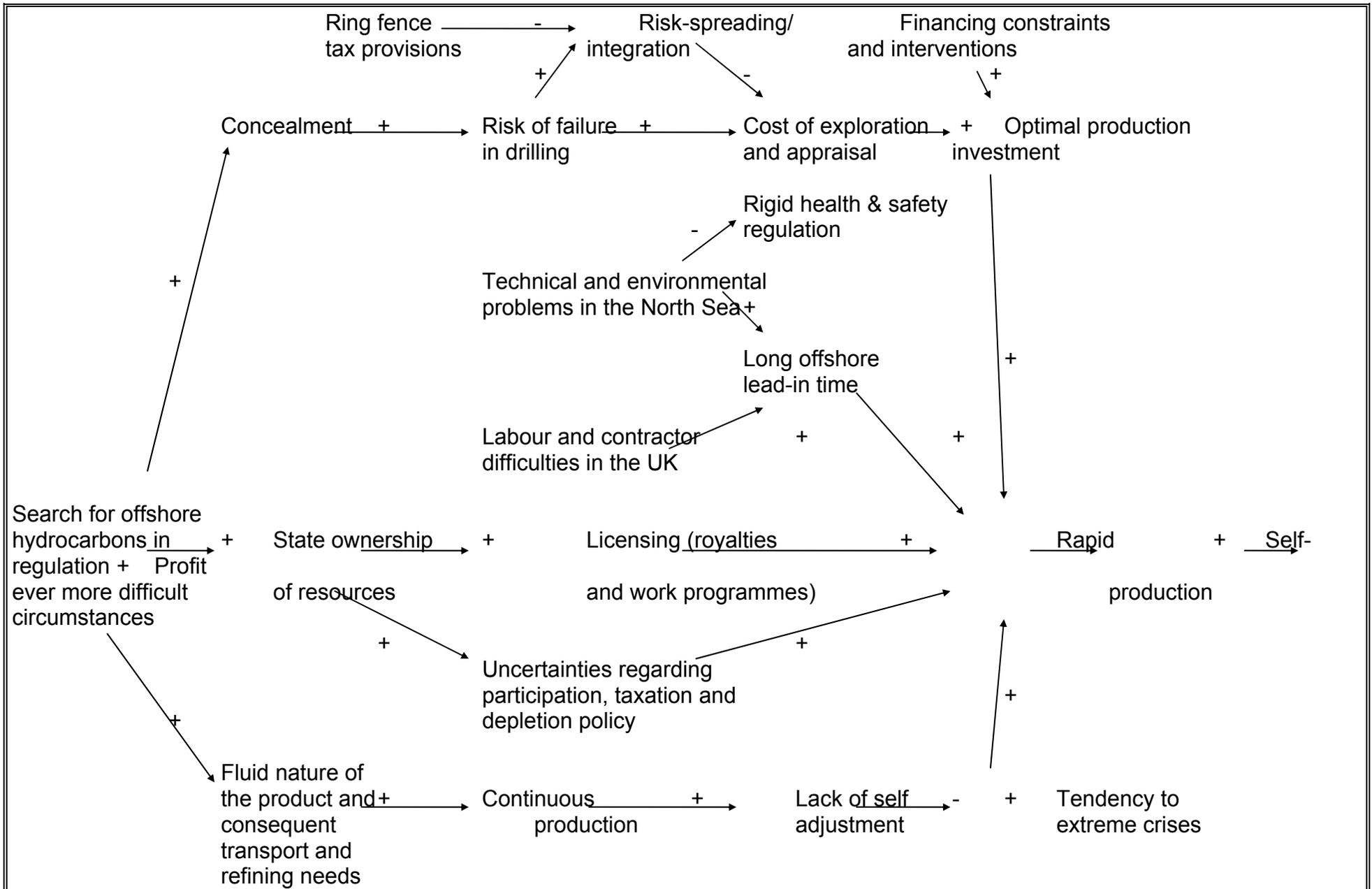
But if a shift in approach of this magnitude is evident between the legislators and the regulators, what happens when we reach the regulated area? Although the regulated area is more complex, for the sake of the current argument two dominant recursive systems will be considered, those of industry management and of engineering.

⁴¹ For example, Carson, *supra* n.18

Studying the recursive system of industry management at this period, it is immediately clear just how peripheral the issue of occupational health and safety is in the context of the entire system. Nor is this as pejorative as it may initially sound. The industry does not primarily exist to carry out functions associated with the improvement of safety. It exists to explore for and produce offshore oil and it is on the basis of this fact that the entire system operates.⁴² It is accordingly possible to construct the detailed cognitive map for this system shown in Figure 5.

⁴² P H Frankel, *Essentials of Petroleum: A Key to Oil Economics and Essentials Updated 1968* (London, Frank Cass, 1968)

Figure 5



It is not necessary here to go into this map in detail. It is sufficient to note that the system stresses certain features of the substance it seeks to produce (concealment, state ownership and fluid nature) which in turn determine the way in which it must operate (broadly: spreading the risk of failed exploration; in accordance with state licensing programmes; and continuously). These operational “facts” combined with the added complexity of the offshore environment (long lead-in time and extremely high front-end loading of costs) mean that the industry is confronted by large economic risks. In other words, the self-steering programme of industry management is not related to two situations of occupational safety but to two situations of economic safety. But we must beware of understanding this too simplistically. This does not mean that the industry seeks first and foremost to cut costs. While profit is undoubtedly the goal, it sees this as most likely to be achieved by reducing the time between expenditure and payback; that is, by implementing a programme of rapid production. Industry management assesses operations on the basis of the net present value of money not on the gross amount it will ultimately receive. In this regard, it is worth noting that other legislative interventions (for example, regarding taxation, state participation and depletion policy) are constructed by the industry as increasing the economic risk and as necessitating the application of the same difference-minimising programme.

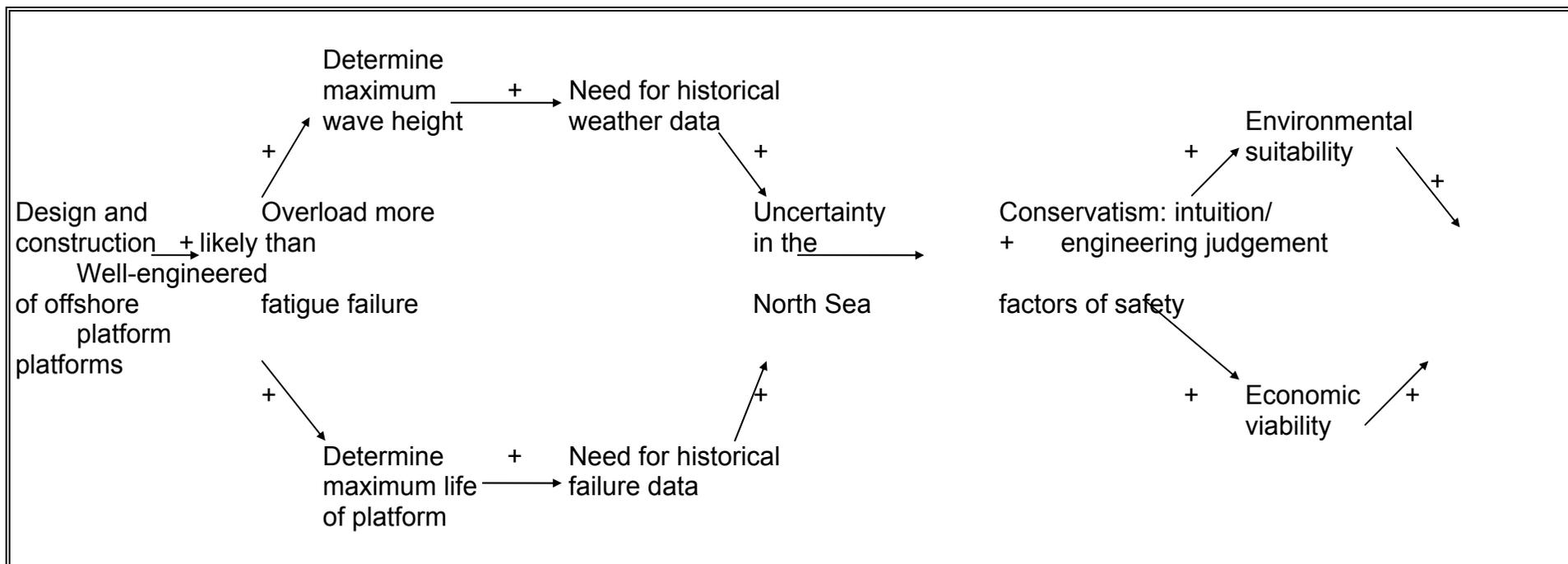
Now, whereas other commentators have noted the detrimental effect of speed on the occupational health and safety situation,⁴³ it is now possible to see why this speed occurs. It is also possible to see how *any* rigidity in health and safety regulation is constructed by industry management as being fundamentally at odds with its need to move as quickly as possible in order to minimise economic risk, and how external interventions of any kind are seen as second best to its own ability to regulate its own affairs towards this end. The regulatory ambition of the legislators takes another knock and the approach of the regulators looks somewhat better adapted if still fundamentally at odds with the self-steering programme of management.

Of course, as was mentioned previously, autopoiesis forces us to consider the possibility that the regulated area is not defined by one system but rather by many, the exact number being a matter for empirical observation. The other dominant system emerging from the study of the offshore oil industry is that of engineering, and it is to this cognitive map that we turn next (Figure 6).⁴⁴

⁴³ For example, Carson *supra* n.18; C Wright, ‘Routine Deaths: Fatal Accidents in the Oil Industry’, 34 *Sociological Review* 265-289 [1986]

⁴⁴ Although a wide range of offshore engineering sources have been drawn on in the larger study, a convenient overview of its development can be found in R J Howe, ‘Evolution of Offshore Drilling and Production Technology’, *Offshore Technology Conference IV*, 593-603 [1986]

Figure 6



Despite the broad range of issues with which the regulators are concerned at this time regarding occupational health and safety, we find in the initial decade of the development of Britain's offshore oil a preoccupation in engineering with the design and construction of the installations to the practical exclusion of other matters. For engineering, the North Sea represents the largest challenge it has ever faced but it deals with this simply by scaling up techniques developed in less hostile environments. Thus, it assumes that structural overload is the principal problem (as it was in the hurricane-prone Gulf of Mexico) and sets about design and construction on the basis of expected maximum wave height and the period that installations will be operational. Engineering is seeking a well-engineered platform—one that is both economically viable and capable of operating in its required environment. The lack of data from the new province means, however, that there is a degree of uncertainty and as a consequence a programme of scientific conservatism is adopted. In this way, it is hoped that over-design and margins for error will accommodate the uncertainty.

Two issues are of particular importance here. First of all, the concentration on installation design and construction means that engineering cannot observe other health and safety issues, notably the more mundane occupational problems that produced such a toll of death and injury during this period. Safety is constructed purely in terms of the integrity of the installation. Secondly, the assumption on which this approach is based (the primacy of the problem of structural overload) means that engineering cannot observe other factors affecting structural integrity. And indeed, this systemic blindness was exposed on two occasions during the 1970s as first fatigue and then dynamic response emerged as more significant problems in the North Sea.

In short, the difference-minimising programme of engineering (scientific conservatism) is certainly directed to safety but it is a narrower construction of that concept than that of the legislators or the regulators. Furthermore, the definition of a well-engineered platform as one that is both economically viable and suited to its environment reveals the location of engineering at the junction of science and economics. Thus, for as long as cost is not a significant factor during the initial decade of North Sea development, engineering is free to employ a programme of scientific conservatism: as we have seen, industry management at this time is happier to incur costs than to lose time. But once cost pressures increase—not least as a result of the redesign and modification necessitated by the emergent problems of fatigue and dynamic response—the programme of conservatism, involving over-design, larger margins of error, redundancy, and so on, is no longer an option and a programme which could help to reduce both technical and economic risks is required. In this way, engineering switches from the deterministic techniques of conservatism to probabilistic techniques that could rationally accommodate more factors, economic as well as technical. When that happens, the steering is in relation to different calculations of overall risk—still quite different from what the legislators and regulators observe.

This is just a brief and simplified snapshot of a larger study but it serves to demonstrate how autopoiesis reveals the shortcomings of linear-causal

assumptions about the regulatory process. The legislators certainly understood their programme of legal instrumentalism in this way but in the eyes of the regulators these aims seemed hopelessly optimistic and different strategies had to be adopted. For the regulated area, regulation was at this early stage either constructed as at odds with the programme of minimising economic risk by a programme of rapid production in the case of industry management or barely constructed at all in the case of engineering.

And of course, freed from the constraints of a linear-causal approach to the regulatory process, interactions among regulated systems, for example, also become visible. Thus, the management programme of speed as the answer to all problems (which were always constructed as problems of economic risk) meant that yet more pressure was put on engineering. Furthermore, management constructed engineering solutions as final and fixed and was thus unable to observe the uncertainty which engineering was so concerned about. But of particular significance to regulators and legislators is the finding that throughout the cognitive maps of the regulated area there is simply no mention of *occupational* health and safety in any way equivalent to their concerns. What the autopoietic approach reveals is that it is no longer sufficient simply to call for tougher enforcement of detailed regulations. Implementationists would disagree, of course. If industry management is set on a course of rapid production to minimise economic risk and this is detrimental to the safety of workers then a tough stance is exactly what is needed. But it seems clear from the present approach that the codes and self-steering programmes of the industry—especially of management—are deep-seated, internally coherent and not something that can simply be pushed aside by interventionist regulation or prosecution. In other words, autopoiesis research produces something more than “the triviality that the legislator has to take into account certain facts about the addressees of his regulations”.⁴⁵ But what precisely does autopoiesis have to say about what regulators can do in the face of such closure and self-steering?

VI.

As we have said, regulatory success/failure depends on the second question mentioned above: How are the diverse processes of difference minimisation “structurally coupled”? To render this notion operational, we must observe concretely how the regulatory act is recontextualised within the different cascades of differences and is unfolded in their minimisation programmes. Regulatory success depends, then, on the ability of the regulatory system to recontextualise in its turn the recontextualisation in the regulated system. In other words, the regulators must direct their attention to the codes and programmes of the systems they seek to regulate. This observation will still, of course, be on the basis of their own distinctions and so the theory offers no hope of direct intervention. But as pessimistic as this sounds, it is important to realise that failing to problematise the situation appropriately is only likely to make matters even worse.

⁴⁵ H Rottluthner, ‘The Limits of Law: The Myth of a Regulatory Crisis’, 17 *International Journal of the Sociology of Law*, 273-285, 274 [1989]

It would seem, therefore, that during this initial period of the development of the occupational health and safety regime in the North Sea, while the different systems constructed events according to their own codes and steered according to their own programmes, there was precious little in the way of a *recontextualisation by the regulators of the reconstruction of the regulations by management and engineering*. While these systems operated to programmes of rapid production, in the case of management, and of scientific conservatism followed by tentative steps towards probabilistic techniques under cost pressures, in the case of engineering, the regulators maintained a straightforward attempt to prescribe everything that the industry should do. There was as a consequence no adaptation to the complexity of the regulated area and indeed no ability to adapt for as long as the programme remained one essentially of prescription—albeit that this was at the level of guidance notes. These systems, then, continued to evolve in rather path-dependant ways, steering according to their own difference-minimising programmes and largely indifferent to the self-steering of others. It comes as no surprise, then, to discover that in due course, following the world's worst offshore accident in 1988, a further Public Inquiry⁴⁶ found little to praise in the regime and plenty to condemn. This was regulatory failure on a grand scale. Significantly, however, the Inquiry did not call for more prescriptive regulation and tougher enforcement. Rather, recognising the futility of this programme—even when the prescription was in the form of guidance notes—the recommendation was for an entirely new approach.

Implemented in full, these recommendations have produced a regime which may be briefly summarised as follows: the existing prescriptive regulations have been replaced with “goal-setting” regulations, and the owners and operators of offshore installations are required to submit to the regulators “safety cases” without which an installation may not operate. Among other things, these safety cases should demonstrate (1) that a safety management system is in place which is adequate to ensure compliance with statutory health and safety requirements, and (2) that all hazards which have the potential to cause a major accident have been identified and their risks evaluated, and that measures have been taken to reduce the risk to a level that is as low as reasonably practicable. It is possible to see in these changes a recognition of some of the problems revealed by the cognitive mapping approach, such as the inability of the regulators to keep pace with developments and the need to encourage a less deterministic approach in engineering. The question is, however, whether this recognition translates into mechanisms which can foster structural coupling of the different systems, and encourage ongoing mutual recontextualisation of each system's reconstructions and self-steering. Four different scenarios of structural coupling can be distinguished.

Scenario One - Tangential Response

In many situations, despite sensitivity to regulatory impulses, the regulated area will not respond in a predictable way. As was seen in the case of

⁴⁶ Lord Cullen, *The Public Inquiry into the Piper Alpha Disaster* (Cm. 1310) (London, HMSO, 1990)

engineering, a variety of difference-minimising programmes are possible in response to the irritations of events. Had we continued the study for a longer period we would have seen a series of further changes of programme in this system as well as in the system of industry management where the programme of rapid production was in due course replaced by a programme of cost-reduction. And yet throughout all of this, a continuing problem of accidents and injuries was alleged.⁴⁷ The interesting point for observation in the context of autopoietic research is the reaction of the regulatory system when it confronts only such ongoing chaotic reactions on its internal screens. There are several ways in which this chaotic recontextualisation can itself be recontextualised by the regulators. If their internal difference minimisation allows for “symbolic politics”, then they may simply ignore the chaos and continue with their regulatory efforts. Alternatively, they may try to strengthen their cognitive and material resources: more money, more legislation and more social science analysis of causal processes. In the case of the offshore regulators, it appears that they ultimately concentrated on the prevention of catastrophic accidents and, in this way, the ongoing toll of more mundane accidents could fade from view. The cumulative catastrophic effects of such minor issues, however, were also obscured until the Piper Alpha disaster in 1988.

In such circumstances of ongoing chaotic reactions to regulatory impulses, however, one response seems to be especially promising for regulators. This is the situation when the regulators recontextualise the reactions as non-understandable, non-predictable, idiosyncratic “tangential responses” and give up any attempt to establish stable structures in the regulated system or systems. Instead, they change the strategy and adapt their stimuli to the tangential response character. They limit their efforts and try only punctual intervention, wait until any of the usual idiosyncratic reactions appear on their screens and then try a punctual stimulus of a different kind and continue in this way until the regulated systems have moved somewhat into their desired direction.

Although this approach respects the limits of autopoietic systems, it is clearly an extremely minimal response and one that carries with it a high degree of risk. While it may, therefore, be suited to some circumstances (such as the “control” of currency values), it is probably of limited value in the domain of occupational health and safety or other situations of technological complexity where stronger structural coupling is called for.

Scenario Two - Bifurcation and Attractors

There is perhaps a danger that the static format of a cognitive map may lead us to believe that we can at least predict how a given system will react to given inputs. But here the simplification that we must inevitably engage in is apt to mislead us, because in such chaotic situations the causal chains revealed by cognitive maps are not the totality of the picture. As a non-trivial machine, a regulated system will react with different outputs even if we know the deterministic relations within the field and keep the input constant. The chances for empirical research grow, however, if our field is, in spite of the

⁴⁷ Carson, supra n.18; Wright, supra n.43

chaotic macro-relations, self-organising in such a way that its macro-structures develop alongside bifurcations and attractors.

This seems to offer an opportunity for rereading in the regulatory system. Indeed, contrary to the expectations of the critics, it opens up the possibility of social control through law! Assume that recursive and self-organising systems can arrive at new attractor-states on the basis of external interference. Then, through general norms or specific legal acts the law can try to produce this external interference, irritating the system in such a way, and in spite of all chaos, that it moves from its attractor-state to one which is at least compatible with the aims of the legislator.⁴⁸ By analogy with “systems therapy” in psychology,⁴⁹ we can envisage the problems with such an attractor-strategy lying in the process of trial-and-error. Only in this way, it seems, can we probe for sensitive “intervention points” which will provoke the desired instability.

While again the trial-and-error nature of this approach raises doubts over its suitability or perhaps acceptability in high-risk settings, it may indeed have a resonance with aspects of the new offshore safety regime. There has been considerable interest in the industry in the apparent discovery that the requirement for systematic risk assessment actually results in lower costs. It is perhaps fortunate for the regulators that the procedures demanded by the new regime (representing an attractor state of reduced risk) have apparently coincided with those which the industry was already disposed to follow to the attractor state of reduced costs without any need for trial and error.⁵⁰ Generalisations here are dangerous but there may be other situations in which the sort of proceduralisation now operating in offshore health and safety will represent an advance over existing prescriptive approaches in areas of complexity and uncertainty.

Scenario Three - Synchronising Difference Reduction

The usual situation in a given social field is that several self-regulating processes are going on at the same time. When several differences are minimised simultaneously they will partially reinforce and partially sabotage each other. Our regulatory system will not be in a position to install additional difference minimisation programmes in the field—it only minimises its own differences. But the regulatory messages are re-read, re-constructed and recontextualised in the implementation field. Legal norms may make one of the internal programmes much more costly, or produce incentives for another one. Generally speaking, the interference will change the competitive situation between different minimisation programmes, increasing the attractiveness of one and decreasing the attractiveness of others.⁵¹ Thus, our interference may lead to systematic control results in the critical case when self-regulation

⁴⁸ Krohn and Küppers, *supra* n.13

⁴⁹ G Schiepek, ‘Selbstreferenz und Veretzung als Grundprinzipien zweier verschiedene System begriffe: Vorüberlegungen für eine sozialwissenschaftliche Synergetik’, 2 *System Familie*, 229-241 [1989]; see also H Willke, ‘Societal Guidance Through Law’ in G Teubner and A Febbrajo (eds), *State, Law and Economy as Autopoietic Systems: Regulation and Autonomy in a New Perspective* (Milan, Giuffrè, 1992)

⁵⁰ United Kingdom Offshore Operators’ Association, *CRINE: Cost Reduction Initiative in the New Era* (London, Institute of Petroleum on behalf of UKOOA, 1994)

⁵¹ Luhmann, *supra* n. 23

processes in different social fields tend to work in the same direction and thus reinforce each other. Some might call this coincidence effectiveness of law and attribute it to causal processes.

In the context of the new offshore health and safety regime, there is an interesting requirement which although applicable mainly to circumstances involving technology and risk is beginning to enjoy more widespread use.⁵² This is the demand that each safety case should include a detailed quantitative assessment of the risks affecting the installation and that the risk in each case must be reduced to a level which is as low as reasonably practicable. While the new regime cannot impose this mathematical difference minimisation programme on the regulated area to the exclusion of its own steering programmes, it can, nevertheless, encourage change in desired directions since it requires those preparing safety cases to be explicit about their assumptions and to make manifest the degree of uncertainty with which they are operating. In this rather indirect way, therefore, self-steering programmes that become difficult or even impossible to justify in terms of risk-minimisation are disadvantaged, while those which minimise risk and are open to learning are favoured.

Scenario Four - Binding Institutions

This is the case where wildly flowing meaning cascades are channelled parallel to each other and mutually interconnected in such a way that a regulator can produce systematic effects. Formal organisations, when they are multilingual, tend to work as binding institutions. They force the spontaneous uncontrolled flow of parallel differences for a certain amount of time together so that they have to be compatible with each other. Of special interest is intra-organisational juridification, i.e. when organisational processes are legally reconstructed in such a way that they themselves become sources of law. These processes have been analysed in detail elsewhere.⁵³ The result is a close structural coupling of law and other social processes within the organisation. And here we have a case where the self-regulation programmes of the law can be directly linked with the legal self-regulation within the organisation. In such situations we can expect a high degree of regulatory success.

If we again try to observe how the regulatory system recontextualises this situation, we will be surprised how little the system needs to know about intra-organisational dynamics. No legal economics and no organisational knowledge need to be produced. The question is only one of how legal norms are changing legal norms. The only caveat is a need to pay attention to the limits of structural coupling, for the links in the organisation between its internal law and other ongoing processes will break if the external law demands too much. And this would be the strategic task for empirical research: to find and even predict the rupture points in concrete structural couplings. While this

⁵² See Health and Safety Executive, *Use of Risk Assessment Within Government Departments* (London, HMSO, 1996)

⁵³ G Teubner, 'Autopoiesis and Steering: How Politics Profits from the Normative Surplus of Capital' in R. in t' Veld, L. Schaapp, C. Termeer and M. van Twist (eds) *Autopoiesis and Configuration Theory: New Approaches to Societal Steering* (Dordrecht, Kluwer, 1991)

remains a problem of trial and error, it can be seen that this approach to structural coupling has a much greater ability to deal with complex and high-risk situations. Furthermore, this approach indicates that the results of autopoiesis research imply recommendations also for regulated systems as well as for regulators.

This scenario is, therefore, of particular interest for our concrete example. Traditionally this has been a difficult area for trade unions to gain a foothold and there have been persistent allegations of victimisation of the workforce where there have been attempts to unionise. Equally, the industry is also notable for the large proportion of work that is contracted out, resulting in potentially complex employment situations on an individual installation.⁵⁴ There is, then, the potential for a number of different meaning systems to be involved in a relatively confined and extremely volatile environment, each operating to its own difference minimising programme. With factors such as these in mind, the new regime requires that each safety case detail the *safety management system* in place on the installation, which system must include provision for workforce involvement in both the development and the ongoing review of the safety case. Other regulations put in place just before the new regime became operative provide for workforce safety representatives and safety committees. Equally, the safety management system must detail the way in which it is interfaced with the safety management systems of contractors working on the installation. Here, then, is an example of a binding institution which goes beyond formal contact between regulator and regulated and sets goals for all those involved in the regulated area to set up their own auditable structure which binds together the disparate strands of which it is composed. While the regulatory system in this auditing role cannot be totally ignorant of what is involved, it no longer needs to seek to attain the impossible levels of knowledge required to prescribe in advance what must be done in every situation.

VII.

Autopoiesis and empiricism are not, then, as mutually exclusive as might have been suspected. In conjunction with techniques such as cognitive mapping, it is possible to obtain a distinctly different view of a research area, which is potentially more adequately complex and not reduced to the dominant rationality of the analysis employed. In other words, changing our map of the regulatory process to an autopoietic view allows the study area to be taken more seriously. While cognitive mapping has been proposed here, perhaps other (more sophisticated) empirical techniques may also be useful when they are deployed within the context of autopoiesis. Only practice will tell. But equally, experience may reveal that we will have to lower drastically our expectations as to the sophistication of available instruments and be content with narratives, with storytelling, with case studies, with more or less journalistic type of inquiries. But one thing is clear: autopoiesis theory essentially depends on systematic empirical observation.

⁵⁴ See Wright, *supra* n.43; C Woolfson, J Foster and M Beck, *Paying for the Piper: Capital and Labour in Britain's Offshore Oil Industry* (London, Mansell, 1996)

In conclusion, however, a somewhat more technical question regarding autopoietic empiricism remains to be answered: in what way does autopoiesis depend on empiricism if falsification is excluded and causal explanation and prediction marginalised? To understand the role of empirical observation in the autopoietic framework we need to enter somewhat into the nuances of the debates within the epistemology of social constructivism. The starting point is, contrary to many myths about constructivism, this: the environment exists! It is not an invention of discourse. The problem is only that the environment cannot be reached by the system's operations and, accordingly, the system is forced to invent internal constructs of the external world in order to cope with it. This is not only true for the cognitive acts of the stomach, of the brain and the mind, but also for communicative cognition and for empirical observations within the scientific discourse. They can never reach the outside world. They only produce artificial data for science as a social system to enable it to cope with the unknown outside world. And this is the point where the debate within the constructivist camp begins. It concerns the qualities of this "coping". Is it the mere survival of certain empirico-theoretical constructs? Is it the pragmatic use of scientific constructs for social action? Is it the resonance of the instruments of science with the music of the outside world?

Amid these turbulent waves of the epistemological debate, autopoiesis tries to steer a stable course avoiding the temptation of both sirens of constructivism: Mary Hesse's "soft programme" as well as the "strong programme" of the Edinburgh school of social constructivism. Bloor's "strong programme" excludes for complex theories the possibility of a world feedback so that any science, even that of law and society, is nothing but a "socially generated imaginative schema like other social myths".⁵⁵ Against this, autopoiesis stresses the relevance for theory of empirical observation due to its direct structural coupling to consciousness and its indirect structural coupling to the outside world. Empirical observations are artificial constructs within science but they have real contacts with the environment insofar as they make themselves sensitive and react to perturbations from the outside world by building up new structures. They are not themselves perceptions but communications about perceptions. To be sure, this does not allow for "correspondence" of scientific constructs with outside events, but it binds the system to its environment by self-determined constraints. Thus, autopoiesis remains a coherence theory of truth: we have to look for coherence between two types of internal constructs—theoretical concepts and empirical facts—that are constructed according to diverse procedures. But via perturbation one of these constructs—the artificial data—is closely coupled to psychic (i.e. individual mental) perception of the outside world. Thus, Edinburgh's "social idealism" with all its solipsist and monadologist threats is rejected. And perhaps it comes as a relief that on this basis we do not agree with Feyerabend's "anything goes" relativism.

So do we agree with Mary Hesse's soft programme of constructivism: "[w]e construct the natural world in our science, but s-t [space and time reality]

⁵⁵ D Bloor, *Knowledge and Social Imagery* (London, Routledge and Kegan, 1976); H Collins, *Changing Order: Replication and Induction in Scientific Practice* (Beverly Hills, Sage, 1985)

constrains these constructions by feedback"?⁵⁶ Our answer is a decisive yes and no. Yes, empirical research is world construction, not a reality test. Yes, empirical research constructs the environment in an internal model and simultaneously produces constraints for its constructive imagination by exposing it to the feedback of perturbations. But here the difference begins. No, the feedback does not come from the external world; it is purely internal. No, spatio-temporal reality itself does not produce any constraint. It is the cognising observer (psychic or communicative) who decides about which constraints to create and to which perturbations to expose the constructive imagination. Thus, feedback is not information from the external world, but rather is internally produced information stimulated by perturbations.

Thus, it is more than mere viability, the sheer survival of a construct that gives empirically supported theories their certainty of being in tune with the environment. It is the self-assertion of internal recursive operations that are able to develop stable eigenvalues. And they do this not only as a formal calculus, but also in close structural coupling with recursive operations of other cognitive processes and those exposing themselves to the perturbations of the outer world, which will always remain unknown to them. Thus, our highly speculative constructs do know that they are on the right track, but they do not know where they are.

Our constructs feel a resistance from the objects they produce. They expose their self-produced expectations at predefined points to outside perturbations. Everything is in the hands of the recursive operations themselves: the expectations, the conditions under which such expectations are fulfilled or disappointed, the consequences drawn from such an experience. Only the yes and the no makes for the crucial point of contact where they lose control, where they make themselves dependent upon their environment.

Theories do not die from a falsification via independent empirical facts. We called this the omnipotence fantasies of empirical researchers, which they tend to develop when they feel disturbed by speculative theories. The only thing that empiricism can do is to create counter-irritations and compel theory to create new routinisations that may keep itself in tune with other constructed worlds or drive itself into implausibility. This is what we would call a relationship of therapy—of course, not the usual interventionist therapies but a therapy rethought in the spirit of autopoiesis. Has Marxism, for example, died from its countless empirical refutations? For decades we have witnessed successful immunisation strategies by this Grand Theory by which it moved into admirably complex constructions. Marxism's disaster had its origins elsewhere, in its loss of resonance with other cultural, political and economic operations, especially with its own communicative political and social consequences which rendered it more and more difficult to reintegrate them into the theory framework. In many respects (for example, with respect to the analysis of social differentiation, the concept of systemic autonomy, the circularity of social self-production, the totalising tendencies of social systems and human alienation), theories of social self-organisation are the legitimate

⁵⁶ M A Arbib and M B Hesse, *The Construction of Reality* (Cambridge, Cambridge University Press, 1986) p3

heirs of Marxian theories. At the moment they seem to be in good resonance with other recursive processes in modern society. And only the future will reveal whether they survive their self-produced consequences. But, given their esoteric character, will they have any consequences?