

# A Theory of Historical Generativity under Constraints

## *Towards Generative Relational History*

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### **Abstract**

We can create only what the historical framework permits. The claim is widely granted and seldom mechanized. Materialist, hermeneutic, and structure–agency readings each specify what constrains action, and each leaves in the dark the process by which the constraint itself is revised. This paper proposes, in preliminary form, Generative Relational History (GRH), the historical extension of the generative relational framework, and takes constraint evolution for its object. Its central proposal is that historical constraint may be understood as a macroscopic phase of the relational field itself, so that action and constraint compose one field observed at two scales. Three consequences are suggested. Goals become a dynamical category admitting three roles: structural goals optimize within existing constraints, generative goals inject perturbation, and non-structural norms hold open degrees of freedom that no goal can express. Agents’ blindness to slow variables is argued to follow from scale separation, a structural condition of the mean field. And the departure of a system from a stable historical stage is given a proposed mechanism in which perturbation functions as trigger, decisive where prior accumulation has already carried the system near a stability boundary. The paper is offered as a mechanism theory: it specifies how constraint may be updated, and declines to predict which constraints will be. Formal resources are borrowed from two physical settings under an explicit division of labour. Background-independent approaches supply the constitution of a stage that has no prior existence; the self-transport term of fluid dynamics supplies the co-evolution of a stage with what moves upon it. Both are taken as vocabulary and existence heuristic, and the paper marks the point at which each borrowing stops.

**Keywords:** historical constraint; constraint evolution; generative relational being; goal ontology; slow variables; criticality; intermittent generativity; philosophy of history.

*A note on the standing of this paper.* This is the first statement of Generative Relational History, and it has the standing of a proposal. It asks one question, how historical constraint is generated, maintained, and updated, and admits material insofar as that material discharges some part of the question. Where it borrows from physics it borrows a vocabulary and a demonstration that certain structures are coherently thinkable; the claim that societies are fluids, or that history carries a metric, lies outside it. Several of its load-bearing claims could be false, and the sections that state them say so. Objection, correction, and counter-evidence are welcome at [huangwanhong@serendip.ngo](mailto:huangwanhong@serendip.ngo).

## 1 INTRODUCTION

We can create only what the historical framework permits. The claim is old, and in one form or another nearly every serious account of history has granted it. Human beings act within conditions they did not choose: what can be attempted, what can be organized, what can even be proposed as worth attempting, stands bounded in advance by a configuration that precedes the actors. The claim is also, in its ordinary form, nearly empty. It becomes substantive when one asks what the framework consists in, and it becomes difficult when one asks how the framework changes.

Three readings of the claim are standard, and each secures something the others leave aside. The materialist reading locates the constraint in the material conditions of production: what a society can create stands bounded by its productive forces and by the relations that organize them. The hermeneutic reading locates it in meaning: we act within a horizon of intelligibility we did not make, and what we can intend stands bounded by what our situation makes it possible to mean. The structure–agency reading holds that structure and action constitute one another, neither being prior. Each reading is a genuine achievement, and this paper takes all three as background. What they share, and what opens the space for the present argument, is that each specifies the constraint and leaves the *updating* of the constraint unmechanized. That constraints change is universally granted. How they change, by what process a configuration that bounds action comes to be a different configuration, is generally attributed to an accumulation whose discharge remains unexplained, or assigned to contingency, which names the gap while leaving it open.

This paper proposes, in preliminary form, that the question of constraint update is the proper object of a theory, and that the generative relational framework is positioned to supply one. The parent framework, generative relational being, holds that relation is prior to the entities it relates and that what exists is generated in and through relation; a governance extension, generative relational governance, treats how a generated relation is governed once it exists. What is proposed here is a third extension, *generative relational history* (GRH), which asks how relation generates the historical constraint under which further relation is generated. Where the parent framework treats relation as generating being, GRH treats relation as generating history: history taken as the constraint field that condenses out of relational generation and thereafter bounds it.

The object of the theory is narrower than its title suggests, and the narrowing is deliberate. GRH takes as its object *constraint evolution*, the process by which the bounding configuration is generated, maintained, and revised. Questions of periodization, of causation among events, and of the meaning of the historical process lie outside it. Most theories of history run from constraint to action, or from action to the historical record. Few ask why the constraint updates, and that question governs the organization of everything below.

**The questions.** The inquiry is governed by eight questions in two tiers. The first tier states what the historical phenomenon poses:

- Q1. The emergence of individual and collective goals, and the manner of their coupling.
- Q2. The constraint that history places upon goals, and the process by which goals in turn make historical constraint evolve.
- Q3. The role of goals in driving the evolution of individual and collective dynamics.
- Q4. The standing of what we decline to optimize. Following goals completely delivers utilitarianism, and normative practice declines to follow goals completely, structural ones especially. This tier asks how that refusal is to be understood, and how such non-structural commitments bear upon goals, dynamics, and constraint.

The second tier states what the framework must answer to be entitled to address the first:

- Q5. The framework's understanding of the dialectical movement of history and the individual.
- Q6. The ontology of that movement.
- Q7. Its formal modelling.
- Q8. Its bearing on practice: on ethics, on normative conduct, on governance.

These are kept deliberately coarse. This is a first investigation, and finer questions would foreclose the space before it has been surveyed; the specific problems arising under each are treated where they arise.

The two tiers compose one architecture. Q1 through Q3 form a loop: constraint bounds the goals that can be formed, goals shape the dynamics that ensue, and the dynamics revise the constraint. Taken alone the loop is a fixed point, a system that would settle and remain settled, since each stage reproduces the conditions of the next. Q4 states the condition under which the loop fails to close. This is why a question that wears the appearance of normative philosophy is placed among the questions of historical dynamics: what escapes expression as a goal is, on the account developed below, what keeps the loop open.

The architecture also serves a disciplinary function worth naming at the outset. The material below touches philosophy of history, the historical-materialist tradition, dynamical systems, background independence, normative theory, governance, and methodology, and a project touching so many literatures risks becoming a survey of all of them. The eight questions supply the containment. Material earns its place in what follows by discharging some part of a named question; where it would be merely interesting, it is omitted or deferred to the research programme in §8. Each substantive part below discharges one question from each tier.

**Premises taken from the parent framework.** Three commitments are inherited and used without re-derivation. The first is the primacy of relation: relations are the condition under which relata are individuated at all. The second is the pairing of generativity with relationality as distinct dimensions, since a configuration may be relationally rich while generatively closed, and the two require separate assessment. The third is a criterion, the *criterion of return*: a value or norm is generative with respect to a system when the system's own goals are unable to reach back and rewrite it, and has been captured once they can. These serve as premises here; the arguments for them belong to the parent framework.

**What this theory delivers.** The modelling commitments are worth stating before any apparatus appears, since several objections this paper would otherwise face are objections to claims it declines to make.

GRH is offered as a *mechanism theory*. It aims to specify how constraint update occurs: by what process, through what channels, under what conditions. Predicting which constraints a given society will come to have lies outside its scope, as does forecasting of any kind. It supplies no closed system of equations, and §5 argues that non-closure is generic to the class of systems at issue. It identifies no objective function that history maximizes, and §3 explains why introducing such a function would readmit teleology through a side door the framework is at some pains to close.

Formal resources are drawn from two physical settings under a division of labour that governs how the borrowings are to be read. Background-independent approaches to spacetime, general relativity and more sharply the group field theory and causal set programmes, are used for a *constitutional* question: whether a stage with no prior existence, generated together with what moves upon it, is a coherently thinkable structure. That question is answered once, in §3, and the borrowing stops there. The self-transport term of fluid dynamics is used for a distinct and *diachronic* question: the form taken by the mutual dragging of stage and performance, once their separation has been denied. The two address different questions and are under no obligation to converge. In neither case does the paper claim that society is the physical system in question. What is claimed is that certain structures, a background generated rather than presupposed, a field that transports itself, are coherent, have been rigorously developed elsewhere, and supply a vocabulary in which the social case can be stated without metaphor.

**The role of this paper.** This is the first proposal of GRH within the generative relational framework, and it carries the obligations of a first paper. It must state the questions the programme will pursue, commit to an ontology precise enough to be wrong, distinguish what has been established from what has merely been named, and leave a research programme that others can take up or refute. §8 accordingly forms a substantial part of the contribution: it sets out six research directions, a methodological position, the open problems visible from here, and the points of contact with contemporary work in the traditions surveyed in §2.

The remainder proceeds as follows. §2 surveys the existing frameworks and states what each achieves, organized throughout by its treatment of constraint update. §3 develops the ontology: the mutual determination of stage and performance, the spectrum of background independence, the commitment that constraint is a phase of the relational field, the limits of the programme, and the joint taxonomy of constraints and goals on which the later parts depend. §4 develops the epistemology, deriving agents' blindness to slow variables and giving the mechanism by which a stable historical stage is departed. §5 sets out the formal modelling: self-transport, fast-slow structure, criticality, cascade, intermittency, and the division of labour between the two available descriptions. §6 treats the normative consequences, including the standing of what resists optimization. §7 turns to governance and practice. §8 states the research programme.

## 2 RECOGNITION OF THE EXISTING FRAMEWORKS

The question of how historical constraint is updated has been approached by a considerable body of work, and this section states what that work has secured. The intent is recognition. A framework arriving late to a well-tilled field owes its predecessors an account of what they achieved, and the account given here is meant to be accurate rather than convenient: the traditions surveyed have solved problems this paper takes over without re-solving, and several of them have posed the question of constraint update with a clarity GRH inherits. Each framework is presented in the same order: its central claim, the specific achievement it records on the question of constraint update, and the difficulty that the subsequent literature has raised on that point. A caution about the third element is required. Where a difficulty has been conceded within a tradition, or is common ground across its critics and defenders, it is reported as such. Where it remains contested, the contest is reported with it, and the reader should take the attribution to be to the critic named rather than to a consensus. No claim is made that any of these frameworks has been refuted, and the difficulties are selected for their bearing on constraint update rather than for their weight in the literature as a whole.

### 2.1 *The Criterion of Selection*

A survey of everything written on historical change would occupy more space than the argument it supports, and this section is confined by a single criterion: each framework is examined for its treatment of constraint update. Frameworks are admitted when they say something determinate about how a bounding configuration comes to be a different bounding configuration, and the discussion of each is limited to what it says on that point. Much else of value in these traditions goes unmentioned, and the omissions carry no verdict.

Three dimensions organize the examination and recur throughout. The first is the *mode of existence* the framework assigns to constraint: whether constraint is a container within which

action occurs, a structure co-constituted with action, or something else. The second is the *source of motion* in the update: whether the drive toward change is located in accumulation, in contradiction, in agency, in contingency, or in an external parameter. The third is the *epistemic standing of the agent*: what the framework holds that historical actors can know about the constraints under which they act, and whether that knowledge is treated as attainable in principle. Table 1 summarizes the survey along these dimensions; the sections below supply the detail.

## 2.2 *Dialectical Materialism and Its Schools*

### 2.2.1 *The Two Levels in Marx*

Marx's texts operate at two levels, and their relation has occupied the tradition since. At the first stands the account of productive forces and productive relations. The 1859 Preface gives it canonically: men enter into relations of production appropriate to a given stage in the development of their material productive forces; the totality of these relations constitutes the economic structure of society; and at a certain stage the material productive forces come into conflict with the existing relations of production, which turn from forms of development of the forces into their fetters, whereupon an epoch of social revolution begins (Marx, 1859). At the second level stands the formulation of the *Eighteenth Brumaire*: men make their own history, and make it under circumstances existing already, given and transmitted from the past (Marx, 1852).

The achievement is twofold and considerable. The first level supplies a mechanism with definite content, and it remains the closest thing in the tradition to a theory of constraint update: it names a slow variable, identifies the condition under which the constraint becomes due for revision, and does so in terms that permit historical investigation. The second level states the general form of the problem this paper takes as its own, and states it with an economy never improved upon: action is conditioned by a configuration it did not choose, and alters that configuration nonetheless.

The limitation is the passage between the two levels. The first says that development in the forces eventually alters the relations; the second says that action under inherited circumstances alters them. Both assert that the constraint gives way. The process by which accumulated development converts into a changed configuration is described more often than specified: the language of fettering names the condition under which change becomes due, and leaves unstated what carries the system across. The point has been pressed from several directions. Analytical reconstruction found that the functional claim required an account of the feedback by which the forces select the relations (Cohen, 1978; Elster, 1985); the tradition's own political wing found the passage insufficient to guide action; and Althusser's intervention was motivated in part by the observation that the transition demands conditions the general formula does not supply (Althusser, 1965).

### 2.2.2 *The Necessitarian Reading*

The Second International inherited the first level and drew it tight. Kautsky's widely circulated commentary on the Erfurt Program presented the development of the productive forces as the motor of a determinate succession of social formations, with the arrival of socialism following from the maturation of capitalism's own conditions (Kautsky, 1892); Plekhanov's treatment of the role of the individual assigned to the great man the acceleration or retardation of an outcome fixed by the general course of development (Plekhanov, 1898). A qualification belongs here and is entered because the label is applied loosely in the secondary literature: Kautsky himself, in his exchange with Bax, explicitly denied that the materialist conception reduces thought to a reflex of economic conditions, and described it as a method for research into the driving forces of social development rather than a doctrine of determination (Kautsky, 1896). What follows concerns the reading that predominated in the period and its consequences for the theory of constraint update, and not the whole of any individual author's position.

The achievement is generally underrated in later criticism. The reading takes the question of mechanism seriously, and it answers with a slow variable whose accumulation is held to account for what appears at the surface as rupture. That structure, in which a slowly changing quantity governs the conditions under which fast events become consequential, is the structure GRH also adopts, and §4 states the debt.

Two limitations are widely accepted. The first is the evacuation of agency: where the succession is determined, the agent's contribution reduces to acceleration or delay, and the political question of what is to be done loses its object. This was the animating objection of the Western Marxist response, and it was pressed from within the tradition well before it was pressed from outside (Lukács, 1923; Gramsci, 1971). The second limitation is less often remarked and bears directly on the present argument: the slow variable is treated as exogenous and monotone. The forces develop; the development is not itself explained by the configuration it will overturn; and the arrow points one way. A framework in which the slow variable is generated by the very dynamics it later constrains cannot take this form, and §5 states the alternative.

### 2.2.3 *Western Marxism*

The Western Marxist tradition may be read, for present purposes, as three responses to the necessitarian reading's evacuation of the agent, each of which enriches the account of constraint in a distinct way.

**Lukács: reification and the standpoint of totality.** The central claim is that the commodity form generalizes into a form of objectivity under which social relations present themselves as relations between things, and that this reification is a constraint on what can be apprehended

rather than merely a distortion of what is believed. The constraint is transformed when a class comes to occupy the standpoint of totality from which the process appears as a process (Lukács, 1923).

The achievement for constraint theory is substantial and is retained here: constraint operates through the forms in which a situation can be apprehended at all, and the epistemic position of the agent is internal to the historical process rather than external commentary upon it. This is a direct ancestor of what §3 treats as the constraint on expressibility.

The limitation most often pressed attaches to the vehicle rather than to the insight. The identification of the proletariat as the identical subject-object of history has been widely judged to import a Hegelian structure that the analysis of reification does not require, and the objection has become close to obligatory in discussions of the work. Lukács advanced a version of it himself in the 1967 preface, describing the identical subject-object as a metaphysical construct (Lukács, 1967), though whether that preface states his original position accurately is itself disputed. The insight about apprehension stands independently of the vehicle, and it is the insight that is taken up here.

**Gramsci: hegemony and the war of position.** The central claim is that domination in developed civil societies operates through consent organized in a dense network of institutions, so that the constraint includes a settlement of common sense that must be contested on its own ground. The war of position names the corresponding form of struggle: protracted, distributed across the institutions of civil society, without a decisive moment (Gramsci, 1971).

The achievement is among the tradition's most valuable for the present question. It describes constraint update as gradual, distributed, and cumulative, and it identifies the medium in which the accumulation occurs. It also supplies the notion of an organic crisis, in which the ruling settlement loses its capacity to organize consent while no successor has yet formed, which is the tradition's most suggestive description of a system between configurations.

The accepted limitation concerns conversion. The war of position describes decades of accumulation and the crisis describes the interregnum, and the passage from the one to the other remains at the level of description. The concept has also been criticized for elasticity: hegemony has been applied to so wide a range of phenomena that its explanatory purchase in any given case requires separate argument, an objection registered from within the tradition as much as outside it (Anderson, 1976).

**Althusser: overdetermination and structural causality.** The central claim is that a social formation is a complex whole with a structure in dominance, that contradictions are multiple and unevenly developed, and that a revolutionary rupture requires their fusion in a conjuncture rather than the maturation of a single contradiction. Structural causality names the mode in which a structure is present only in its effects (Althusser, 1965; Althusser & Balibar, 1968).

The achievement is a lasting gain and is taken over here. The rejection of a single expressive contradiction removes the last remnant of a Hegelian teleology from the materialist account, and structural causality is a near neighbour of what §3 argues for as constraint's mode of existence: a constraint present in what it conditions rather than standing outside it.

The accepted limitations are two. The conjuncture in which fusion occurs is named with precision and specified only by the fusion that occurred, so that the concept identifies the moment after the fact. And the account was pressed hard on the question of agency: the treatment of the subject as an effect of interpellation, developed in the essay on ideological state apparatuses (Althusser, 1970), raised the question of how a structure is transformed by those it constitutes. Thompson's polemic put the objection at its sharpest (Thompson, 1978); the polemic was contested at the time and remains so, and what is reported here is the question it raised rather than the verdict it proposed.

#### 2.2.4 *Analytical Marxism*

The central claim of the analytical current is methodological: the tradition's theses should be stated with the clarity that permits assessment, and defended by the standards of argument prevailing elsewhere in philosophy and the social sciences. Cohen's reconstruction gave the primacy of the productive forces its most rigorous form, arguing that relations of production obtain because they are functionally suited to develop the forces (Cohen, 1978). Elster pressed the demand for microfoundations: a macro-level claim is admissible only when underwritten by an account of the individual actions that realize it (Elster, 1985).

The achievements are two, and this paper accepts both. Functional explanation was given a defensible form, in which the explanation is licensed by a consequence law rather than by the mere identification of a benefit. And the demand for microfoundations remains binding on any successor: a mechanism theory that cannot say what agents are doing when the constraint changes has not yet supplied a mechanism.

The debate that followed is instructive, and its standing should be stated accurately, since it remains open rather than settled. Elster's objection was that the conditions justifying functional explanation in evolutionary biology are absent in social theory, and that a functional explanation of a macro-phenomenon is admissible only where the mechanisms of individual behaviour producing the aggregate can be indicated at least schematically (Elster, 1985). Cohen replied that the absence of such an elaboration weakens a functional explanation without invalidating it, offering the pre-genetic Darwinian explanation of hollow bones as a case of an explanation that was good before its mechanism was known (Cohen, 1982). The exchange leaves a requirement rather than a refutation, and this paper faces the requirement on its own account: §4 states the corresponding risk for the mechanism proposed here, together with the constraint that keeps it from arising. The current has also been criticized for the cost of its own method, in that the reduction to individual action set aside the relational and proces-

sual character of the original theory, which is precisely what the present framework takes as primitive.

#### 2.2.5 *World-Systems Analysis*

The central claim is that the appropriate unit of analysis is the historical system rather than the national society, that the modern world-system is a capitalist world-economy with a core, semi-periphery, and periphery, and that this system has a developmental history with cycles and secular trends (Wallerstein, 1974; Arrighi, 1994).

The achievement, for the present question, is the treatment of scale and duration. Cycles of accumulation, hegemonic succession, and secular trends are described as processes whose periods exceed the horizon of any actor within them, and the analysis is conducted at a scale at which the constraint on any national society is visible as the product of a larger dynamic. This is a genuine theory of slow variables, and §5 takes up the same concern in a different vocabulary.

Two lines of criticism are worth reporting, the first as a position in a continuing debate and the second as a more general difficulty. Brenner argued that the account defines capitalism by exchange relations and the world division of labour rather than by production, and that this weakens its treatment of class dynamics (Brenner, 1977); the argument was contested by world-systems analysts and the debate has not closed. The second difficulty is less disputed: the number, dating, and boundaries of the long waves vary between analysts, and the mechanism generating the periodicity is specified less fully than the periodicity itself.

#### 2.2.6 *Post-Marxist Positions*

The central claim of the post-Marxist current, in Laclau and Mouffe's formulation, is that the social is discursively articulated, that no class occupies a privileged position given in advance by the relations of production, and that hegemonic settlements are contingent articulations of elements with no necessary belonging (Laclau & Mouffe, 1985).

The achievement is the opening of the field of the possible. The pretension to have identified a historical law is set aside, the identification of the revolutionary subject ceases to be given by structural position, and the analysis of how political identities are constructed rather than expressed is substantially advanced.

The accepted limitation is the one that bears on this paper most directly. Contingency, having replaced necessity, is asked to perform the work of a mechanism. That a settlement might have been otherwise leaves unstated why this settlement gave way at this moment while others endured. An objection along these lines was pressed immediately by Geras, who argued that the position dissolves the object of analysis along with its determinism (Geras, 1987), and was answered by Laclau and Mouffe in the same venue; the exchange is a dispute rather than a settled finding. What is reported here is the narrower point that survives it and does not

require Geras's framing: a vocabulary describing the form of a settlement with great subtlety is not thereby equipped to say when one settlement passes into another.

### 2.3 *Non-Marxist Frameworks*

#### 2.3.1 *Weber and the Switchmen*

The central claim relevant here is Weber's image: not ideas, but material and ideal interests directly govern conduct, and yet the world images created by ideas have very often, as switchmen, determined the tracks along which action has been pushed by the dynamic of interest (Weber, 1946). Ideas supply direction; interests supply motion.

The achievement is the distinction between two kinds of constraint that are often run together, and the demonstration that the ideational can be causally efficacious without constituting a separate motor. The analysis of the Protestant ethic supplied the worked case (Weber, 1905), and the account of rationalization supplied a slow variable of considerable power.

The accepted limitation is that the image describes the switch and leaves unspecified how a switch comes to be thrown. Weber's own methodological commitments, and his suspicion of theories of historical development, made this a deliberate abstention rather than an oversight; it nonetheless leaves the question of constraint update open.

#### 2.3.2 *The Annales and the Long Duration*

The central claim is a stratification of historical time: the almost motionless history of man in relation to his environment; the slowly rhythmic history of groups, economies, and states; and the history of events, which Braudel described as surface disturbances, crests of foam carried by the tides of history (Braudel, 1949, 1958).

The achievement is the clearest anticipation in historiography of what §5 treats as scale separation. Two consequences follow from taking it seriously, and both are retained here: historical constraint possesses more than one relaxation time, and an actor operating at the timescale of events has systematically restricted access to what operates below.

The accepted limitations are the coupling and the agent. The strata are distinguished with great power and their interaction is less specified: what conditions permit the deep stratum to become sensitive to the surface, and by what process the surface accumulates into the depth, are questions the framework poses more effectively than it answers. And the subordination of the event drew the standard objection that human agency is left with little to do, an objection sharpened by the tradition's own later turn toward the history of mentalities and microhistory.

#### 2.3.3 *Historical Institutionalism*

The central claims are that institutions constrain by making some paths more costly than others, that early choices are locked in through increasing returns, and that institutional devel-

opment is punctuated by critical junctures during which the range of viable options widens (North, 1990; Pierson, 2000; Capoccia & Kelemen, 2007). A second generation added an account of gradual transformation, identifying displacement, layering, drift, conversion, and exhaustion as modes by which institutions change without rupture (Streeck & Thelen, 2005; Mahoney & Thelen, 2010).

The achievement is the most operational vocabulary available for constraint update. Path dependence with increasing returns supplies a mechanism for why constraints persist; the typology of gradual change supplies mechanisms by which a configuration becomes a different configuration in the absence of a rupture; and the emphasis on ambiguity in rules, and on the gap between rule and enforcement, identifies where the leverage for endogenous change is located (Mahoney & Thelen, 2010).

The accepted limitation concerns the critical juncture, and it has been stated most clearly from within the tradition. Capoccia and Kelemen observe that despite the theoretical importance of critical junctures, analyses of path dependence have devoted little attention to them, and they undertake to reconstruct the concept, delimit its range, and supply methodological guidance for its use (Capoccia & Kelemen, 2007). The reconstruction advances the matter considerably and identifies the juncture by a heightened probability that agents' choices affect the outcome, relative to that probability before and after. The identification remains, in practice, retrospective: what marks a moment as a juncture is that the range of outcomes was wider then, which is established by the divergence that followed. What distinguishes a shock that opens the range from one the institution absorbs is where the present paper directs its contribution, and §4 states it.

#### *2.3.4 Critical Realism*

The central claims are a stratified ontology distinguishing the real, the actual, and the empirical; generative mechanisms possessed by structures and exercised whether or not their effects are actualized; emergence as the relation between strata; and, in Archer's development, the morphogenetic cycle in which structural conditioning precedes social interaction, which in turn produces structural elaboration or reproduction (Bhaskar, 1975, 1979; Archer, 1995).

The achievement is the ontological vocabulary closest to what this paper requires. Structures with generative powers are constraints present in their effects; emergence licenses talk of strata without reduction; and the morphogenetic cycle is a serious and explicitly temporal theory of how structures are reproduced and transformed. Archer's analytical dualism, which holds structure and agency apart in time so that their interplay can be examined, is a considered solution to the problem §3 meets and answers differently.

The accepted limitations are two, and the second is a difference rather than a defect. The first is the objection, pressed from a broadly Popperian direction, that the generative mechanisms of the deep stratum are posited by retroduction from actualized effects, which places

the ontology at some distance from independent test. The tradition's response, that retrodution supports depth explanation beyond correlation and that scientific ontology is generally so posited, is a serious one, and the discussion is open. The second is the point on which GRH departs. Analytical dualism preserves the distinctness of structure and agency as a condition of the analysis, and this paper takes constraint and action to be one field observed at two scales, which forecloses the dualism. The departure creates an obligation, and §5 discharges it: scale separation supplies the analytical leverage that temporal separation was introduced to provide, while treating the strata as one thing at different resolutions.

### 2.3.5 *Luhmann*

The central claims are that social systems are operationally closed and autopoietic, reproducing themselves through their own operations; that a system's environment perturbs rather than instructs it; that structural coupling names the arrangement by which a system is rendered sensitive to particular environments; and that evolution proceeds through variation, selection, and restabilization (Luhmann, 1984, 1997).

Two achievements bear on this paper. Constraint is treated as a restriction on what can register as information within a system, which is close to what §3 calls the constraint on expressibility. And self-reference is placed at the centre of the theory rather than treated as an anomaly to be managed, which is the correct response to a situation in which the observer is inside what is observed.

Two difficulties are regularly raised. Individuals belong to the environment of social systems rather than to the systems themselves, which secures the theory's consistency and leaves intentional action without an evident role in system transformation; Habermas pressed a version of this objection (Habermas, 1985), and Luhmann's defenders reply that the placement is a methodological decision rather than a denial of agency. And operational closure, having explained why systems are stable, makes the explanation of substantial structural change correspondingly demanding.

## 2.4 *The Common Position and the Point of Entry*

The achievements gathered above admit a summary along the three dimensions. On the mode of existence of constraint, the tradition has moved steadily away from the container: structural causality, generative powers, and structural coupling all treat constraint as exercised through its effects. On the source of motion, several determinate answers are on offer, of which the development of the forces and the accumulation of increasing returns are the most fully specified. On the epistemic standing of the agent, it is established that agents' access to their own conditions is systematically restricted, whether by reification, by ideology, by interpellation, or by the duration of the deep strata.

Table 1: The surveyed frameworks along the three dimensions of §2.1. The final column reports difficulties raised in the literature on the question of constraint update; where these remain contested, §2.2 and §2.3 report the contest.

| Framework                   | Mode of existence of constraint                    | Source of motion                                     | Difficulty raised on update                                                 |
|-----------------------------|----------------------------------------------------|------------------------------------------------------|-----------------------------------------------------------------------------|
| Marx                        | Economic structure conditioning the whole          | Development of forces against fettering relations    | Passage from fettering to transformation described, unspecified             |
| Second International        | Container fixed by material development            | Accumulation in an exogenous, monotone slow variable | Agency evacuated; slow variable unexplained by the system it governs        |
| Lukács                      | Form of objectivity governing apprehension         | Attainment of the standpoint of totality             | Vehicle requires an identical subject-object widely judged unsupportable    |
| Gramsci                     | Settlement of common sense in civil society        | Protracted contest across civil institutions         | Conversion of accumulation into crisis left at the level of description     |
| Althusser                   | Structure present only in its effects              | Fusion of multiple contradictions in a conjuncture   | Conjuncture specified by the fusion that occurred; agency constrained       |
| Analytical Marxism          | Relations selected by their functional fit         | Consequence law linking relations to development     | Discrimination among candidate arrangements requires a feedback account     |
| World-systems               | Position within a single historical system         | Cycles of accumulation and hegemonic succession      | Periodization contested; generating mechanism less specified than the cycle |
| Post-Marxism                | Hegemonic articulation without necessary belonging | Contingent rearticulation                            | Contingency asked to do the work of a mechanism                             |
| Weber                       | Tracks laid by world images                        | Interests, with ideas as switchmen                   | Throwing of the switch left unspecified by design                           |
| Annales                     | Stratified durations                               | Slow movement of the deep strata                     | Coupling between strata underspecified; event subordinated                  |
| Historical institutionalism | Differential cost of available paths               | Increasing returns; ambiguity in rules               | Juncture identified retrospectively by the divergence that followed         |
| Critical realism            | Generative powers of stratified structures         | Morphogenetic cycle of conditioning and elaboration  | Deep mechanisms posited by retroduction; dualism preserved by method        |

*continued on the following page*

Table 1 (continued)

| Framework | Mode of existence of constraint              | Source of motion                      | Difficulty raised on update                                           |
|-----------|----------------------------------------------|---------------------------------------|-----------------------------------------------------------------------|
| Luhmann   | Restriction on what registers as information | Variation, selection, restabilization | Agency placed in the environment; closure makes deep change demanding |

What the surveyed positions share is a common stopping point, and stating it precisely is the purpose of this section. In each case the fact of constraint update is registered, and the process of the update is described rather than mechanized. Accumulation is named without an account of why accumulation discharges at one moment while being absorbed at others, as in the fettering of the forces and in the approach to a critical juncture. Contingency is named as what makes the outcome open, which locates the gap and leaves it open. The conjuncture, the juncture, and the organic crisis are identified after the event by the divergence that followed them. Each of these occupies the position a mechanism would occupy.

Three requirements follow, and they organize the parts below. The first is an ontology of constraint precise enough that the question of how it changes has a determinate sense, which §3 supplies. The second is an account of what agents can and cannot know about the constraints under which they act, since a mechanism requiring agents to perceive what they are altering is a mechanism no historical actor could operate; §4 supplies it. The third is a dynamics in which accumulation and trigger are distinguished, so that the discharge of an accumulation has a stated condition, which §5 supplies. The remainder attempts these three in order.

### 3 ONTOLOGY

§2 closed with three requirements, of which the first was an ontology of constraint precise enough that the question of how constraint changes has a determinate sense. This section supplies it. The order of exposition runs from the problem that forces the question, through the existing answers, to the commitment this paper makes, the limits under which that commitment is made, and the categorial apparatus the later parts depend upon.

#### 3.1 *The Mutual Determination of Stage and Performance*

The problem may be stated with an image before it is stated with an argument. We act upon a stage: a configuration of possibilities, given in advance, within which what we do is done. The image is natural and nearly unavoidable, and it underwrites the container conception of constraint that §2 found the tradition steadily abandoning. What makes the image inadequate is a fact the tradition also registers: the performance reshapes the stage. What is done within

the configuration alters the configuration, and it does so without any actor stepping outside to make the alteration.

### *3.1.1 The Absence of an External Vantage*

Taken seriously, the mutual determination of stage and performance forecloses a position that most accounts quietly retain. If the stage is altered only from within, there is no vantage from which the alteration is surveyed. This has a consequence for theory and a consequence for the actor, and they should be kept apart. For theory, it means that any account positing an observer who tracks the configuration while standing outside it has helped itself to something the situation denies. For the actor, it means that the configuration under which one acts is altered by the acting, and that the alteration is not available to the actor as an object of view at the time it occurs. The second consequence is developed in §4; the first is what concerns the present section.

### *3.1.2 The Structure Underlying the Apparent Paradox*

The mutual determination has the appearance of a paradox: the stage conditions the performance, the performance conditions the stage, and neither is prior. The appearance dissolves once the two are recognized as operating at different timescales. The stage conditions the performance at the timescale of action; the performance conditions the stage at a timescale much longer, over which the effects of many performances accumulate. Circular determination between quantities at a single timescale would indeed be vicious. Determination running in both directions between a fast quantity and a slow one is an ordinary structure, thoroughly studied, and the subject of §5.

What remains after the paradox dissolves is a question about the kind of thing the stage is. If the stage is altered by what occurs upon it, and if no actor stands outside to alter it, then the stage and what occurs upon it cannot be two independent kinds of thing related externally. The remainder of this section states what they are instead.

## *3.2 The Historical Ontologies of the Existing Frameworks*

### *3.2.1 The Container Conception*

The container conception treats historical constraint as a bounded region within which action occurs: the conditions are given, action takes place inside them, and the conditions are altered by forces of a different order from the action they contain. The conception is rarely defended in this form and frequently presupposed. Its attraction is that it makes the constraint determinate and the analysis tractable, since a container can be described independently of what it contains. Its defect is the one just stated: it requires that the alteration of the container be effected by something other than what the container holds, and in the historical case there is nothing else.

### 3.2.2 *Co-Constitution and the Question It Leaves*

The structure–agency literature abandoned the container and put co-constitution in its place: structure is the medium and outcome of the practices it recursively organizes, in Giddens’s formulation (Giddens, 1984), and structure and agency are held apart analytically in Archer’s, precisely so that their mutual conditioning can be examined in sequence (Archer, 1995). Both are advances on the container, and both leave a question standing that §2 identified as the tradition’s common stopping point.

The question is what co-constitution consists in. To say that structure and action constitute one another names a relation and specifies neither its mechanism nor the mode of existence of the terms. Giddens’s duality of structure locates structure in memory traces and in its instantiation in practice, which secures the mutuality at the cost of leaving structure without a mode of existence between instantiations. Archer’s analytical dualism secures the mode of existence by holding the terms apart in time, at the cost of preserving as an ontological result what was introduced as a methodological device. The present paper takes a third route: the terms are not two kinds of thing requiring a relation, and what appears as two is one field observed at two resolutions.

### 3.2.3 *Stratified Ontologies*

Critical realism’s stratification of the real, the actual, and the empirical, together with emergence as the relation between strata, supplies the most developed alternative (Bhaskar, 1975, 1979). Its gain is that constraint acquires a mode of existence independent of its actualization: a structure possesses generative powers whether or not those powers are exercised. Its cost, for present purposes, is that the strata are distinguished as levels of reality, so that the relation between them requires an account of emergence that carries substantial metaphysical weight. What follows retains the insight that constraint exists in a manner distinct from its instances, and locates the distinction in scale rather than in level.

## 3.3 *The Spectrum of Background Independence*

Before the commitment of §3.4 can be stated without metaphor, one thing must be shown: that a structure of the required kind is coherently thinkable. The required kind is a background that is generated together with what it conditions, rather than presupposed by it. Physics supplies the demonstration, and the demonstration is all that is borrowed here. Whether societies resemble spacetimes is not at issue, and nothing below depends on their doing so.

### 3.3.1 *The Treatment of the Metric in General Relativity*

In Newtonian mechanics, space and time are the stage: fixed, given in advance, and unaffected by what occurs within them. General relativity removes the fixity. The metric that determines

spatiotemporal relations is itself a dynamical variable, determined by the field equations from the distribution of matter and energy, while that same metric determines how matter and energy move. Neither term is prior; the geometry is a solution rather than a setting.

This is the first and weakest sense of background independence, and it already suffices to establish the point at issue in §3.1. The mutual determination of a configuration and what occurs within it is the ordinary structure of a theory that has been in successful use for a century.

### 3.3.2 *The Residual Manifold in Canonical Approaches*

Canonical quantizations of gravity carry background independence further while retaining a residue. Geometric operators acquire discrete spectra, and the theory is formulated so as to respect diffeomorphism invariance, yet a differentiable manifold remains as the arena on which the fields are defined (Rovelli, 2004). The relevant point is that background independence admits degrees: a theory may dispense with a fixed metric while retaining a fixed manifold, and the question of how much background has been dispensed with is a substantive one.

### 3.3.3 *The Treatment of Spacetime in Group Field Theory and Causal Sets*

The strongest form dispenses with the manifold. In group field theory, the fundamental degrees of freedom are combinatorial and algebraic, defined on a group manifold with no space-time interpretation, and continuum spacetime with its geometry is expected to emerge as a collective phase of a large number of these degrees of freedom, by a process of the condensate type (Oriti, 2014, 2017). Causal set theory proceeds differently, taking a discrete partial order as fundamental and recovering continuum geometry as an approximation to it (Sorkin, 2003).

What these programmes establish, for the purposes of this paper, is a single point of principle: a background may be a phase of something more fundamental rather than a presupposition of it. The stage need not be a stage. It may be what a large number of relational degrees of freedom look like when they are in a particular collective state, and the question of what state they are in becomes a legitimate question with a determinate sense.

### 3.3.4 *The Extent of the Borrowing*

The borrowing stops here, and stating its limit is part of making it. Three things are taken. The first is the demonstration just given, that a generated background is a coherent construction rather than a figure of speech. The second is a vocabulary: phase, order parameter, condensate, collective state. The third is a warning, developed in §3.5, about what the social case lacks that these programmes possess.

Three things are not taken. No claim is made that social relations satisfy the equations of any of these theories, or any equations resembling them. No claim is made that the analogy

licenses transfer of results: nothing established about spacetime emergence is thereby established about historical constraint. And no numerical or structural correspondence is asserted between the two domains. The borrowing is an existence demonstration and a vocabulary, and the sections that follow use it as such.

### 3.4 *The Ontological Commitment*

#### 3.4.1 *The Statement of the Phase Claim*

The commitment may now be stated.

**Claim 1 (the phase claim).** *Historical constraint is a macroscopic phase of the relational field. It is what a large number of relations look like when they stand in a particular collective state, and its properties are the properties of that state. It occupies the position that a container is imagined to occupy, and it occupies that position as a description of the relations themselves at a scale at which individual relations go unresolved.*

Three terms in the claim require definition, and the definitions are given here rather than assumed.

The *relational field* is the totality of relations obtaining among the participants in a historical situation, taken together with the manner in which those relations condition one another. The parent framework's primacy of relation is doing work here: the field is not built from prior individuals who then enter relations, since what individuates a participant is its position in the field. The field is the primitive.

A *phase* is a collective state of a large number of components, characterized by properties that belong to the aggregate and are undefined for any component taken singly. The term is used in its technical sense, and the claim is not a metaphor. Two features of phases matter here. A phase possesses order parameters, quantities defined on the aggregate that specify which collective state obtains. And a phase can change: the same components, under altered conditions, can settle into a collective state with different macroscopic properties.

*Constraint* is what the relational field makes impossible, unsayable, or unrankable for a participant in it, in virtue of the collective state the field is in. The three modes are distinguished in §3.6. The essential point is that constraint describes the relations themselves, at a scale at which individual relations go unresolved.

#### 3.4.2 *The Standing of Stage and Actor under the Claim*

The phase claim dissolves the problem of §3.1 rather than solving it. If constraint is a macroscopic phase of the field and action is what occurs among the relations composing that field, then stage and actor are not two kinds of thing between which a relation must be found. They

are one field described at two resolutions: constraint is the field coarse-grained, action is the field resolved. The mutual determination that appeared paradoxical is the ordinary relation between a coarse description and a fine one in a system where the coarse quantities are functions of the fine and the fine evolve under conditions the coarse specify.

This has an immediate consequence for the analytical dualism of §2.3.4. Holding structure and agency apart in time is unavailable to a framework that denies they are distinct kinds, and the leverage that the temporal separation was introduced to provide must be recovered by other means. The means is scale separation, and §5 supplies it. The obligation is recorded here so that its discharge can be checked.

### *3.4.3 The Constraint Field*

The claim licenses a notation used throughout the rest of the paper. Let  $\Gamma$  denote the constraint field: the coarse-grained state of the relational field, the macroscopic phase whose properties constitute what is possible, sayable, and rankable for participants.  $\Gamma$  names the relational field under coarse-graining, and its dynamics, treated in §5, are the dynamics of the field at that resolution. Where the later sections write equations in  $\Gamma$ , the subject of those equations is what this section has defined.

### *3.4.4 What the Commitment Costs*

The phase claim is the paper's principal risk, and the risk should be stated rather than managed. If constraint is a phase in the technical sense, then order parameters exist for it, and the question of which phase a given historical situation occupies has a determinate answer. If no such order parameters exist, even in principle, then the term is doing metaphorical work and the sections that build on it lose their support. The paper does not exhibit an order parameter for any historical case, and §3.5 explains why it holds that none can be exhibited from within. That combination, a commitment to the existence of a quantity together with an argument that the quantity is not computable by participants, is a substantive position rather than an evasion, and §8 lists its identification as the first research direction.

## *3.5 The Limits of the Programme*

Three limits bound what the ontology just stated can be developed into, and they have distinct sources. Naming the sources is more useful than listing the limits, since it shows which are inherited and which belong to the social case alone.

### *3.5.1 The Constitutional Limit: No Independently Motivated Symmetry*

The first limit is inherited from the constitutional borrowing. In the physical programmes, the emergence of a background from more fundamental degrees of freedom is disciplined by

symmetry: the group structure is independently motivated, and it constrains which collective states are admissible. The social case has no such group. What plays the corresponding role, if anything does, would be a set of invariants preserved under rewriting of the relational grammar, and no such set has been identified. The consequence is that the emergence claimed in §3.4 is claimed structurally and cannot be derived. §8 states the identification of invariants as an open problem.

### 3.5.2 *The Dynamical Limit: No Closure*

The second limit is inherited from the dynamical borrowing of §5. Systems whose evolution is governed by nonlinear self-transport do not admit closed descriptions at the coarse-grained level: averaging the equations of motion produces terms involving higher-order correlations, and the hierarchy does not terminate. The social case inherits this, and §5.10 argues that it inherits it as a generic feature rather than as a special defect. The consequence is that no closed system of equations for  $\Gamma$  is available, and none is offered.

### 3.5.3 *The Limit Peculiar to the Social Case: Self-Reference*

The third limit belongs to the social case alone, and neither physical borrowing supplies a precedent. Participants in the relational field read the constraint under which they act, and their reading enters the field as a further relation. The metric, in the physical case, does not consult its own value. Moreover the reading is multivalued: two participants may read the same configuration differently, and both readings become part of what is to be described. This is Luhmann's point about self-reference (Luhmann, 1984), entered here as a limit rather than as a resource. The consequence is that the coarse-graining relating  $\Gamma$  to the underlying field is not a fixed map, since what participants take the constraint to be is among the things the constraint supervenes upon.

Taken together, the three limits state the difficulty of the social case with more precision than an undifferentiated list of caveats would allow: the social case carries the constitutional problem of a background with no prior existence, the dynamical problem of a system that transports itself, and a problem of self-reference that neither physical case faces.

### 3.5.4 *The Exclusion of an Action Principle*

One further exclusion follows from the limits and is stated separately because of what it protects. It would be natural, given the vocabulary borrowed in §3.3, to seek an action functional for the relational field, from whose stationarity the dynamics would follow. This paper declines to do so, and the reason is not technical difficulty. An action principle supplies a quantity that the system's trajectories extremize, and a historical theory equipped with such a quantity has committed itself to a magnitude that history maximizes. That is teleology in the form that

the framework is at pains to exclude: not the overt claim that history has a goal, but the formal apparatus from which such a claim can be recovered. §8 returns to the boundary against teleology; the exclusion is recorded here because it constrains what §5 may write down.

### 3.6 *The Joint Categorization of Constraints and Goals*

The apparatus of the remaining sections requires two categorizations, and they must be given together. A typology of constraints alone leaves unspecified how constraint enters the dynamics, since what converts a configuration into a course of action is the goals formed under it. A typology of goals alone leaves the distinction between kinds of goal without ontological grounding, since what distinguishes them is which constraints they operate upon. The two are given here, in the ontology, because goals determine how constraint enters dynamics and therefore belong to the ontology of the historical process rather than to its ethics.

#### 3.6.1 *Constraints Typed by Mode of Holding*

Constraints are distinguished by the manner in which they hold, rather than by the substrate in which they are realized. A typology by substrate, distinguishing material from institutional from symbolic constraints, would contradict the phase claim, which holds that all of these are states of one field. Three modes are distinguished.

*Constraints of possibility* determine what cannot be done. Material and technical limits are the clearest instances. This mode is the slowest to change and the most nearly exogenous to the dynamics it constrains.

*Constraints of expressibility* determine what cannot be said, and in particular what cannot be formulated as a goal. A course of action that cannot be articulated within the available vocabulary is unavailable in a manner different from physical impossibility, and the difference matters: the boundary of the expressible moves, and its movement is the layer at which this paper locates the main work of constraint update.

*Constraints of evaluability* determine what counts as better. They comprise the standards by which courses of action are ranked, and they constitute the evaluation functional under which optimization proceeds. This mode changes fastest of the three and is the one that goal ontologization, treated in §6, rewrites.

The three have different relaxation times and couple to different segments of the loop set out in §1. That they are three modes of one field, rather than three kinds of thing, is what the phase claim secures. Table 2 sets them out.

#### 3.6.2 *Goals Typed by Expressive Standing*

Goals are distinguished first by their standing with respect to expression.

| Mode           | What it holds                                                              | Relative relax-<br>ation time | Standing in this paper                                      |
|----------------|----------------------------------------------------------------------------|-------------------------------|-------------------------------------------------------------|
| Possibility    | What cannot be done: material and technical limits                         | Slowest                       | Largely exogenous to the dynamics it constrains             |
| Expressibility | What cannot be said, and in particular what cannot be formulated as a goal | Intermediate                  | The layer at which constraint update principally occurs     |
| Evaluability   | What counts as better: the standards by which courses of action are ranked | Fastest                       | The evaluation functional that goal ontologization rewrites |

Table 2: Constraints typed by mode of holding. The typology cuts by manner of holding rather than by substrate, since a typology by substrate would contradict the phase claim.

*Structural goals* are expressible, rankable, and optimizable. Wealth, output, power, survival, efficiency, profit, and their institutional proxies are instances. They enter the evaluation functional directly, and they constitute the domain in which economics, control theory, and utilitarian normative theory operate with full legitimacy. This paper disputes none of that legitimacy, and §6 disputes only the extension of the domain to the whole.

*Non-structural goals* are normatively effective and cancel themselves when stated as goals. The classical instance is the injunction to dwell in the low places that others disdain, of which it is characteristic that no end is served by the dwelling; pressed for a justification, one can say only that it is fitting. Trust, humility, generosity, and sincerity share the structure, and share a diagnostic feature: the more thoroughly they are optimized, the more thoroughly they vanish. Trusting in order to be trusted, humility performed in order to appear humble, and art made to raise a score are each self-defeating in a manner that has nothing to do with the sincerity of the agent. What is defeated is the thing itself, by the form of the pursuit.

*Generative goals* are directed without being terminal. Their logic is the making of possibility rather than the reaching of a state: exploration, play, wandering, encounter, venture, creation. They inject into the field configurations that no evaluation functional has ranked, and, under conditions specified in §4, such configurations can be amplified into changes of the constraint field itself.

A note on the name is required, since an earlier formulation called these stochastic goals. The name misdescribes them. What is unpredictable is the historical effect, and the goal itself may be perfectly definite: one may set out to explore the unknown with complete clarity about what one is doing. Randomness, moreover, implies structurelessness, and the claim here is that these goals are directed, differing from structural goals in lacking a terminal state rather than in lacking direction. Exploration has a form. The name *generative* is continuous with the

| Type of goal   | Expressive standing                                                                           | Dynamical role | Mode of constraint engaged                                          |
|----------------|-----------------------------------------------------------------------------------------------|----------------|---------------------------------------------------------------------|
| Structural     | Expressible, rankable, optimizable: wealth, output, power, survival, efficiency, profit       | Dissipation    | Evaluability: acts under a ranking and, in the limit, rewrites it   |
| Non-structural | Normatively effective and self-cancelling when stated: trust, humility, generosity, sincerity | Transport      | Expressibility: holds open what has yet to be formulated            |
| Generative     | Directed without being terminal: exploration, play, wandering, encounter, venture, creation   | Injection      | Below all three, since what is injected has yet to acquire standing |

Table 3: Goals typed by expressive standing and by dynamical role, with the mode of constraint each engages. The three are distinguished by dynamical role rather than by content.

parent framework and records what the category does.

### 3.6.3 Goals Typed by Dynamical Role

The second axis assigns each goal a role in the dynamics of the constraint field, and it is the axis on which the categorization does its work.

*Injection* generates new relational configurations, adding to the field what was not there. *Transport* carries configurations across scales without generating or fixing them. *Dissipation* fixes configurations into rules, removing them from the dynamics by making them settled.

The two axes cross, and the crossing yields the result this section is for. Structural goals act predominantly as dissipation: to optimize is to fix, and what is optimized ceases to vary. Generative goals act as injection, and the absence of a terminal state is precisely what makes them a source rather than a sink. Non-structural goals act as transport: they hold open the range across which configurations can move, generating none and fixing none. This last assignment is derived here from the categorization, and §6 takes it as established rather than assuming it. Table 3 gives the crossing together with the interlocking treated below.

### 3.6.4 The Interlocking of the Two Categorizations

The two typologies engage at determinate points. Structural goals operate upon constraints of evaluability, since to optimize is to act under a ranking and, in the limit, to rewrite the ranking. Non-structural goals bear upon constraints of expressibility, holding open what has not yet been formulated and cannot be formulated without being destroyed. Generative goals

operate below all three modes, since what they inject has not yet acquired the standing that would place it under any of them.

The interlocking is what supplies the ontological grounding required at the outset of §3.6. The distinction between kinds of goal is a distinction of dynamical role, and the roles are individuated by which mode of constraint each engages; content and the psychology of those who hold them leave the classification untouched. Goals, on this account, belong to the ontology of the historical process: they are the mechanism by which the coarse state of the field conditions the fine dynamics, and by which the fine dynamics alter the coarse state.

#### 3.6.5 *A Note on the Term Generative*

The framework is named for generativity and one category of goal is named generative, and the two uses must be distinguished. Framework-level generativity is a property of a system: the capacity to continue producing relations and constraints not derivable from the present configuration. Generative goals name the class of goals whose dynamical function is injection. The relation between them is that generative goals are one contributor to system-level generativity, and §6 argues that they are insufficient for it on their own, since injection without transport is damped before it propagates. Both terms are retained, and the level at which each is used is marked wherever ambiguity could arise.

### 4 EPISTEMOLOGY

The second requirement stated at the close of §2 was an account of what agents can and cannot know about the constraints under which they act. The requirement is not merely a matter of completeness. A mechanism of constraint update that requires agents to perceive the constraint they are altering is a mechanism no historical actor could operate, and the plausibility of the account given in §4.5 depends on the epistemology given first.

The tradition has an established position on this question, and §4.1 states it. The position taken here differs in its explanation rather than in its verdict: agents' access to their own conditions is restricted, and the restriction follows from the structure of scales rather than from a failure of the agents.

#### 4.1 *The Historical Epistemology of the Existing Frameworks*

##### 4.1.1 *Ideology and the Critique of Consciousness*

The materialist tradition's central epistemic thesis is that consciousness is conditioned by social position, and that the conditioning systematically distorts. In its early form the thesis concerns the inversion by which the products of human activity present themselves as independent powers; in Lukács it becomes the account of reification, under which the commodity form

generalizes into a form of objectivity that makes the process appear as a collection of things (Lukács, 1923); in Althusser it becomes interpellation, by which individuals are constituted as subjects who recognize themselves in the positions the structure assigns (Althusser, 1970).

The achievement is the recognition that epistemic access is internal to the historical process. What an agent can know about the conditions of action is itself conditioned, and the conditioning is structural rather than accidental. This paper retains that recognition without qualification.

The point of departure concerns the modality of the restriction. In each of these accounts the restriction carries a normative charge: it is a distortion, a false consciousness, an occlusion, and its removal is the goal of a critique. The restriction is, in principle, remediable, and the achievement of the standpoint from which the process appears as a process is the form the remedy takes. §4.2 argues that a substantial part of the restriction is remediable by no critique whatever, since it follows from scale rather than from position.

#### *4.1.2 Effective-Historical Consciousness*

The hermeneutic tradition arrives at a related restriction by a different route. Understanding occurs within a horizon that the understander did not construct, prejudices in the neutral sense are the condition of understanding rather than obstacles to it, and consciousness of being affected by history is at the same time an acknowledgement that the effects cannot be fully brought before consciousness (Gadamer, 1960).

The achievement here is the removal of the normative charge: the situatedness of the understander is a condition of understanding rather than a defect in it, and the demand for a view from nowhere is set aside as incoherent rather than as merely difficult. This paper follows the hermeneutic tradition on that point and departs on another. The hermeneutic restriction is a restriction on the understanding of meaning, and its source is finitude. The restriction argued for below is a restriction on the observability of a quantity, and its source is the relation between timescales. The two are compatible, and they are different.

#### *4.1.3 The Shared Presupposition*

Both traditions, for all their difference, presuppose that the epistemic difficulty is of a kind that better positioning would improve. Critique promises the standpoint of totality; hermeneutics promises a fusion of horizons that widens what can be understood. In each case the restriction is a function of where the agent stands, and movement is possible.

The following section argues that a component of the restriction is invariant under any movement available to a participant. It is a property of the observation relation itself, and it would persist for an agent free of ideology and possessed of every relevant fact about the present.

## 4.2 *The Structural Derivation of Blindness*

### 4.2.1 *The Mean-Field Position of the Participant*

Consider the epistemic position of a participant in the relational field as §3 defined it. The participant stands in a definite and small number of relations, and acts within them. What the participant encounters, in acting, is the local configuration: the specific relations obtaining here, and the aggregate effect of everything else, which arrives as a general condition rather than as a set of resolved relations.

This is the situation described in physics as a mean-field position. A component of a large system interacts with its immediate neighbours individually and with the remainder only through an averaged influence. The averaged influence is what the order parameter of the system is defined upon, and it is precisely what a component in this position cannot resolve. The component registers the mean field as a condition of its own dynamics; the value of the order parameter, which is a property of the aggregate, appears to it as the way things are.

The transfer of this description to the historical case requires the ontology of §3 and nothing further. Once constraint is a macroscopic phase of the relational field rather than an object external to it, the participant's relation to constraint is the relation of a component to the collective state of which it is part. The participant acts under the constraint and contributes to it, and encounters it as the general condition within which the local relations obtain.

### 4.2.2 *The Timescale of the Slow Variable*

A second consideration compounds the first. The macroscopic state of a large system relaxes slowly, and the relaxation time grows with the extent of the correlated region. Where a state is coherent across a large domain, the time required for that state to respond to a local disturbance is long compared with the time in which the disturbance occurs.

Applied to the historical case, this gives the reason why constraint is slow. Constraints of possibility, of expressibility, and of evaluability are states coherent across large populations, and their response times are correspondingly long. What follows is a relation between two timescales, and the relation is what matters: the interval over which a participant acts, deliberates, and observes is short compared with the interval over which the constraint responds. Within the shorter interval, the constraint presents as fixed.

### 4.2.3 *The Statement of the Result and Its Modality*

The two considerations together yield a result.

**Claim 2 (blindness to the slow variable).** *A participant in the relational field is unable to observe the state of the constraint field or its displacement, and the inability follows from the participant's position with respect to scale. The displacement of a slow variable is*

*unobservable on the timescale of the fast variables through which the participant acts, and the state of the aggregate is unresolvable from a position within it.*

Three qualifications determine what the claim does and does not assert.

The claim concerns observation from within by a participant, and leaves untouched the position of a later observer. Historians reconstruct constraint displacements routinely and correctly, and they do so from a position after the relaxation has completed. The claim is that the displacement is unavailable at the time of acting, and it is consistent with the displacement's being obvious afterward.

The claim concerns a quantity rather than a meaning, which distinguishes it from the hermeneutic restriction and makes it compatible with that restriction. An agent may understand the meaning of a situation very well and remain unable to observe the state of the aggregate of which the situation forms a part.

The claim is structural, which is what distinguishes it from the tradition's account of ideology. Ideology critique proposes that a restriction on consciousness may be lifted by attaining a different standpoint. The restriction described here persists for any participant, at any standpoint, however free of distortion, because the restriction attaches to the relation between the scale at which the participant acts and the scale at which the constraint is defined. A participant who knew every relevant fact about the present configuration would still stand at a definite place in a large system, and would still act on a timescale short compared with the response of the aggregate.

#### *4.3 The Transplanted Concepts and Their Content*

Three concepts have now been used, and each carries a definite technical content that should be stated so that the extent of the transfer can be assessed. These are concepts of statistical physics rather than of the constitutional programmes of §3.3, and their use here is independent of that borrowing.

An *order parameter* is a quantity defined on an aggregate that specifies which collective state the aggregate occupies, and which is undefined or uninformative for any component taken singly. Its transfer to the present setting identifies constraint with the order parameter of the relational field: what mode of constraint holds, and how strongly, is a specification of the collective state.

A *mean field* is the averaged influence of an aggregate upon one of its components, standing in for the resolved influence of every other component. Its transfer identifies the participant's epistemic position: what a participant encounters as the general condition of action is the mean field of the relational aggregate.

A *phase transition* is a change in the collective state of an aggregate, in which macroscopic properties change while the components remain what they were. Its transfer identifies con-

straint update: the participants and their capacities persist, and what they compose changes state.

The limits of the transfer are stated in §3.5 and hold here without modification. In particular, no order parameter is exhibited for any historical case, and §4.2 has just argued that none is available to a participant. What the transfer supplies is a specification of what would be required for the constraint field to have a determinate state, and an account of why that state is unavailable from within.

#### 4.4 *Three Consequences*

##### 4.4.1 *The Retrospective Availability of Constraint Displacement*

The first consequence follows immediately. Agents discover that the constraint has shifted after the shift has occurred, and the discovery takes the form of recognizing that what was formerly difficult has become ordinary, or that what was formerly sayable has ceased to be. The recognition is reliable and comes late by structural necessity rather than by inattention.

This has a corollary for the historiographical situation. The later observer's advantage over the participant is a matter of position with respect to the relaxation rather than a matter of superior insight, and the temptation to read the participants' failure to see what was happening as a failure of intelligence or nerve is, on this account, a misattribution.

##### 4.4.2 *The By-Product Principle*

The second consequence bears directly on the question of constraint update. A course of action undertaken to achieve a goal generates relations beyond those the goal specifies. The generation is unavoidable: to organize people, materials, and procedures toward an end is to bring into being a configuration of relations, and no goal specifies the configuration completely. The relations so generated are, by construction, undescribed by the goal that occasioned them.

**Claim 3 (the by-product principle).** *The realization of a goal generates relations the goal does not describe, and it is among these by-products, rather than among the described achievements, that displacements of the constraint field originate.*

The principle answers a question the tradition leaves in an awkward position. If constraint update proceeded through the achievement of goals, then the constraint would be revised in the direction the goals specified, and history would be the record of intentions realized at the level of the framework. The historical record supports no such reading. The by-product principle locates the update elsewhere: in what the pursuit of goals brought into being without describing.

The principle as stated is incomplete, and the incompleteness is worth marking before §4.5 supplies the remedy. By-products are generated continuously and in enormous number, and

almost all of them are absorbed without trace. A principle that identifies the site of constraint update leaves unanswered the question of which by-products, among the multitude, are the ones through which the update proceeds.

#### 4.4.3 *The Standing of the Remainder*

The third consequence identifies a category the normative part will require. §3.6 introduced constraints of expressibility and non-structural goals, and §4.2 has now supplied what those categories rest upon. There exists, in any historical configuration, a dimension of the relational field that participants cannot represent: unresolvable from within by the argument of §4.2, and unavailable to formulation as a goal by the argument of §3.6. Call this dimension the *remainder*.

The remainder is not mysterious, and the epistemology just given is what removes the mystery. It is the aggregate state of the field, together with those of its degrees of freedom that the prevailing evaluation functional does not rank. Its inaccessibility is a consequence of the participant's position rather than an obscurity in the thing. §6 argues that norms protect this dimension without representing it, and the argument requires exactly what has been established here: that the dimension is real, that it is consequential, and that it is unavailable to the participants whose norms protect it.

### 4.5 *The Departure from a Stable Historical Stage*

#### 4.5.1 *The Question*

A question stands behind much of §2 and is rarely posed directly. A social formation that optimizes within its constraints becomes better adapted to those constraints over time: the structural goals of §3.6 are pursued, the evaluation functional is served, and the configuration is progressively tuned. Such a system should settle. Why, then, does any historical formation leave its settled state? Why did feudal Europe give way, why has capitalism failed to arrive at a configuration and remain there, and why do revolutions occur at all?

The tradition supplies three answers, and §2 recorded them: the accumulation of contradiction, the development of the productive forces, and contingency. Each identifies a real feature of the situation, and each stops short of a mechanism in a way that can now be stated precisely.

Accumulation of contradiction says that tension builds, and leaves unstated why the tension discharges at one moment while being absorbed at others. Development of the forces identifies a slow variable, and treats it as exogenous to the configuration it will overturn and as monotone in its direction. Contingency correctly locates the trigger in something particular and unforeseen, and supplies no account of why this trigger propagated when a thousand comparable ones were damped.

#### 4.5.2 The Proposed Mechanism

The elements are now in place. The goal categorization of §3.6 supplies three dynamical roles; the epistemology of §4.2 supplies the participant's position; and the by-product principle supplies the site at which update originates.

**Claim 4 (the mechanism of departure).** *Generative goals inject into the relational field configurations that the prevailing evaluation functional does not rank. Non-structural norms maintain a range across which such configurations can propagate. Where the constraint field stands near a boundary of stability, a configuration so injected and so propagated can be amplified until the field passes into a different phase, and the system leaves the state it had occupied.*

The mechanism has three components, and the division of labour among them is what distinguishes it from the answers just reviewed. Injection supplies the material: configurations that were not there before and that the ranking does not capture. Transport supplies the propagation: without a range across which an injected configuration can move, injection is damped locally and has no consequence at scale. Amplification supplies the passage: the nonlinear character of the field's own dynamics, treated in §5, is what converts a small configuration into a change of phase.

#### 4.5.3 Trigger and Cause

A condition on the mechanism must be stated at once, since without it the mechanism claims far too much.

**Claim 5 (the criticality condition).** *A perturbation is amplified into a change of phase only where the constraint field already stands near a boundary of stability. Away from such a boundary, injected configurations are damped, and the formation is robust to perturbations of the same magnitude that would be decisive nearby.*

The condition has an immediate consequence for how historical causation is to be described. The perturbation is the *trigger* of a transition, and what determines whether a transition occurs is the state the system had already reached. Two sources of historical change are thereby distinguished, and they operate on different timescales and through different agents.

*Structural accumulation* is the slow displacement of the constraint field toward a boundary of stability. It proceeds through the ordinary operation of the formation, it is unobservable to participants by Claim 2, and by itself it produces no visible change.

*Generative triggering* is the injection of a configuration that, given the state accumulation has reached, is amplified. The trigger need not be large, and need not be distinguished in any

way from the many comparable events that were damped. What distinguishes it is the state of the field it entered.

History, on this account, is the joint product of the two, and neither necessity nor contingency describes it alone. The state reached by accumulation determines whether any trigger can succeed; the particular trigger determines the moment and the manner.

#### 4.5.4 *The Two Filters*

The mechanism selects twice, and the two selections should be kept distinct, since they answer different questions and each is insufficient alone.

The first filter determines *survival*. A configuration that the prevailing evaluation functional ranks is acted upon: it is optimized, institutionalized, and thereby fixed, which is to say removed from the dynamics. A configuration the functional does not rank is left alone, and its being left alone is what permits it to persist in an unfixed state. What has no goal-form escapes the machinery that would settle it.

The second filter determines *amplification*. Survival delivers a configuration that remains available; whether it propagates depends on the state of the field, by Claim 5. The same configuration, identical in content and equally unranked, is inert in a formation far from its stability boundary and decisive in one near it.

Stating both is what distinguishes the mechanism from a restatement of the phenomenon. The first filter explains why the configurations that matter are drawn from what the indices do not measure. The second explains why the overwhelming majority of such configurations nonetheless come to nothing.

#### 4.5.5 *The Three-Stage Reading of Quantitative and Qualitative Change*

The mechanism yields a reading of the relation between quantitative and qualitative change that answers a question the classical formulation leaves open: why quantitative change should produce a qualitative change at one point and fail to at every prior point.

In the first stage the formation occupies a stable state. Its recovery capacity is high, perturbations are absorbed, and the historical record shows continuity. In the second stage, long quantitative change displaces the constraint field toward a boundary. Recovery capacity declines while the macroscopic configuration continues to present as stable, and the decline is unobservable to participants. In the third stage, a perturbation of ordinary magnitude is amplified, the boundary is crossed, and a different phase is established.

Quantitative change acquires, on this reading, a specific referent. Its content is the displacement of the constraint field and the associated decline in recovery capacity, rather than an accumulation of more of something. And the final event is relieved of a burden it was never able to carry: the preparatory work belongs to the second stage, which may have occupied decades or centuries, and the trigger contributes the timing.

The reading is offered as an interpretation of a formulation that has been read in many ways, and its warrant is that it supplies the missing condition. It gives quantitative change a determinate dynamical content, and it states what must be true for the qualitative change to follow.

#### *4.5.6 The Consequence for the Position of the Participant*

Claim 2 and Claim 5 together produce a result sharper than either alone. The proximity of the constraint field to a boundary of stability is a property of the aggregate and of the slow variable, and it is therefore unobservable to participants for precisely the reasons given in §4.2. Participants are unable to determine whether they stand deep within a stable configuration or at the edge of a transition.

The consequence is that an identical action carries entirely different historical weight depending on a condition its author cannot assess. The same demonstration, the same publication, the same refusal is absorbed without trace in one decade and becomes the occasion of a transition in another, and the difference resides in the state of the field rather than in any property of the action.

This accounts for a pattern in the historical record that is otherwise puzzling. Events acquire their status as turning points retrospectively, and the participants' failure to recognize the significance of what they were doing is the normal case rather than the exceptional one. It also accounts for the peculiar temporal signature of major transitions, which appear impossible until shortly before they appear to have been inevitable. Both descriptions are correct, and they are descriptions of different stages of the same process viewed from a position that cannot distinguish them in advance.

#### *4.5.7 The Discriminating Power of the Mechanism*

The mechanism must be tested against the objection that defeated functional explanation in the exchange recorded in §2.2.5. If injection followed by amplification accounts for departure from any stable formation, then it accounts for every transition equally, discriminates among none, and earns nothing.

The criticality condition supplies the first part of the answer, since it entails that most injections produce nothing, and that the mechanism predicts stability at least as often as it predicts change. The two-filter structure supplies the second, since it entails that the configurations through which transitions proceed are drawn from a specifiable region: the part of the field the prevailing indices do not measure.

Together these yield expectations that can be disappointed. Transitions should be preceded by a decline in recovery capacity rather than by an increase in the magnitude of perturbations. They should originate in domains that the prevailing evaluation functional does not rank, rather than in the domains that the formation measures and manages most closely. And

formations whose institutionalization has consumed the range across which configurations propagate should exhibit greater stability together with a diminished capacity to generate new constraint, which is a conjunction that the account of §6 requires and that observation could contradict.

#### *4.5.8 The Standing of the Mechanism*

A boundary on the claim closes this section. That historical systems generally exhibit criticality in the sense the physical sciences give the term is unestablished, and this paper does not assert it. What is proposed is a mechanistic hypothesis: that major updates of historical constraint are more likely where the constraint field stands near a boundary of stability than where it stands far from one, and that the mechanism of Claims 3 through 5 describes how such updates proceed when they proceed at all.

The hypothesis is consistent with the standing declared in §1. GRH specifies a process and declines to predict outcomes, and the criticality condition is a statement about the conditions under which a process operates rather than a law governing the succession of historical formations. §5 gives the mechanism its formal setting and states, more precisely than has been possible here, what would have to hold for the hypothesis to be true.

## 5 MULTISCALE HISTORICAL DYNAMICS

The third requirement stated at the close of §2 was a dynamics in which accumulation and trigger are distinguished, so that the discharge of an accumulation has a stated condition. §4 gave the mechanism in words. This section gives it a form.

Two obligations from earlier sections are also discharged here. §3.4.2 recorded that a framework denying the distinctness of structure and agency owes a replacement for the analytical leverage that holding them apart in time was introduced to provide; §5.3 supplies it. §3.5.2 recorded that the coarse-grained description admits no closure; §5.10 states what follows.

### *5.1 The Object and the Ambition of the Modelling*

#### *5.1.1 A Mechanism Theory*

What follows specifies a class of structures and the behaviour available to systems having that structure. It does not specify a system, and it fits no parameters. The distinction matters for how the equations below are to be read: they state the form of a dynamics, and the claim attaching to them is that historical constraint evolves in a manner having this form, and that a good deal follows from the form alone.

### 5.1.2 The Range of the Borrowing

The borrowing from fluid dynamics is confined to structure. Three features are taken: a non-linear term by which a field transports itself, a transfer of activity across scales with a range in which transfer occurs without generation or removal, and a concentration of that removal into sparse and intermittent structures. What is left behind is everything that makes the equations of fluid motion the equations of a fluid: conservation of mass and momentum, an equation of state, the constitutive relation for the stress, and the dimensional analysis that gives the theory its predictive power.

The distinction may be put as a rule for reading the sections below. Where a structural feature of the equations is used, the argument stands or falls on whether social systems possess that feature. Where a quantitative result of fluid mechanics might be invoked, it is not invoked, and §5.7 states the one case in which the temptation is strongest and the refusal most necessary.

### 5.1.3 Three Grades of Formal Commitment

Formal statements in this section carry one of three grades, and each is marked where it occurs.

A statement is *schematic* when it exhibits the form of a relation without licensing calculation: the equation displays which terms are present and how they enter, and no solution is claimed. A statement is *structural* when it asserts that a system possesses a property defined for a class of dynamical systems, such as multiple attractors or a spectral gap. A statement is *analogical* when it transfers a construct from the physical case whose social counterpart has yet to be constructed. Schematic and structural statements carry the argument. Analogical statements illustrate, and §5.7 is the only extended instance.

## 5.2 Nonlinear Self-Transport

### 5.2.1 The Structure of the Self-Transport Term

In the equations of fluid motion the acceleration of a fluid parcel includes a term in which the velocity field transports itself. Written schematically, the evolution of the velocity  $\mathbf{v}$  contains

$$\partial_t \mathbf{v} + (\mathbf{v} \cdot \nabla) \mathbf{v} = \dots \quad (1)$$

where the omitted terms carry pressure, viscosity, and any external forcing. The second term on the left is the one of interest. It is quadratic in the field, and it says that what carries the field from place to place is the field itself. No external agent moves the fluid; the motion redistributes itself.

Two consequences of the term are relevant here. It is the source of the nonlinearity from which the characteristic behaviour of these systems follows, including sensitivity to small disturbances under some conditions and complete insensitivity under others. And it makes the

system's evolution unavailable to decomposition into a background plus a disturbance upon it, since the disturbance participates in its own transport.

### 5.2.2 *The Self-Transport of the Constraint Field*

The social counterpart is written schematically:

$$\partial_t \Gamma + (\Gamma \cdot \nabla) \Gamma = \dots \quad (2)$$

with  $\Gamma$  the constraint field defined in §3.4.3. The statement is schematic in the sense of §5.1.3: it exhibits a form, and no solution is claimed for it. What the form asserts is that the configuration under which relations are formed is carried by the relations it configures, and that the carrying is quadratic in the field rather than linear in some external drive.

The reading of the omitted terms follows the categorization of §3.6. Injection enters as a source, supplied by generative goals. Dissipation enters as a sink, supplied by the institutionalization in which structural goals issue. The transport is the term written, and non-structural norms bear upon the range across which it operates, in a manner §5.5 makes precise.

### 5.2.3 *The Displacement of the Control Form*

The form of equation (2) may be contrasted with the form standard in control theory, in which a state  $x$  evolves under

$$\dot{x} = F(x, u) \quad (3)$$

with  $u$  a control input. The two forms differ in what they place outside the system. The control form requires a  $u$  that is set rather than evolved, and therefore a controller occupying a position outside the state whose evolution is described. Applied to historical constraint, the control form would require an agent who alters the configuration while standing outside it, which §3.1.1 argued to be unavailable.

The self-transport form dispenses with the requirement. Every term is a function of the field, the sources and sinks included, since injection and dissipation are supplied by goals that are themselves configurations within the field. This is a commitment with consequences beyond the present paper, and it is stated as such: a framework built on relational primacy has no room for a controller, and the analytical habit of asking what the lever is, and who holds it, has no purchase on a system that transports itself. What replaces the question is treated in §7.

### 5.3 Fast and Slow Structure

#### 5.3.1 The Separation of Variables

The loop of §1 may be written in the form standard for systems with two timescales:

$$\dot{x} = f(x, y) \tag{4}$$

$$\varepsilon \dot{y} = g(x, y), \quad 0 < \varepsilon \ll 1 \tag{5}$$

in which  $x$  collects the fast variables and  $y$  the slow. The statement is structural: it asserts that historical systems, over the ranges in which the assertion holds, possess two well-separated timescales.

The assignment of variables follows the ontology. Fast variables comprise individual action, daily interaction, short-horizon goals and the structural goals prominent among them, transactions, and the movement of opinion: quantities that change on the timescale at which participants act. Slow variables comprise institutions, culture, structures of trust, the boundary of the expressible, and the constraint field itself: quantities whose relaxation times exceed the horizon of the participants, for the reason given in §4.2.2. What occurs daily is change in  $x$ . Change in  $y$  requires the accumulated effect of many such changes.

#### 5.3.2 Singular Perturbation and the Slow Manifold

Systems of this form have been studied under the theory of singular perturbations, and the results relevant here concern the behaviour in the limit of small  $\varepsilon$  (Fenichel, 1979; Jones, 1995; Kuehn, 2015). Setting  $\varepsilon$  to zero yields an algebraic constraint  $g(x, y) = 0$ , whose solution set is the critical manifold; for small nonzero  $\varepsilon$  and under a normal hyperbolicity condition, a nearby invariant slow manifold exists, and trajectories are rapidly attracted to it and thereafter move along it slowly.

The result licenses a description in which the fast variables are enslaved to the slow: given the slow state, the fast dynamics settle quickly into a configuration determined by it, and the interesting motion is the slow drift of that configuration. This is the formal content of the observation that a stable historical period exhibits a great deal of activity and very little change.

#### 5.3.3 The Description Available Far from Criticality

The reduction supplies what a stable era looks like from within. The fast variables move continuously, the slow manifold determines where they settle, and disturbances to the fast variables decay at a rate set by the attraction to the manifold. An observer at the timescale of the fast variables sees activity that leaves the configuration unaltered, and the observation is correct rather than illusory: over the observation window the configuration is, to good approximation, fixed.

Normal hyperbolicity is a condition rather than a guarantee, and the conditions under which it fails are the subject of §5.4.

#### *5.3.4 The Order of Priority Between the Two Forms*

The two forms so far written stand in a definite relation, and stating it prevents a misreading. Equation (2) is the general form, and the fast–slow system is a reduced description available under a condition. The condition is the separation of timescales, and where it holds, the field admits decomposition into a slowly drifting component and a rapidly equilibrating one.

The order matters because the fast–slow form reintroduces, in appearance, what §5.2.3 expelled: a state vector evolving under a given vector field, with the field’s dependence on the state suppressed. The appearance is a consequence of the reduction. The vector fields  $f$  and  $g$  are themselves functionals of the field, and their apparent fixity is an artefact of describing the system over an interval in which the slow state changes little. Self-transport is the ontology; fast–slow structure is a regime-specific approximation to it.

#### *5.3.5 The Determination of an Event’s Significance*

A consequence follows immediately and states, in dynamical terms, the thesis with which the paper began. Consider an identical disturbance to the fast variables, applied at two moments. In the first, the system sits well inside the domain of attraction of the slow manifold, and the disturbance decays. In the second, the slow variable has drifted to a position at which attraction has weakened, and the same disturbance carries the system elsewhere. The disturbances are identical; the outcomes differ; and what differs is the slow state.

The significance of an event is therefore a property of the configuration in which it occurs rather than a property of the event. This is the formal counterpart of the observation in §4.5.6 that key events acquire their standing retrospectively.

### *5.4 Criticality and the Boundary of Stability*

#### *5.4.1 Recovery Capacity and Susceptibility*

Two quantities characterize a system’s response to disturbance. Recovery capacity measures the disturbance a system absorbs while returning to its prior configuration. Susceptibility measures the response of the system’s state to a small change in conditions. The two vary inversely, and both are properties of the slow state rather than of the disturbance.

Far from a boundary of stability, recovery capacity is high and susceptibility low: disturbances are absorbed, and a system may absorb them for a very long time. As the slow state approaches a boundary, recovery capacity declines and susceptibility grows, and disturbances of unchanged magnitude produce responses of growing magnitude. At the boundary, sus-

ceptibility diverges in the idealized case, and arbitrarily small disturbances suffice to carry the system across.

#### *5.4.2 The Derivation of Criticality from Fast and Slow Structure*

The criticality condition of §4.5.3 requires no separate postulate. It follows from the structure already written. The slow variable drifts; the drift carries the system toward a configuration at which normal hyperbolicity fails; at such a configuration the fast dynamics cease to be enslaved, and a disturbance that would elsewhere decay instead grows.

This is the section's most useful result for the argument as a whole. The mechanism of §4 joins accumulation to trigger by an assertion; the fast-slow structure derives the joining. Accumulation is the drift of the slow variable, the trigger is a disturbance to the fast variables, and the condition under which the trigger is consequential is the condition under which the reduction of §5.3.2 fails.

#### *5.4.3 The Closing of the Spectral Gap*

The failure has a characterization worth stating separately, since it governs §5.6. The reduction of §5.3.2 requires a gap between the rate at which fast variables relax and the rate at which slow variables drift. Approach to a boundary of stability narrows the gap: the relaxation of the fast variables slows as attraction weakens, and at the boundary the timescales become comparable. The separation on which the two-timescale description rests thereby fails precisely where the interesting transitions occur.

#### *5.4.4 The Refusal to Construct a Control Parameter*

In the physical cases, the approach to a boundary is parameterized: a quantity is identified whose variation carries the system toward the transition, and the distance to the boundary is computed from it. This paper constructs no such quantity for the historical case, and the refusal is a position rather than an omission.

Two reasons support it. The first is §3.5.1: the identification of a control parameter requires an independently motivated structure on the space of configurations, and none is available. The second is §4.2: were a control parameter constructible from quantities available to participants, the distance to a boundary would be measurable from within, and the epistemic result of §4 would be false. The refusal is therefore required by the rest of the account, and §8 states the identification of such a quantity, should one exist, as an open problem whose resolution would revise §4.2 rather than merely supplement it.

#### 5.4.5 *Critical Slowing and the Question of Observability*

One qualification is required, and it bears on the strength of the epistemic claim. Systems approaching a boundary of stability exhibit critical slowing: recovery from small disturbances takes longer, and the resulting changes in variance and autocorrelation have been proposed as generic early warning signals (Scheffer et al., 2009). The signal has the useful property of requiring no knowledge of the control parameter, since it is read from the response to disturbance rather than from the position in configuration space.

Whether the corresponding measurement can be made in historical systems is an open question, and §8 lists it. The qualification is entered here because it identifies the point at which the epistemic result of §4.2 could be weakened: that result concerns the unavailability of the slow variable itself, and it leaves open whether some functional of the fast variables carries information about the slow state. Should such a functional prove measurable, the blindness would admit degrees, and §4.2.3 would require the corresponding amendment.

### 5.5 *Cascade and the Coupling of Scales*

#### 5.5.1 *The Correction of the Two-Timescale Picture*

The fast–slow description partitions activity into two bands. The turbulent case suggests a different picture, in which activity is distributed across a continuum of scales and the transfer between them is the object of interest. The two pictures are reconciled in §5.6; the present section states the second.

#### 5.5.2 *The Inertial Range*

In a turbulent flow, energy enters at large scales, leaves at small ones, and passes between them across a range in which it is neither supplied nor removed. This intermediate band is the inertial range, and its defining property is that activity within it is transferred rather than generated or dissipated (Frisch, 1995).

The social reading follows the categorization of §3.6.3. Injection occurs where generative goals produce configurations that no ranking has evaluated. Dissipation occurs where institutionalization fixes configurations into rules and removes them from the dynamics. Between them lies a range across which configurations are carried without being either produced or fixed, and the function assigned to non-structural norms in §3.6.3 is the maintenance of this range. The claim of §6, that what resists optimization protects the system’s capacity for constraint update, is in these terms the claim that dissipation consuming the inertial range severs the transfer on which update depends.

### 5.5.3 *Transfer Toward Larger Scales*

Transfer toward smaller scales is the ordinary case in three dimensions. Two-dimensional flows exhibit the opposite: energy is transferred toward larger scales, accumulating at scales greater than those at which it entered (Kraichnan, 1967; Boffetta & Ecke, 2012). The inverse cascade supplies the image required by the argument of §4: local activity, individually inconsequential, accumulating into a change at a scale far above the scale of its production.

### 5.5.4 *The Question of an Inverse Cascade in Social Systems*

Whether social systems exhibit a transfer of this kind is a substantive question and is left open. What would be required is evidence that activity at the scale of individual relations accumulates preferentially toward larger scales rather than being dissipated at the scale of its production, and that the accumulation exhibits the statistical regularity that would distinguish transfer from coincidence. The question is stated as a research direction in §8, and the argument of this paper is constructed so as to require the possibility of upward accumulation rather than the existence of a cascade in the technical sense.

## 5.6 *The Division of Labour Between the Two Descriptions*

### 5.6.1 *A Presupposed Gap and a Denied One*

The two descriptions stand in apparent conflict. The fast–slow reduction requires a gap between timescales, and its results follow from the gap. The cascade picture describes a continuum with no gap, and its results follow from the absence of one. A framework using both owes an account of when each applies.

### 5.6.2 *The Applicability of Each Description*

The account follows from §5.4.3. Far from a boundary of stability, the gap exists: fast variables relax quickly, the slow manifold is normally hyperbolic, and the two-timescale description is accurate. This is the regime of the stable historical era, and the epistemic results of §4 are results about this regime. As the slow state approaches a boundary, the gap narrows; at the boundary the timescales merge, the reduction fails, and the description in which activity is coupled across a continuum of scales becomes the appropriate one. This is the regime of transition.

The conflict is thereby resolved into a partition. The fast–slow description governs the long intervals in which little changes; the cascade description governs the intervals in which the system reorganizes. Neither is general, and the transition between regimes is the closing of the gap.

### 5.6.3 *The Index That Selects Between the Descriptions*

The partition is indexed by a single quantity, the distance of the slow state from a boundary of stability, and the account inherits the standing of that quantity. §5.4.4 declined to construct it, and the consequence is that the index is well defined and unavailable for computation from within. This is the same combination noted at §3.4.4, and the same qualification applies: a commitment to the existence of a quantity, together with an argument that participants cannot compute it, is a substantive position whose vindication would require the work listed in §8.

## 5.7 *The Balance of Injection and Dissipation*

### 5.7.1 *The Social Reading of the Source Term*

Injection is the production of relational configurations that no ranking has evaluated. Its sources are the generative goals of §3.6.2, and its rate is a property of a society's arrangements: the room available for exploration, the tolerance of activity without a stated end, and the extent to which such activity escapes evaluation.

### 5.7.2 *The Social Reading of the Sink Term*

Dissipation is the fixing of configurations into rules. Institutionalization is its principal form, and the mechanism is the one treated in §6: a configuration that becomes a rule ceases to vary, and a variable that ceases to vary leaves the dynamics.

### 5.7.3 *The Standing of the Dimensionless Ratio*

In fluid mechanics the ratio of the nonlinear transport to the dissipative term is the Reynolds number, and its value determines the character of the flow. The temptation to construct a social counterpart is considerable, and this paper declines it.

The refusal is stated in the strong form. No social Reynolds number is proposed here, and the balance of injection against dissipation is offered as a qualitative consideration: a society in which fixing outpaces production of the unevaluated will exhibit a narrowing inertial range, and one in which production outpaces fixing will exhibit a widening one. This is the whole of the claim, and it is an analogical statement in the sense of §5.1.3.

### 5.7.4 *What the Dimensionless Group Would Require*

The reasons for the refusal indicate what a successful construction would demand. A dimensionless group requires dimensioned quantities, a characteristic scale, and a characteristic velocity, none of which the social case supplies. It requires, further, that the group be predictive across systems: the utility of the Reynolds number is that flows at equal values behave alike regardless of the fluid, and a social counterpart lacking this property would be a ratio rather

than a dimensionless group. The cascade structure of §5.5 carries the argument, and the ratio contributes an illustration.

## 5.8 *Intermittent Generativity*

### 5.8.1 *The Concentration of Dissipation*

In turbulent flows, dissipation is distributed with great unevenness: it concentrates in sparse structures occupying a small fraction of the volume, and the statistics of the small scales depart from those a uniform distribution would produce (Frisch, 1995). Intermittency names the phenomenon, and it is a robust feature rather than a correction to a smoother picture.

### 5.8.2 *The Temporal Pattern of Constraint Update*

The social counterpart is the temporal pattern the argument has been assembling. Constraint update occurs in a manner distributed with corresponding unevenness: long intervals in which the slow state drifts and little at the surface changes, punctuated by brief intervals in which the configuration reorganizes. The pattern follows from §5.4 and §5.6: the drift is slow because the slow manifold is attracting, the reorganization is brief because it occurs where attraction has failed, and the alternation is the alternation of the two regimes.

### 5.8.3 *The Locality of Grammar Rewriting*

Intermittency has a spatial aspect as well as a temporal one. Reorganization of the constraint field is expected to concentrate in regions of the field rather than proceeding uniformly across it: particular domains of practice, particular institutions, particular relations. The expectation supplies a target for empirical work, and §8 states it.

### 5.8.4 *The Observable Signature of the Mechanism*

The three preceding sections yield a claim about the shape of historical change.

**Claim 6 (intermittent generativity).** *Historical constraint is updated intermittently. Long intervals of drift, during which the configuration is stable and activity leaves it unaltered, alternate with brief intervals of reorganization concentrated in limited regions of the field. The alternation follows from the structure of the dynamics rather than from the distribution of events, and it is the observable signature by which the proposed mechanism may be recognized.*

The claim states what distinguishes this account from a continuous conception of historical development on one side and from a conception of history as a sequence of ruptures on the other. Continuity holds within a regime, discontinuity marks the passage between regimes, and the alternation is a property of a system possessing the structure set out above.

## 5.9 *The Non-Evaluative Character of Stability*

### 5.9.1 *Recovery Capacity and Optimality*

A distinction is required at this point, since the vocabulary of stability invites a reading the account must exclude. An attractor is stable in virtue of recovery capacity, which measures response to disturbance. Optimality is a ranking of configurations by a criterion. The two are independent: recovery capacity is a dynamical property, and rankings are supplied from outside the dynamics.

### 5.9.2 *The Neutrality of Stability with Respect to Value*

It follows that a configuration may be stable and just, stable and unjust, stable and efficient, stable and inefficient. Stability reports the response to disturbance and reports nothing about the arrangement's merits. A long and stable historical period may be read as a period in which nothing needed changing, or as a period in which what needed changing was suppressed, and the dynamics adjudicates between the readings in neither direction.

### 5.9.3 *The Compatibility of Degradation with Stability*

The distinction cuts against the present framework as much as against others, and the case should be stated plainly. A system whose inertial range has been consumed by dissipation, in the sense of §5.5.2, has fewer live disturbances to absorb, and it may on that account be more stable than a system retaining its capacity for update. Degradation of the capacity for constraint update and stability of the current configuration are therefore compatible, and may be positively associated.

### 5.9.4 *The Discipline Imposed on the Later Sections*

The consequence for §6 is a discipline. The claim developed there, concerning what the projection of all goals into a single optimizable space costs a system, is a claim about a capacity rather than about the merits of the configurations produced. Reading stability as health, or as concealment, would import into the dynamics a judgment the dynamics does not supply, and the sections that follow are written so as to avoid it.

## 5.10 *The Closure Problem*

### 5.10.1 *The Moment Hierarchy*

A system governed by a quadratic self-transport term resists description in terms of its averages. Averaging the equation produces a term involving the average of a product, which is not the product of the averages; describing that term requires an equation for the second-order

correlation, whose average involves the third; and the hierarchy continues without terminating. This is the closure problem, and it is a consequence of the quadratic nonlinearity rather than a limitation of technique (Frisch, 1995; Pope, 2000).

#### *5.10.2 The Position of the Social Case*

The social case inherits the problem in the same form. A description of the constraint field in terms of aggregate quantities requires the correlations among relations, and those require correlations of higher order. The point worth making is one of standing: non-closure here is an instance of a general feature of systems with self-transport, and its presence in the social case reflects the structure of such systems rather than any special deficiency of social inquiry.

#### *5.10.3 The Standing of Non-Closure Across the Class*

The observation has a use beyond consolation. Approximations to closure in the physical case are made by supplying a relation between the unclosed term and the resolved quantities, and the relation is justified by physical argument rather than derived. Any corresponding move in the social case will require an analogous justification, and the demand supplies a criterion by which such moves may be assessed. §8 states the construction of social closure approximations as a research direction.

### *5.11 The Connection to the Study of Complex Systems*

#### *5.11.1 The Range of Systems Sharing the Structure*

The structure set out in this section is exhibited by a range of systems that have been studied independently and in detail. Seismicity displays long accumulation of stress punctuated by rupture. Neural systems display slow modulation of excitability with rapid transitions to seizure. Climate systems display slow forcing with transitions between states (Scheffer et al., 2009; Ashwin et al., 2012). Evolutionary systems display long intervals of relative stasis with intervals of rapid change (Eldredge & Gould, 1972). In each case the analytical content is a slow variable whose drift alters the conditions under which fast dynamics operate, and in each case the study of the system has produced results about the approach to transitions.

#### *5.11.2 The Place of Turbulence in the Multiscale Class*

The relation of the turbulent case to the others is worth stating, since §5.2 and §5.5 draw on it heavily. Turbulence is the case in which self-transport and scale coupling are exhibited with the greatest clarity, and it is for those two features that it is used here. The multiscale structure is the genus; turbulence is one species of it, distinguished by the particular form its nonlinearity takes.

### 5.11.3 *The Available Exchange*

Placing the account within this literature identifies what could be gained from it and what would have to be established first. The methods of geometric singular perturbation theory, of averaging, and of coarse-graining across scales are available in developed form, and §8 lists their application as a direction. What would have to be established first is that the historical case admits the structures those methods require, and §5.6.3 has stated the principal obstacle: the index by which the applicable description is selected is a quantity the account holds to be unavailable from within the system it indexes.

## 6 NORMATIVE CONSEQUENCES

The preceding sections were descriptive. This one asks what follows for the assessment of goals and norms, and the placement is deliberate: the normative consequences developed here are read off the dynamics of §5 rather than argued independently and then illustrated by it.

The order of exposition runs from the reconstruction of goals in relational terms, through their coupling and the process by which they harden into standards, to the standing of what resists such hardening, and closes with the relocation of utilitarianism this account implies. Q4 of §1 is discharged here.

### 6.1 *The Relational Reconstruction of Goals*

#### 6.1.1 *Goals and the Ordering of Preferences*

A goal, on the account taken here, is the condensation of relational tension at the level of the expressible. Where the standard treatment begins with an agent possessing an ordering over outcomes and derives action from the ordering, this account begins with a configuration of relations in which some tension obtains, and treats the goal as what that tension becomes when it is put into words.

The difference is consequential in three ways. Preference orderings are attributes of individuals, and tensions are attributes of configurations, so that the account locates the origin of goals in the field rather than in those who hold them. Preference orderings are complete by construction, and tensions admit no such assumption: a tension may obtain without any available formulation, which is the condition §3.6.1 called the constraint of expressibility. And preference orderings are given prior to the dynamics, while tensions are generated by it, so that the formation of goals falls within what the theory must explain.

### 6.1.2 *The Source of Individual Tension*

Individual tension arises from the incompatibility of relational positions. A participant stands in many relations at once, and the positions these confer make demands that cannot always be jointly satisfied. What is required of one as a colleague, as a member of a family, as a participant in a professional community, and as a citizen may be jointly unsatisfiable in a particular situation, and the residue of that incompatibility is the material from which goals are formed.

The account has the consequence that the richer a participant's relational position, the more tension is available for condensation, and that a participant occupying a single position has correspondingly little. Both are stated as consequences rather than as observations, and §8 lists their examination.

### 6.1.3 *The Source of Collective Tension*

Collective tension arises from asymmetries in the relational field that admit no local resolution. An asymmetry between two participants may be resolved between them. An asymmetry that reproduces itself across the field, so that resolving any instance leaves the pattern intact, is a tension of the collective, and it is from such tensions that collective goals are formed.

The distinction between the local and the non-local instance is what the analysis turns on. A grievance settled by the parties to it produces no collective goal. A grievance whose settlement in one instance is followed by its recurrence in another indicates that the tension is a property of the configuration, and the goal that condenses from it is a goal of the collective in the sense that matters here: its content refers to the configuration rather than to any of the instances.

## 6.2 *The Three Couplings*

Individual and collective goals are coupled, and the coupling takes three forms with different consequences. Q1 of §1 is discharged by their statement.

### 6.2.1 *Expressive Coupling*

The collective supplies the vocabulary in which individual tension can be formulated. A participant with a tension and no words for it has, in the strict sense of §3.6.1, no goal; acquiring the vocabulary converts the tension into something that can be pursued, communicated, and evaluated.

The coupling operates in both directions, and the second direction is the one worth marking. In acquiring the vocabulary, the individual goal is rewritten into a form the collective can recognize. What is gained is the possibility of pursuit; what is exacted is that the tension be expressed in terms the collective already possesses, and whatever exceeded those terms is left

behind. The mechanism is the one treated at greater length elsewhere in this framework, by which a system produces the participants its own dynamics require.

### *6.2.2 Resource Coupling*

The collective determines which individual goals obtain the conditions of their realization. This is the coupling most visible and most studied, and it requires little comment here beyond the observation that it operates upon goals already formed. Resource coupling allocates; it does not constitute.

### *6.2.3 Reverse Coupling*

The third coupling runs from the individual to the collective, and it is the one on which constraint update depends. A tension for which the available vocabulary has no formulation does not thereby disappear. It persists as something registered without being stated: as difficulty, as a pattern of conduct that fits no available description, as an unease that resists formulation. Such a residue is the sole entry point by which the constraint on expressibility is revised, for the reason that a vocabulary is extended only under pressure from what it fails to accommodate.

The connection to §4 should be made explicit. The by-product principle held that the pursuit of goals generates relations the goals did not describe. The present section identifies where such by-products register: in the residue of tensions the vocabulary cannot state. And §5 supplies the condition under which the register becomes consequential, since a residue in a system far from a boundary of stability is absorbed, and the same residue near a boundary is amplified.

## *6.3 The Ontologization of Goals*

### *6.3.1 From Direction to Standard*

A goal begins as a direction: a formulation of a tension, indicating what would relieve it. Under conditions that obtain widely, it becomes something else. The formulation acquires a measure; the measure acquires an institutional home; and what began as an indication of where to go becomes a standard by which conduct is assessed. The goal has become a criterion.

The transformation is ordinary and, within limits, benign. A measure permits coordination, comparison, and accountability, and a collective goal without a measure is difficult to pursue collectively at all. What follows concerns the consequences of the transformation for the dynamics, and leaves its local usefulness undisputed.

### 6.3.2 From Tension-Driven to Index-Driven Dynamics

The consequence is a change in what drives the system. A tension-driven dynamics is one in which conduct responds to relational configurations, and such systems characteristically possess multiple stable configurations and exhibit dependence on the path by which a configuration was reached. An index-driven dynamics is one in which conduct responds to a measure, and such systems characteristically possess a single optimum toward which conduct converges.

The change is a change in the type of the dynamics rather than in its parameters. What was a field with several stable configurations becomes a landscape with a peak, and the difference is visible in the behaviour: exploration of alternative configurations, which in the first case is how the system finds its way, becomes in the second case error to be corrected.

### 6.3.3 The Statement of the Projection Claim

The claim toward which this subsection has been building may now be stated, and it is stated in a form more careful than the slogan that summarizes it.

**Claim 7 (the cost of totaled projection).** *On the problem of the continued generation of historical constraint, projecting all goals into a single optimizable space reduces a system's capacity to retain relational degrees of freedom that resist expression.*

Each qualification in the claim is load-bearing, and the argument requires all four.

The claim is restricted to a problem: the continued generation of historical constraint. Optimization of logistics, of clinical protocol, of the allocation of a fixed budget falls outside the restriction, and such cases are neither counterexamples to the claim nor applications of it.

The claim concerns *projection into a single space* rather than optimization. Optimizing structural goals within their own domain remains legitimate and rational, as §3.6.2 granted. What the claim concerns is the treatment of the entire goal system as one optimization problem, in which every goal is rendered commensurable with every other by reduction to a common measure.

The claim asserts a *reduction in capacity* rather than an elimination. A system so projected retains some capacity to hold relational degrees of freedom, and projection may generate new constraints of its own. The claim is comparative and admits of degree.

And what is reduced is the capacity to retain *degrees of freedom that resist expression*, which is a specific quantity rather than a general good. The claim says nothing about welfare, justice, or the quality of the configurations a projected system produces.

### 6.3.4 The Argument for the Claim

The argument for Claim 7 runs through the dynamics and requires no evaluative premise.

Optimization damps disturbance. This is what optimization is, considered dimensionally: a procedure that moves a system toward an extremum of a criterion returns the system to that extremum when displaced, and the return is the damping of the displacement. A system under thoroughgoing optimization is a system in which departures from the optimum are corrected.

Disturbances are the material of constraint update. §4 argued that the configurations capable of altering the constraint field are those the evaluation functional fails to capture, and §5 argued that their amplification requires them to survive long enough to be transported. A procedure that corrects departures removes precisely the configurations on which update depends, since a departure from the optimum is what an unranked configuration looks like from within an index-driven dynamics.

The conclusion follows. Totalized projection damps the disturbances that constitute the material of constraint update, and thereby reduces the system's capacity for such update. The argument concerns a rate rather than a valuation, and it would go through unchanged for an observer indifferent to whether historical constraint is ever updated.

#### *6.3.5 The Relation to the Mechanisms of Degradation*

The transformation described here is the specific mechanism by which the evaluative layer of the constraint field is rewritten. §3.6.1 distinguished the constraint of evaluability as the fastest of the three modes, and goal ontologization is what rewrites it: the standards by which courses of action are ranked are replaced by the measure that the ontologized goal supplies. The account thereby locates within the dynamics a process treated elsewhere in this framework as the rewriting of a relational grammar.

### *6.4 The Remainder and Non-Structural Norms*

#### *6.4.1 The Self-Cancellation of the Stated Norm*

A norm of the kind §3.6.2 called non-structural exhibits a feature that distinguishes it sharply from a goal: stating it as a goal destroys it.

The classical instance is the injunction to occupy the low places that others disdain. Asked what end the occupation serves, one finds no answer of the ordinary kind, and pressed further one can say only that it is fitting. Suppose the injunction were reformulated as a goal, with a measure attached and performance assessed against it. What would then be pursued is a rank on that measure, and the pursuit of a rank on a measure of humility is not humility. The same holds throughout the class. Trust extended in order to be trusted is calculation; sincerity performed for its effect is performance; and a work made to raise a score on a scale of beauty stands in a different relation to beauty than a work made otherwise.

The self-cancellation has nothing to do with the sincerity of the agent, and the point is

worth insisting on. What is destroyed is the thing itself, by the form of the pursuit, and an agent of perfect sincerity who adopts the goal-form destroys it as thoroughly as a cynic.

#### 6.4.2 *The Classification of Non-Structural Norms*

The natural response to the foregoing is to classify such norms as goals of an unusual kind, and the response should be resisted. A goal is a formulation of a tension, indicating what would relieve it, and a norm that cancels itself when so formulated is not a formulation of that kind.

The alternative classification follows from §3.6.3. Non-structural norms hold open the range across which relational configurations may move, and their function in the dynamics is transport. They are, in the vocabulary of §3.6.4, boundary conditions on the goal system: conditions that determine the space within which goals are formed and pursued, standing to that space as a condition rather than as an element of it.

#### 6.4.3 *The Source of Normative Force*

A consequence follows for the standing of such norms, and it inverts the ordinary expectation. That a norm resists formulation as a goal is generally treated as a defect: a norm that cannot be stated as an objective is thought to be vague, unenforceable, or ill-defined.

On the present account the resistance is the source of the norm's function. What such norms protect is a set of relational degrees of freedom that no ranking has evaluated, and a norm capable of being stated as a rankable objective would, by §6.3.4, be a procedure for damping departures rather than for preserving them. The resistance to formulation and the capacity to protect are the same property described in two ways.

#### 6.4.4 *Purposiveness Without a Purpose*

The structure has an ancestor in the philosophical tradition, and the connection strengthens the account rather than decorating it. Kant's analysis of aesthetic judgment identifies a class of judgments that are purposive without any representable purpose: what pleases in the beautiful pleases without a concept and without the object's being brought under an end (Kant, 1790). The judgment has a lawfulness, and it is a lawfulness that supplying a determinate concept would destroy.

The parallel holds at the point that matters. The reason the injunction of §6.4.1 can be defended only as fitting, and the reason a norm so defended loses its character when a purpose is supplied, are one structure appearing in two settings. What the present account adds is the dynamical function: the tradition establishes that judgments of this form are coherent and possess their own lawfulness, and §3.6.3 assigns them a role in the transport of relational configurations across scales.

## 6.5 Protection under Conditions of Blindness

### 6.5.1 The Standing of Intentional Protection

The main claim of this section may now be stated.

**Claim 8 (protection under blindness).** *In a system whose participants have no access to the slow variable, mechanisms of protection adopted with the intention of protecting the system's capacity for constraint update fail, since the intention places the mechanism within the fast-variable optimization it was adopted to counteract. Norms held without such an intention retain the capacity that intentional mechanisms lose.*

The argument proceeds in three steps. §4 established that participants have no access to the slow variable. It follows that a mechanism adopted in order to protect the slow variable is adopted under a description of its purpose that participants cannot verify against the state of the thing protected. Assessment of the mechanism must therefore proceed by proxy, and the proxy is a measure. But a mechanism assessed against a measure is a structural goal in the sense of §3.6.2, whose dynamical role is dissipation. The mechanism has become an instance of the process it was adopted to counteract.

### 6.5.2 The Standing of Norms Held on Other Grounds

The corresponding positive claim follows from §6.4. A norm held for its own sake, and defended when challenged by an appeal to its fittingness rather than to its consequences, resists conversion into a measure for the reason given in §6.4.1, and it retains the transport function assigned in §3.6.3.

The formulation requires care. The claim is not that ignorance is preferable to knowledge, nor that agents should refrain from reflecting on what their norms accomplish. It is that a norm's protective function survives reflection on that function only where the norm continues to be held on other grounds. An agent may know perfectly well what a norm accomplishes; what the agent cannot do, without cost, is hold the norm because of that accomplishment.

### 6.5.3 The Descriptive Standing of the Claim

Claim 8 is descriptive. It states what happens to a mechanism of protection under specified conditions, and it recommends nothing.

The distinction is easily lost, since the claim has an obvious use in argument, and the use should be declined here. Nothing in the dynamics establishes that the capacity for constraint update is worth protecting; §5.9 held that stability is not an evaluative notion, and the same holds of generativity. A society that has lost the capacity for constraint update has lost a capacity, and whether the loss is to be regretted is a question the dynamics leaves open. What

the account supplies is the price of the loss, stated in terms of what the system can thereafter do.

#### *6.5.4 The Relation of the Claim to the Transition Mechanism*

An objection arises at this point, and the account is stronger for meeting it directly than for leaving it to be discovered.

Claim 8 holds that intentional protection fails. §4 and §3.6.3 hold that non-structural norms do protect the degrees of freedom on which constraint update depends. If such norms protect effectively, then maintaining them appears to be an intentional strategy of protection, and Claim 8 appears to rule out what the rest of the account requires.

The resolution lies in the distinction between a function and a reason. Non-structural norms protect as a consequence of being held for their own sake, and the protection is a by-product of the holding rather than its object. An agent who maintains such a norm because it protects has supplied the norm with a purpose, and by §6.4.1 the norm so supplied is no longer of the kind that protects. The self-cancellation that made the class difficult to state is precisely what does the work here: it is the reason the protective function survives only where it is not the reason for the holding.

The consequence for practice is severe, and §7 takes it up rather than softening it. An institution that maintains a space of non-optimization because such spaces are valuable has already converted the space into an instrument, and the conversion is not undone by the sincerity of those who perform it.

### *6.6 The Dynamical Statement of the Remainder*

#### *6.6.1 Dissipation and the Inertial Range*

The claims of this section admit restatement in the vocabulary of §5, and the restatement is where the two lines of the paper meet.

§5.5.2 identified a range of scales across which relational configurations are transported without being generated or fixed, and §5.7 identified institutionalization as the process by which configurations are fixed. If fixing extends across the whole range, transport ceases: configurations are removed at the scale of their production, and nothing survives to accumulate. The system retains injection and dissipation and loses the transfer between them.

#### *6.6.2 The Function of Non-Structural Norms in These Terms*

The function assigned to non-structural norms in §3.6.3 is, in this vocabulary, the maintenance of the range. They neither produce configurations nor fix them, and what they contribute is the interval across which configurations produced at one scale can persist long enough to accumulate at another.

The claim of §6.3 and the claim of §6.5 may thereby be read as one claim stated at two levels. Totalized projection extends fixing across the range; the range is what transport requires; and a system whose range has been consumed retains its capacity to optimize and loses its capacity to be revised.

### *6.6.3 The Convergence of the Vocabularies*

Three descriptions have been used in this paper for what is here claimed to be one structure, and their convergence is the appropriate place to check whether the paper's borrowings have earned their place. The relational vocabulary speaks of degrees of freedom that no ranking has evaluated. The dynamical vocabulary speaks of an inertial range across which transport occurs. The normative vocabulary speaks of what cannot be pursued as a goal without being destroyed. The proposal here is that these pick out one thing under three descriptions, and the identification is the substantive content of this subsection rather than a summary of it.

## *6.7 The Criterion and the Forms of Its Failure*

### *6.7.1 The Criterion of Return*

§1 took from the parent framework a criterion, and it can now be applied. A norm retains its non-structural character just in case the goals it serves cannot reach back and rewrite it. Where the goals of a system can modify a norm to suit them, the norm has become an instrument of those goals, whatever its content.

The criterion has the merit of being applicable without an account of the norm's content, and the corresponding limitation that it requires a judgment about a counterfactual: whether the norm would be revised under pressure, rather than whether it has been.

### *6.7.2 The Co-opted Norm*

Failure of the criterion has a characteristic form, and instances are readily supplied. A commitment to fairness that becomes a measured target, reported and optimized, has been rewritten by the goals it was to constrain. A commitment to sustainability that becomes an index has undergone the same conversion. In each case the content of the norm survives in the vocabulary, and its dynamical role has changed from transport to dissipation.

What makes such cases instructive is that they proceed without bad faith. The conversion is generally performed by those most committed to the norm, and for the best of reasons: a norm that is measured can be defended, budgeted for, and enforced. The account developed here explains why the improvement carries the cost it does, and §7 considers what, if anything, can be done about it.

### 6.7.3 *The Limitations of the Criterion*

Three limitations should be entered. The criterion is counterfactual, and its application requires a judgment about how a norm would fare under pressure it has not experienced. It is binary, where the phenomenon admits degrees, since a norm may be partially co-opted. And it is retrospective in practice: the clearest evidence that a norm could be rewritten is that it has been. §8 lists the construction of a criterion that is positive rather than counterfactual as an open problem.

## 6.8 *The Relocation of Utilitarianism*

### 6.8.1 *The Domain of Adequacy*

The account developed here bears on utilitarianism, and the bearing is a relocation rather than a refutation.

Utilitarianism is a correct theory of one region of the goal table of §3.6. Where goals are structural in the sense of §3.6.2, the aggregation of consequences under a common measure is the appropriate form of assessment, and the tradition's development of that form is a genuine achievement. The relocation concerns the extension of the treatment to the whole table: to goals whose formulation as rankable objectives destroys them, and to the generative goals whose function is the production of configurations that no ranking has yet evaluated.

The parallel with Claim 7 is close, and the two may be read as one structure appearing at different levels. Claim 7 concerns the projection of a goal system into a single optimizable space. The relocation of utilitarianism concerns the extension of a theory adequate to one class of goals across the class of all goals. The second is the first as it appears in normative theory.

### 6.8.2 *The Dynamics of a System with No Remainder*

The relocation admits a second and equivalent statement. A utilitarian treatment of the whole goal system is adequate to a system in which the remainder is zero: a system in which every consideration bearing on conduct can be expressed, ranked, and aggregated, with nothing left over.

Such a system is consistent, and §5 states what its dynamics would be. With no unranked configurations, injection ceases; with nothing to transport, the inertial range is idle; and the constraint field settles into a configuration from which its own dynamics cannot displace it. The loop of §1 closes and becomes a fixed point. This is the sense in which Q4 is the condition under which the loop fails to close, and it is why the question was placed among the questions of historical dynamics rather than among the questions of ethics.

### 6.8.3 *The Form of the Argument*

The form of the argument deserves comment, since the standard case against utilitarianism takes a different form. That case proceeds by counterexample: a scenario is constructed in which the utilitarian verdict conflicts with a confident judgment, and the conflict is offered as evidence against the theory. The exchange that follows concerns whether the intuition or the theory should yield.

The present argument makes no appeal of this kind. It observes that a system organized as utilitarian theory recommends has a determinate dynamical consequence, and it states the consequence. An interlocutor who accepts the consequence has understood the argument, and the disagreement that remains concerns whether the capacity for constraint update is worth retaining, which is a question the dynamics leaves open by §6.5.3.

### 6.8.4 *The Standing of the Result for Moral Theory*

A last misreading should be excluded. The account might be taken to hold that a utilitarian framework requires supplementation by non-consequentialist commitments in order to be morally adequate, and this is not the claim.

The claim concerns a dynamical condition. Non-structural norms occupy a position in the dynamics of the constraint field, and their function is the maintenance of an interval on which the field's capacity for update depends. Whether the norms are also morally required is a separate question on which the present account is silent. What has been shown is that a system lacking them has a determinate structure, and that the structure is one in which historical constraint ceases to be revised by the dynamics it constrains.

## 7 APPLICATION AND PRACTICE

Q8 of §1 asked how the account bears on practice. This section answers, and the answer is constrained by what the preceding sections established. Three results in particular narrow what may be said here, and they are stated at the outset so that the modesty of what follows is understood as a consequence rather than as a reticence.

§4 established that participants have no access to the slow variable. §5.4.4 declined to construct a quantity measuring the distance to a boundary of stability, and gave reasons that would apply to any such construction attempted from within. §6.5.4 argued that a space of non-optimization maintained because such spaces are valuable has thereby been converted into an instrument. Taken together, these hold that the practitioner cannot see the variable that matters, cannot measure the proximity of the transition that matters, and cannot protect what matters by intending to protect it.

A section on practice written under these constraints has two honest forms. It may state what the constraints rule out, which is considerable and worth stating precisely. And it may

identify the residual space in which action remains possible, which is narrower than a reader arriving at this section would expect. Both are attempted below. What is declined is the third form, in which the constraints are acknowledged in an opening paragraph and then set aside.

## 7.1 *The Design Paradox*

### 7.1.1 *The Statement of the Paradox*

The central difficulty may be stated in three steps.

A system's capacity for constraint update depends on maintaining relational degrees of freedom that no ranking has evaluated, by §6.6. Such degrees of freedom are maintained by norms that resist formulation as goals, by §6.4. And a norm adopted in order to maintain them has been supplied with a purpose, which by §6.4.1 destroys the property that made it capable of maintaining anything.

The consequence is that deliberate institutional design of the required kind is self-defeating in a specific and structural way. The designer who understands the account thereby loses the capacity to act on it, since the understanding supplies exactly the purpose that converts the norm into an instrument. This is the design paradox, and the sections that follow neither dissolve it nor treat it as a reason to abandon the question.

### 7.1.2 *The Standing of Sincerity*

One response is available and should be closed immediately. It may be suggested that the paradox is a matter of motive, and that a designer who genuinely values the norm, rather than valuing it for its effects, escapes the difficulty.

The suggestion fails for the reason given in §6.4.1. What converts a norm into an instrument is the form of the pursuit rather than the state of mind of the pursuer. An institution that establishes a protected space, documents the reasons for the protection, and reviews the space against those reasons has instituted a measure, and it has done so whatever the sincerity of those who established it. The paradox is structural, and structural difficulties are not addressed by good faith.

### 7.1.3 *The Limits of the Paradox*

The paradox has a definite scope, and stating it prevents an overextension that would make the section pointless.

What the paradox rules out is the deliberate maintenance of non-structural norms for the sake of their dynamical function. It does not rule out the maintenance of such norms for other reasons, including the reasons internal to them: an institution may hold to a practice because the practice is fitting, and the dynamical function follows without being the reason. Nor does the paradox extend to the constraint of possibility or to the constraint of evaluability, which

are open to deliberate alteration in the ordinary way. And it does not rule out the removal of impediments, which §7.3 treats as the principal form of available action.

## 7.2 *Governance under the Account*

### 7.2.1 *The Position of Governance in the Framework*

Governance, in the framework to which this paper belongs, concerns how a generated relation is governed once it exists. The present section supplies what the historical extension adds: the object of governance is a relational field whose constraint structure is itself in motion, and the motion is not available to those who govern.

### 7.2.2 *The Unavailability of the Governing Target*

The most consequential result for governance is negative and follows from §5.4.4. A governance programme framed as keeping a system away from a boundary of stability requires knowing where the boundary lies. The account holds that this distance is unavailable to participants, and that its unavailability is structural rather than a deficiency of current measurement.

The result rules out a class of proposals that would otherwise be natural. Early warning systems for institutional crisis, resilience indices, and dashboards reporting a society's distance from a transition are, on this account, proposals to measure a quantity whose measurement from within is what the framework denies. §5.4.5 entered the one qualification: statistical signatures of critical slowing may be readable from the response to disturbance without knowledge of the underlying parameter, and whether historical systems admit such measurement is an open question rather than a settled impossibility.

### 7.2.3 *The Hazard of Index-Based Governance*

A second result is the specification of a hazard that governance by measure carries, and it follows from §6.3 rather than from the epistemic results.

Governing by index is a special case of the projection treated in Claim 7. A governing body that adopts a measure, reports against it, and adjusts conduct to improve it has instituted an index-driven dynamics in the domain it governs, and by §6.3.4 has thereby begun damping the disturbances on which that domain's capacity for constraint update depends. The claim is comparative and admits of degree, as Claim 7 requires: an index applied to a bounded domain, alongside domains left unmeasured, differs from an index applied across a society's whole range of activity.

The practical content of the result is a question to be asked of any proposed measure. It is not whether the measure captures what matters, which is the usual question and a reasonable one. It is what proportion of the governed domain the measure leaves unmeasured, and

whether that remainder is large enough to carry the disturbances the domain requires. A governance regime may be assessed on this dimension without any judgment about the merits of the measures it employs.

#### *7.2.4 The Standing of the Inertial Range in Governance*

The corresponding positive statement is weaker than one would wish, and is entered at the strength the account supports. A governance regime that leaves substantial domains of activity unmeasured retains, in those domains, the transfer treated in §5.5.2. Whether the retention can be pursued as a policy is precisely what §7.1 places in question, since a domain left unmeasured in order to preserve transfer has been assigned a function and thereby measured in the relevant sense.

What survives the paradox is a distinction between omission and provision. A governance regime that has not extended measurement into a domain differs from one that has designated the domain as a protected reserve, and the difference is the one §6.4.1 identifies. The first leaves a space; the second has instituted one. Only the first supports the dynamical function, and no programme can produce the first, since a programme of leaving-alone is a form of attention.

### *7.3 Institutional Practice under Non-Optimizability*

#### *7.3.1 The Removal of Impediments*

The paradox constrains provision and leaves removal open, and this asymmetry is where the practical content of the account is concentrated.

Consider two institutional acts. The first establishes a protected space for unmeasured activity, with a rationale and a review. The second discontinues a measurement that had been extended over a domain previously unmeasured. The first supplies a purpose and, by §6.4.1, converts the space. The second removes an instrument and supplies nothing in its place. The domain that results is unmeasured in the manner of §7.2.4's first case, since nothing has been designated and no function assigned.

The asymmetry gives the account's principal practical recommendation, and it is a recommendation about what to stop rather than what to do: the extension of measurement into domains that had done without it is the mechanism by which the inertial range is consumed, and the extension is generally reversible in a way that provision is not.

#### *7.3.2 Redundancy, Dissent, and Unabsorbed Activity*

Three institutional features are commonly defended on grounds independent of this account, and the account supplies an additional consideration bearing on each. The independence matters: since each is already held for its own reasons, the additional consideration does not supply the purpose that §7.1 warns against.

Redundancy is ordinarily defended as insurance against failure. On the present account it also preserves configurations that a fully optimized arrangement would eliminate, and its elimination narrows the range across which transfer occurs.

Dissent is ordinarily defended by appeal to the interests of dissenters or to the epistemic value of criticism. On the present account it also supplies configurations that the prevailing evaluation functional does not rank, which is the condition §4 identified for a disturbance to survive selection.

Activity that no institution has absorbed is ordinarily left undefended, being visible chiefly as waste. On the present account it is the domain in which generative goals operate, and its elimination removes the injection term of §5.7.1.

In each case the account supplies a consideration to be weighed by those already disposed to preserve these features on other grounds. Whether a consideration so supplied can be acted upon without converting the feature is the question §7.1 leaves open, and §7.4 returns to it.

### *7.3.3 Institutional Forms That Resist Conversion*

A narrower question is available and admits of a more definite answer: which institutional forms resist conversion into measures, whatever the intentions of those who operate them.

Three properties bear on this. A practice whose value is realized in its performance rather than in an outcome resists measurement, since the measure would have to be taken of the performance itself. A practice whose participants are not selected for their performance of it resists optimization, since selection pressure is the mechanism by which practices are tuned to measures. And a practice whose discontinuation carries no visible cost resists the accountability that generates measurement, at the price of being easy to discontinue.

The third property is worth marking as a hazard rather than a recommendation. The features that make a practice resistant to conversion into a measure are the same features that make it indefensible when its budget is questioned, and the account offers no way around this: a practice that could be defended by demonstrating its contribution would be a practice whose contribution had been measured.

### *7.3.4 The Assessment of a Regime*

The foregoing supports assessment more readily than design, and the distinction is where the account's practical usefulness lies.

Three questions may be put to an existing arrangement, and each is answerable from features that are visible. What proportion of activity within the arrangement is subject to measurement, and what proportion has never been measured? Has the proportion measured been increasing, and over what period? Do the practices held for their own sake within the arrangement retain that character, or have they acquired rationales, reviews, and reported measures?

The third question is the criterion of return of §6.7.1 in a form that can be applied to institutions. Its answer is retrospective, as §6.7.3 conceded, and retrospective assessment is nonetheless assessment: an institution can determine whether its practices have been converted, even where it cannot determine whether they are about to be.

#### 7.4 *Ethics and Normative Conduct*

##### 7.4.1 *The Position of the Individual*

The account bears on individual conduct, and the bearing is limited in a manner that follows from Claim 8. An individual who understands the account and adopts non-structural commitments for the reasons the account supplies has, by §6.4.1, adopted them in the goal-form and destroyed what was to be adopted.

What remains available is a distinction that the account clarifies rather than creates. A person may hold a commitment because it is fitting, and may separately understand what such commitments contribute. The two stand in a relation that requires care: the understanding must not become the reason, and there is no procedure that guarantees this. The account's contribution to individual conduct is therefore diagnostic rather than directive. It supplies a way of recognizing when a commitment has been converted, which is when its defense begins to proceed by demonstrating its contribution.

##### 7.4.2 *The Standing of the Ethical Vocabulary*

A consequence follows for how ethical claims are to be read within this framework. §6.5.3 held that the dynamics establishes nothing about whether the capacity for constraint update is worth having, and the same restriction applies here. The account establishes what a system loses when its non-structural commitments are converted, and it leaves the evaluation of that loss to whatever normative theory the reader brings.

The restriction is worth observing carefully, because the temptation to overstate is considerable at this point. An account that explains the function of humility, trust, and sincerity in the dynamics of historical constraint might readily be presented as a vindication of those virtues. It is not one. It is a description of what a system containing them can do and what a system without them cannot, and the step from that description to a recommendation requires a premise the account does not supply.

##### 7.4.3 *The Ethics of the Practitioner*

One case deserves separate treatment, since the paper's own position falls within it. A person who studies these dynamics professionally, and who advises institutions on the basis of that study, occupies the position the design paradox most directly concerns.

The account offers such a person little of the ordinary kind. It supplies no programme to recommend, and its principal practical content is a recommendation to discontinue certain extensions of measurement rather than to institute anything. It suggests that the advisory relation itself carries the hazard treated in §7.2.3, since advice given and adopted becomes a rationale, and a rationale is the beginning of a measure. What it supplies instead is a description precise enough that a practitioner can recognize the conversion of a practice when it occurs, and the discipline to decline the proposals that would accelerate it.

### 7.5 *The Standing of This Section*

The recommendations assembled here are thin, and their thinness is a result rather than an omission. An account holding that the relevant variable is unobservable, that the relevant distance is unmeasurable, and that the relevant protection is destroyed by being intended will not yield a programme, and a section that produced one would have contradicted the sections preceding it.

Two things have been established. The account rules out a class of proposals with some precision: governance targeting proximity to a transition, protected reserves designated as such, and the defense of practices by demonstration of their contribution are each shown to be self-defeating, and shown to be so for stated reasons rather than by general skepticism. And a narrower space of action has been identified, consisting in the removal of impediments rather than the provision of protections, and in the assessment of arrangements rather than their design.

Whether the space so identified is wide enough to be useful is a question this paper leaves to those who work in it. §8 lists the search for institutional forms that survive the design paradox as a research direction, and records that the difficulty is, at present, unresolved.

## 8 THE RESEARCH PROGRAMME

A first paper in a programme owes its readers an account of what has been done, what has merely been named, and what would have to be established for the whole to stand. This section supplies that account. It states the place of the framework within the larger effort to which it belongs, sets out the directions in which the work continues, states the methodological position under which it is conducted, lists the problems that remain open, marks the boundary that separates the account from a form of explanation it declines, and identifies the points of contact with work currently under way in the traditions surveyed in §2.

## 8.1 *The Place of the Framework and the Contribution of This Paper*

### 8.1.1 *Position Within the Larger Effort*

The framework to which this paper belongs treats relation as prior to what it relates and as the medium in which what exists is generated. Its first development concerns how relation generates being; a second concerns how a generated relation is governed once it exists; and the present extension concerns how relation generates the historical constraint under which further relation is generated.

The three stand in a definite order. The first supplies the primitive, the second treats a relation already in existence, and the third treats the condition under which relations of any kind are formed. Read in this order, the historical extension supplies what the other two presuppose: both operate within a constraint structure whose generation neither was designed to explain.

### 8.1.2 *What This Paper Establishes*

Four things have been argued rather than asserted, and they are what the paper offers for assessment. Each is offered as a proposal that the work listed below would be required to secure.

An ontology has been committed to and its terms defined: constraint as a macroscopic phase of the relational field, with the definitions of §3.4.1 and the risk stated at §3.4.4. A result has been derived rather than assumed: participants' blindness to the slow variable follows from their mean-field position, by the argument of §4.2. A mechanism has been given for the departure of a system from a stable configuration, in which accumulation and trigger are distinguished and the condition for a trigger to be consequential is stated, by §4 and §5.4. And a normative consequence has been derived from the dynamics rather than argued independently, in Claim 7 and its argument at §6.3.4.

### 8.1.3 *What This Paper Leaves Unestablished*

Three things have been named without being established, and the distinction should be recorded plainly.

No order parameter has been exhibited for any historical case, and §3.4.4 conceded that the phase claim requires one to exist. No solution or approximation has been offered for the self-transport equation, which remains schematic in the sense of §5.1.3. And the mechanism of §4 has been given no empirical test, its discriminating power having been argued at §4.5.7 rather than demonstrated.

#### 8.1.4 *The Question of Generality*

An observation is worth recording without being acted upon. The apparatus assembled here, in which a constraint structure conditions the goals formed under it while being revised by their pursuit, is not obviously restricted to the historical case. Organizations, disciplines, professional communities, and other configurations in which participants act under conditions they collectively revise exhibit the same structure at smaller scale.

The observation is recorded as a direction rather than a claim. A first paper that asserted the generality would have weakened the focus by which §1 justified its inclusions, and the assessment of whether the account extends is a matter for work that has established it in one case first.

### 8.2 *Directions of Research*

Six directions follow, one for each part of the account from §3 onward, so that no part is implied to be finished.

#### 8.2.1 *Ontological Directions*

The identification of invariants is the first problem, and it is the problem on which the ontology's standing rests. §3.5.1 argued that the social case lacks an independently motivated symmetry group, and what would replace it is a set of quantities preserved under rewriting of the relational grammar. Their identification would supply what the phase claim requires and §3.4.4 conceded to be missing.

Two further questions belong here. Whether the three modes of constraint distinguished in §3.6.1 are exhaustive, and whether they are the right cut, is open: the typology was justified by its fit with the goal categorization rather than derived. And the extent to which container ontology can be dispensed with in practice, as against in principle, is worth examining, since the analytical convenience of treating constraint as a container is considerable and the account forgoes it entirely.

#### 8.2.2 *Epistemological Directions*

Whether blindness admits degrees is the principal question. §4.2.3 stated the result in a modality that §5.4.5 then qualified: if statistical signatures of critical slowing are readable from the response to disturbance, some information about the slow state is available without knowledge of the slow variable itself, and the result requires amendment. Establishing whether such signatures are measurable in historical systems would settle a question on which §7 also turns.

A second question concerns collective epistemic apparatus. Institutions of record, measurement, and analysis extend what participants can know, and whether they extend it to the

slow variable is not settled by the argument of §4.2, which concerned the position of a participant rather than the capabilities of an apparatus. The question carries a tension worth stating: an apparatus that made the slow variable visible would weaken Claim 8, since intentional protection would then have a target, and the account would require revision at a load-bearing point.

### 8.2.3 *Formal Directions*

The self-transport equation of §5.2.2 admits development in three directions. Its solution or numerical treatment under simplifying assumptions would establish whether the form supports the behaviour attributed to it. The construction of closure approximations, in the manner of §5.10.3, requires a justification of the same kind that physical closures receive, and supplying one would convert the analogy into a model. And the multiscale apparatus named in §5.11.3, comprising geometric singular perturbation theory, averaging, and coarse-graining across the constraint hierarchy, is available in developed form and awaits the demonstration that the historical case admits the structures it requires.

### 8.2.4 *Normative Directions*

A positive criterion for the remainder is the outstanding problem. §6.7.3 conceded that the criterion of return is counterfactual, binary, and retrospective in application, and a criterion identifying non-structural norms by what they are rather than by how they would fare under pressure would strengthen §6 considerably.

A typology of such norms would serve the same end. The class was introduced by instances and by a diagnostic feature, and whether it admits internal structure, and whether the instances share more than the diagnostic, is unexamined.

The systematic comparison with other normative traditions is a third direction. This paper treated utilitarianism structurally, in §6.8, because the structure of aggregation under a common measure is what Claim 7 concerns. Deontological, virtue-theoretic, and contractualist positions stand in relations to the account that have not been examined, and the treatment of virtue ethics in particular is likely to be substantive rather than incidental, given the affinity between non-structural norms and the virtues.

### 8.2.5 *Practical and Governance Directions*

The design paradox of §7.1 is the central problem, and §7.5 recorded it as unresolved. What is sought is an institutional form whose maintenance does not supply the purpose that converts it: a form that persists for reasons internal to it while contributing the dynamical function, without the contribution becoming the reason. Whether such forms exist is open, and §7.3.3 identified three properties that would characterize them.

Two further directions belong here. The interface with the governance extension of the framework requires specification: what a governance account gains from being given a constraint structure in motion, and what it must give up. And the study of index-based governance as a case of Claim 7 offers the most accessible empirical target the account supplies, since the extension of measurement into previously unmeasured domains is documented, datable, and comparable across settings.

### *8.2.6 Empirical Directions*

Three empirical questions follow from the mechanism.

The characterization of intermittency is the first. Claim 6 holds that constraint update is distributed unevenly in time and concentrated in limited regions of the field, and the claim has observable content: the temporal distribution of institutional reorganizations, and their concentration in domains rather than their diffusion across them, are measurable in principle.

Evidence for upward accumulation is the second. §5.5.4 left open whether social systems exhibit transfer toward larger scales, and stated what would be required to establish it.

The mechanism's own prediction is the third and the most direct. §4.5.7 held that transitions should originate in domains that the prevailing indices do not measure, which is a claim about where to look rather than about what will happen. Its examination requires historical cases in which the prevailing indices are documented, and the origin of the transition can be located relative to them.

## *8.3 Methodology*

### *8.3.1 Two Methods and Their Defects*

The account recommends a dialectic of two methods, and it is stated with the defect of each rather than with the strengths.

The traditional method, proceeding by textual study and philosophical argument, is difficult to verify or falsify. A claim developed by argument from a tradition's texts can be defended against evidence indefinitely, and the discipline that would terminate the defense is supplied from outside.

The empirical method carries two defects. It cannot defeat the problem of induction, and it cannot cross from what is the case to what ought to be, so that no accumulation of evidence adjudicates a normative claim. And it estranges its object: a method that proceeds by measurement studies what has been measured, and the human matter of its inquiry is reached only through the proxies measurement supplies.

### 8.3.2 *The Asymmetry of the Defects*

The two defects are asymmetric, and neither method repairs the other. Empirical work cannot cure unfalsifiability in the domain where the gap between is and ought obtains, since the data that would adjudicate a normative claim are not the kind of thing data are. Traditional work cannot defeat induction, having no independent access to the regularities in question.

What the pairing accomplishes is the constraint of each method's overreach. Empirical work holds speculation to the phenomena; traditional work prevents the identification of a measurable proxy with the thing it proxies for. The dialectic is therefore a discipline rather than a synthesis, and its two halves do not combine into a method without defects.

### 8.3.3 *The Application of the Account to Inquiry*

The second half of that discipline is Claim 7 applied to inquiry. A research programme that projects its object into the space of what it can measure has performed, at the level of method, the operation §6.3.3 described at the level of goals: what resists measurement is left out, and what is left out is the material on which the programme's own revision would depend.

The estrangement named in §8.3.1 is therefore not an incidental cost of empirical method but the specific form the projection takes in inquiry. The account thereby applies to itself, and the application is a constraint on how this programme is to be conducted rather than an observation about others.

### 8.3.4 *Discipline in Borrowing*

The paper's borrowings from physics were made under a discipline that later work should retain, and it is stated here as a rule rather than as a description of what was done.

A borrowing supplies vocabulary and demonstrates that a structure is coherently thinkable. It does not transfer results: what holds of a physical system is established for that system by argument the social case does not inherit. Where a borrowing might be extended into a quantitative correspondence, the extension requires independent justification, and §5.7.3 declined one such extension for reasons that generalize. And each borrowing should be given a stated point at which it stops, as §3.3.4 and §5.1.2 did, so that its reach can be assessed rather than inferred.

## 8.4 *Open Problems*

Five problems are open in the strong sense that the account does not indicate how they would be resolved.

#### 8.4.1 *The Existence of an Order Parameter*

The phase claim requires that order parameters exist for historical constraint, and §3.4.4 conceded that none has been exhibited. The problem has an unusual structure, since §5.4.4 and §4 together hold that such a quantity is unavailable to participants. What is sought is therefore a quantity whose existence is compatible with its unavailability from within, and whether the two conditions are jointly satisfiable is itself unsettled.

#### 8.4.2 *A Positive Criterion for the Remainder*

§8.2.4 stated this as a direction; it is entered here as a problem because the counterfactual character of the present criterion may be ineliminable. A norm's resistance to conversion is a disposition, and dispositions are identified by what would happen rather than by what has. If no positive criterion exists, the account's central normative distinction is permanently retrospective, and §7 inherits the consequence.

#### 8.4.3 *The Formal Treatment of Self-Reference*

§3.5.3 identified self-reference as the limit belonging to the social case alone. Participants read the constraint under which they act; the readings enter the field; and the readings differ between participants, so that the coarse-graining relating the field to its description is neither fixed nor single-valued. No formal apparatus for this situation has been offered here, and the physical borrowings supply no precedent, the metric having no opinion about its own value.

#### 8.4.4 *The Conditions for a Slow Manifold*

§5.6 partitioned the applicability of the two descriptions by distance to a boundary of stability, and the partition rests on the existence of a spectral gap in the regime far from the boundary. Whether historical systems exhibit such a gap, or whether activity is coupled across scales at all times, is unsettled. If the latter, the fast-slow description of §5.3 loses its warrant and the epistemic results derived from it require reconstruction on the cascade description alone.

#### 8.4.5 *The Character of the Approach to Criticality*

The last problem is the most consequential and the one where premature resolution would do most damage.

The account holds that the slow variable drifts toward a boundary of stability, and it does not explain why the drift occurs. Two possibilities are available. The drift may be driven, so that the slow variable is carried by influences that could equally have carried it elsewhere. Or the system may organize itself toward the boundary, so that the approach is a consequence of the dynamics rather than of what acts upon it.

The second possibility has an attraction that should be regarded with suspicion. If the institutionalization that consumes the inertial range is itself the drift toward criticality, then Claim 7 and the criticality condition describe one process from two sides, and optimization is self-undermining in a strong and elegant sense: it would not merely damp the disturbances on which update depends but carry the system toward the state in which the remaining disturbances become decisive. The elegance is exactly why the possibility is entered as a problem. Establishing it would require an argument this paper has not made, and adopting it without one would supply history with a tendency, which is the boundary treated next.

## 8.5 *The Boundary Against Teleology*

### 8.5.1 *The Form of the Distinction*

The account is dialectical and declines to be teleological, and the distinction requires statement, since the vocabulary of transitions between configurations can be read either way.

A teleological account holds that the movement of history is directed toward a terminus, whether by the self-development of an idea, by the realization of a potential, or by convergence upon an end. The present account holds that a configuration gives way when the relational conditions sustaining it cease to sustain it. The negation is supplied by the conditions rather than by what the configuration is developing toward, and the successor configuration is whatever the dynamics produces rather than what the process was for.

### 8.5.2 *The Observation Point That Teleology Requires*

The account excludes teleology by a route more specific than a declaration of preference, and the route is worth stating because it connects the exclusion to the epistemic results.

A teleological reading of history requires a position from which the direction of the process is visible. Hegel's philosophy of history supplies such a position, and the supply is not incidental: an account in which the process is directed requires that the direction be legible from somewhere, and the philosopher who reads it occupies the required place. §4 denies that any such position exists within the system, and §3.1.1 denies that one exists outside it. Teleology thereby loses its footing in this framework for the same reason that the cybernetic form was displaced in §5.2.3: both require an observer the ontology does not admit.

### 8.5.3 *The Points of Exposure*

Three points in the account are where teleology could re-enter, and each was closed by a specific measure.

An action principle would supply a quantity that history extremizes, and §3.5.4 declined to seek one. A control parameter would supply a direction of drift and, with it, a temptation to read the drift as tendency; §5.4.4 declined to construct one. And a self-organizing approach to

criticality would supply history with a state it seeks; §8.4.5 entered the possibility as an open problem rather than a result, for precisely this reason.

The three exclusions have a common form, and stating it makes the boundary a policy rather than a series of decisions. Each declines a formal construction that would license reading a tendency into the dynamics, and each is declined on the grounds that the construction is unavailable rather than that its consequences are unwelcome.

## 8.6 *Contact with Contemporary Work*

§2 was retrospective, treating what the surveyed traditions achieved. This subsection is prospective: it identifies what those traditions are presently working on, where the account developed here bears on that work, and under what discipline the contact should be made.

### 8.6.1 *Questions Currently Under Discussion*

Several lines of contemporary work bear on the question of constraint update, and the following are the most direct.

The value-form tradition and the readings associated with it treat value as a social form rather than as a substance, and analyse the abstraction that makes commensuration possible. The associated notion of real abstraction holds that the abstraction occurs in practice rather than in thought: exchange abstracts from the particularity of what is exchanged, and the abstraction is performed by the transaction rather than by the observer.

Work on platform economies and on data as a condition of production examines an extension of measurement into domains that had not been measured, together with the forms of rent and control that follow.

Social reproduction theory examines the domain of activity on which production depends and which the analysis of production had excluded, and asks how the exclusion is maintained.

Ecological work in the tradition analyses the rift between social metabolism and the natural conditions it depends upon, and treats the rift as a consequence of the specific form the social process takes.

Post-Marxist work continues to develop the analysis of hegemony and contingency, and work associated with accelerationist positions asks what technical conditions make which political forms available.

World-systems analysis continues its examination of long waves and hegemonic succession, and the debate over microfoundations that followed the analytical current remains live.

### 8.6.2 *The Common Limitation and the Rereading It Permits*

The diagnosis of §2.4 extends to this body of work, and the extension is the ground on which contact is proposed. In each case the fact of constraint update is registered and its mechanism

is left unspecified. Value-form analysis explains how the abstraction holds without treating how the boundary of the expressible moves. Post-Marxist work replaces necessity with contingency, and contingency states the openness of the outcome rather than the process producing it. Ecological work describes the rift as consequence without treating the scale structure of its occurrence. Social reproduction theory identifies the excluded domain without treating how the exclusion is maintained by the grammar that excludes it.

One rereading is worth stating in more detail, since it is an act of recognition rather than a correction. The tradition's accumulated contradiction has been treated as the cause of rupture. On the present account it is the drift of the slow variable toward a boundary of stability, with the trigger supplied separately and selected by the criterion of §4.4.2. The rereading gives the tradition's term a precise dynamical content and assigns the causal work to two factors rather than one, which is a division of labour neither account had alone.

### 8.6.3 *Points of Contact*

Five pairings follow, and each is a hypothesis of translation rather than an identification.

Real abstraction may correspond to the constraint on expressibility of §3.6.1, both concerning what a practice makes sayable. Metabolic rift may correspond to the consumption of the inertial range by dissipation, both concerning a transfer that has been severed. Hegemony may correspond to the expressive coupling of §6.2.1, both concerning the supply of the vocabulary in which a subject's situation can be formulated. The measurement of previously unmeasured domains in platform economies may be an instance of Claim 7, and §8.2.5 recorded it as the most accessible empirical target. And long waves may correspond to the relaxation times of the slow variables of §5.3.1.

### 8.6.4 *The Discipline of the Contact*

Each pairing requires the qualification that a translation is proposed rather than established, and the first is the case in which the qualification carries most weight. Real abstraction and the constraint on expressibility arise in incompatible settings: the former presupposes an analysis of value in which the present account takes no position, and the resemblance between the two concepts is a resemblance of role rather than of content. Writing the pairing as an equivalence would import commitments this paper has declined to make.

The discipline applies to all five. What is proposed is a point at which two vocabularies may be brought into contact, and what would establish the contact is work in which a phenomenon is described in both and the descriptions are compared. Until that work is done, the pairings indicate where to look.

The relation the account seeks with these programmes should be stated in closing, since a first paper proposing a framework is easily read as claiming to supersede what it surveys. The claim made here is narrower. Each of these programmes has an account of what constrains

action and a description of how constraint gives way; what the present framework offers is a mechanism for the second, stated in terms general enough to be attached to more than one account of the first. What it receives in return is the substantive content those programmes supply, without which a mechanism theory describes a form and never a history.

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*A note on method.* The formal statements in this paper carry the three grades distinguished in §5.1.3, and no statement has been given a grade higher than the argument supports. Equations (2) and those following it exhibit forms; they are not solved, and nothing is derived from them that the prose does not derive independently. Where a quantitative construction was available and would have lent the account an appearance of rigour it has not earned, the construction was declined and the refusal recorded: §3.5.4 for an action principle, §5.4.4 for a control parameter, §5.7.3 for a dimensionless group. The account would be strengthened by any of the three, supplied with its own justification. It would be weakened by their assumption.

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