After structure: Expression in built form

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The concept of the ‘inverted genotype’ occupies an important place in the space syntax literature. Since its conception, however, this has been associated with a particular structuralist reading which - inasmuch as it contradicts central structuralist principles - is problematic. This paper puts forward a different reading of the inverted genotype, drawing on the expressive philosophy of Baruch Spinoza. It advances an expressionist approach to the problem of built form, effectively shifting from a structuralist towards a Spinozist perspective.

**Keywords:** Typology, space syntax, inverted genotype, minimal initial system, expression.

**Introduction: The dual problem of morphology**
Architectural typology - the exercise of identifying, analysing and taxonomising architectural form - is arguably one of the most important analytical trajectories within the field of architecture. At its most basic, the typological enquiry may be characterised as an attempt to devise a method for defining and classifying architectural form. The logic of this operation is to discern a set of more or less homologous (structurally similar) properties across a given sample of spatial arrangements, whether buildings, compounds or cities. In this sense, the typological analysis of architectural form may be seen as part of a wider exploration of ‘morphology’; the latter being an umbrella term for enquiries analysing homologous properties in a range of phenomena including botanical, biological, and artefactual forms. The morphological enquiry turns on two fundamental problems: that of morphoanalysis and that of morphogenesis. The former concerns the problem of identification in form and relates to the static properties particular to a given form. The latter concerns the problem of formal ontogenesis, and therefore relates to the dynamic processes involved in the production of forms.

Whilst analytically discernible, the two problematics are fundamentally interrelated. The question of form inevitably begs the question of formation and so one needs an understanding of the latter to comprehend the former. This is a principle that is shared by all morphological enquiries. However, the actual forces involved in the morphogenetic process vary greatly from field to field. Comparing morphogenesis in biology with morphogenesis in architecture, for instance, one soon realises that these phenomena express entirely different morphogenetic logics. Whereas the scientist analysing a biological form may pursue the question of formation via notions of genetics, lineage and environment, these concepts seem maladjusted when transposed to architecture. The architectural theoretician therefore must approach the question of morphogenesis from a different angle.

One popular way of exploring architectural morphogenesis is via sociologically or anthropologically informed enquiries. Here, the imprints of society are sought out in the structural makeup of a given spatial reality. Enquiries of this nature tend to follow the procedures made popular in the structural anthropology of Levi-Strauss (1963), their concern with ‘society’ giving their analyses a characteristically anthropocentric focus. Compared to the merits of biological analogy, such anthropocentric approaches appear to suit the architectural enquiry well. Architectural form after all constitutes
a kind of artefact, and artefacts are by definition human-made, so exploring the morphogenetic logics of the architectural artefact through the lens of society would seem to make sense. However, a case may be made that the problem of architectural morphogenesis is somewhat more complex than that, and that crucial nuances concerning the logic of architectural form are overlooked when adopting this approach.

The problems derive from the assumption that the finished architectural entity be defined in accordance with some abstractly defined and ontologically anterior social template. This effectively takes away any inherent principles of formation from the architectural artefact itself, reducing it, as it were, to the reification of a form that precedes and is foreign to it. The architectural artefact thus merely represents the culture from which it is believed to be derived, thereby expressing no logic of its own. For the analysis of cities, this quickly reveals itself as unsatisfactory. Cities constitute a group of artefacts whose morphogenetic process typically unfolds over centuries. Their form furthermore is rarely due to a single recognised designer or artificer but the result of a communal effort. One could, therefore, expect an individual city to be defined more or less exclusively by the culture that it derives from. Yet, as space syntax research shows, this is only rarely the case. In fact, a disproportionally large number of cities appear to converge towards a similar formal principle irrespective of culture (Hillier, 1996, p.262-264). Such empirical findings indicate an insufficiency in anthropocentric models and provide evidence in support of the existence of some inherent drive or principle operating within the architectural entity.

This paper outlines a model that aspires to describe the problem of architectural morphogenesis in more satisfactory terms. Providing a philosophical rather than an anthropological perspective on the question of architectural form and formation, it will draw on the work of Hillier and Hanson on architectural form and space syntax, reading this alongside the modal philosophy of Dutch philosopher, Baruch Spinoza. The point of the exercise is to highlight a compatibility between these philosophies as regards form and formation, and to thereby exhume a more suitable conceptualisation of architectural morphogenesis to that deployed in structuralism. This aim informs the structure of the paper which is divided into three major parts. The first part provides an overview and critique of structural anthropology and space syntax’s relation to it. The second discusses the key notions of Spinozism and their relevance to the question of form and formation. Lastly, the third part discusses the overlaps between the two theories and notes some implications for current space syntax research.

Central to the analysis is the syntactical concept of ‘the inverted genotype’. This is a concept that Hillier and Hanson (1984) deploy against the models of structural anthropology; it therefore constitutes a useful starting point for the enquiry that this paper carries out. The inverted genotype is often deployed on its own, but this paper will argue that at least three other concepts must be introduced to adequately understand it. These include the notions of ‘the minimal initial system’, ‘description retrieval’ and ‘morphic languages’. Taken together, this group of concepts – which the paper will refer to as ‘the genotype doctrine’ – presents a model for theorising form and formation that the paper finds reminiscent of the modal philosophy of Spinoza. It thus forms a crucial bridge between the critical first part of the paper and its model-building second and third parts.

The problem with structuralism

The relationship between anthropological structuralism and space syntax is a vexed one, with Hillier and Hanson sometimes critiquing structuralism, sometimes appearing to endorse it. The structuralist
principle that interests Hillier and Hanson is that according to which the architectural entity may be said to be informed by a prior anthropological blueprint, or rule. They are obviously interested in circumventing this principle, but before doing so, acknowledge its explanatory value in certain, limited cases. These are cases where the spatial form may reasonably be said to be defined more or less completely by an anterior social principle. To support this argument Hillier and Hanson discuss the compound of the Bororo community – an Amerindian tribe that is also the subject of a famous study by Levi-Strauss (1974) – finding the morphology of this compound to be a reflection of the complex social relations entrenched in the community (Hillier and Hanson, 1984, p.213-222).

This, then, is a spatial arrangement designed to express or rather reflect a prior social order. To the extent that its morphology is expressive of anything, it is therefore of an anterior anthropological principle; one that is detached from the architectural reality that it is thought to impose itself upon. The problem with the structuralist explanation arises when, leaving such special cases aside, other architectural artefacts are investigated. As Hillier and Hanson point out, only in a few architectural arrangements may a clear and distinct representational principle of the kind structuralist anthropology evokes be discerned. Indeed, architectural artefacts seem to be distributed within a much wider spectrum of spatial solutions – one which ranges from the representational to the non-representational – with the particular instance of the Bororo compound being a case of extreme and statistically insignificant representationalism. As one departs further from this representational end of the spectrum, it becomes increasingly difficult to find a clearly defined prior design principle, and explaining spatial arrangements as direct reflections of society therefore becomes untenable.

It is important to note that non-representational architectural entities are not necessarily devoid of formal order. Indeed, some of these seem to converge towards structurally similar forms without such forms being grounded in a representationalist order; see for instance, the discussions of configurational forms such as ‘the beady ring’ and the ‘deformed wheel’ (Hillier and Hanson, 1984, p.10; Hillier, 1996, p.262-282). This suggests a different process of morphogenesis to that imagined by structuralist anthropologists. Far from being imposed on the architectural artefact in a top-down manner, these are structures that grow into their morphological shape by following certain ‘laws’ particular to the architectural reality itself. ‘In some cases’, write Hillier and Hanson, ‘the question as to why a particular society adopts a particular settlement form is answered not in terms of some social or economic function, but by saying that, given some initial conditions and a consistent process of aggregation, the settlement form is a product of autonomous spatial laws, not of human determination’ (Hillier and Hanson, 1984, p.200; emphasis added). This is an altogether different design principle to that proposed by structural anthropology. It evokes an autopoietic principle operating within the architectural entity itself rather than the imposition of a prior rule or form, and as such, it constitutes a completely different way of conceptualising the formation of the architectural artefact.

Hillier and Hanson’s critique of structuralism hinges on its evocation of what might be termed a ‘cookie-cutter approach’ to morphogenesis, i.e. of abstract structures determining in a ‘mechanical’ way the morphological reality of the architectural entity. Their solution, however, is not to discard structuralism but to find within structuralism another principle of formal organisation that better tallies with their findings. In so doing the authors take inspiration from Levi-Strauss’ account of ‘mechanical’ and ‘statistical’ systems; two archetypical forms of social morphogenesis found to operate in marital systems
Notes:
1 See also Hillier (1996, chapter 7).
2 Hillier and Hanson (1984, p.202-206) themselves discuss this – see in particular their section on ‘abstract materialism’ – but without drawing the necessary conclusions.
3 See also Bafna (2012), Griffiths (2011) and Hanna (2011) for contrasting theoretical considerations of the syntactical concepts of genotype and inverted genotype.
4 Hillier in fact disavows such ‘Lamarckian’ design principles on numerous occasions (e.g. Hillier and Leman, 1973, p.507; Hillier, 1996, p.297-301).

(Hillier and Hanson, 1984, p. 202-206). They employ these two kinds of systems – of which one is constituted by a linear and identitarian principle of formation, whilst the other is constituted by a more open-ended and non-linear principle – in what might be seen as an attempt to reinvent structural anthropology from within. Their method is to first seize the stochastic principle of morphogenesis originally developed with respect to social structures, then transpose it to the discussion of structure in architectural form. It is however less certain whether such a transposition is in fact compliant with the principles of structural anthropology. If structural anthropology asserts a certain principle of stochasticity operating within the genesis of marital relations, it crucially does not extend this to the world of material things. This omission has to do with the relationship that exists between social fact and artefact – between society and its material reifications – in structuralism.

One of the fundamental tenets of the structuralist model is that social fact and artefact stand in an asymmetrical relationship to each other; the former inscribing itself, as it were, in the latter2. It is therefore not dynamical conditions or non-linearity that are foreign to structural anthropology, but the very idea of extending these principles to non-anthropic entities. It follows that if an open-ended and dynamic principle may be introduced by structural anthropology in the realm of social relations, it cannot simply be extended to artefacts since to do so necessarily undermines this asymmetrical relationship.

The genotype doctrine: Morphic languages, minimal initial systems and the open-ended exploration of spatial realities

If the reworked structuralist model deployed by Hillier and Hanson is contradictory, can another theoretical principle be found which better explains the manifestation and perpetuation of formal order in non-representational architectural entities? Answering this question demands taking a closer look at the notion of the inverted genotype and what this paper refers to as ‘the genotype doctrine’, i.e. the network of concepts formed by this concept with the notions of the minimal initial system, description retrieval and morphic language. The concept of the inverted genotype designates a deep morphological tendency (or shape) in which a series of individuals participate. It is this relationship between deep archetype and individual instance that leads Hillier and Hanson to the problematic territory of biological analogy, i.e. that the morphological tendency is a ‘genotype’ and the individual manifestation its ‘phenotype’ (see Steadman, 1982, for a critique of biological analogy in architecture)3. Unlike the genotypes theorised in biology, however, the formal principle that Hillier and Hanson have in mind is not internal to the architectural object, at least not in the sense that a string of DNA may be said to be internal to a cell in the biological body. Neither, however, is it located on the outside of the object; if that were the case the explanatory models of structural anthropology would be valid.4 Their original resolution to the problem points to a non-hereditary kind of internal principle; one that emerges from an ‘outside’ and is then internalised in an ‘inside’.

This ‘outside-to-inside’ process may only be explained when comprehending the notion of the genotype alongside a series of other concepts with which it makes up a shared proposition or doctrine. The first of these is the notion of ‘morphic languages’ (Hillier et al., 1976, p.149-153; Hillier and Hanson, 1984, p.45-49); a concept which designates a group of languages characterised by their more or less discernible structural or ‘syntactic’ patterns. The term is quite generic, and effectively encompasses any kind of system where such patterns may be discerned. A morphic language thus may be a particular structure of social relationships, but it also may be a particular pattern of spatial relations. The broadness of the notion may be seen as problematic, but it also points to a crucial element
in space syntax theory inasmuch as it reflects the fundamental syntactic conjecture that society is spatial just as (architectural) space is social. It therefore designates the common ground that society and space must be able to pass through in order for space to have a social logic and vice versa. Significantly, morphic languages are of such a nature that they may be ‘retrieved’ from a particular configurational reality and then reinvested in another. This process – known as ‘description retrieval’ – is important insofar as it allows a given pattern to be retrieved, redeployed and perpetuated thereby engendering a new type. Description retrieval thus facilitates the movement from experimental phenotype to obdurate genotype.

Morphic languages must not be thought of as representing a particular idea or form that comes before them. Rather, they are emergent phenomena that constitute that particular reality. They therefore draw on no prior model, expressing instead a series of material events whose otherwise heterogeneous logics they subsume and bring to order (if only momentarily). Such an emergent logic may be more or less rule-bound, but according to Hillier and Hanson is ultimately guaranteed by a random process of aggregation and subtraction operating from no prior guiding principle. This ‘random, ongoing process’ (Hillier and Hanson, 1984, p.205) – sometimes referred to as ‘the minimum setup’ (Hillier et al., 1976, p.150), sometimes as ‘the minimal initial system’ (Hillier and Hanson, 1984, p.49) – is imagined as a pure state of formation in which material bodies (both human and architectural) collide, with tentative formal arrangements arising from these collisions. The minimal initial system is, in this sense, a driver of formal genesis even if the forms that it produces are only solidified at a later stage, namely in the constitution and reproduction of a genotype. In this sense it is likeable to an ideal ‘preformal state’ in which the random collision of bodies is the norm and the emergence of metastable patterns the exception.

The concepts of the minimal initial system, the morphic language and description retrieval make up the preconditions for the establishment of the architectural genotype. Taken together, they define a process of formation in which forms emerge spontaneously from the stochastic encounters of bodies and are then selected or ignored by a given social group. In this way, the desired movement from a preformal outside to a formal-architectural inside is achieved in a manner that bypasses anthropocentric models of representation. Unlike structuralism, where forms radiate from a social to a spatial reality, the genotype doctrine thus affirms a kind of expressive tendency inherent to the architectural reality itself. Space, as Hillier and Hanson write, is not ‘a by-product of something else whose existence is anterior to [...] and determinate of it’ (Hillier and Hanson, 1984, p.5; emphasis added). Rather, it is a profoundly productive material state-of-affairs which carries within itself the principles of formal genesis, thereby making building types something else and something more than the docile recipients of a structural form. Crucially, the genotype doctrine is no marriage structure. It is a morphic structure, a concept that extends to both social and artefactual reality while privileging neither. As such, it concerns a problematic much wider in scope than the structuralist enquiry may support.

**The question of form and matter in space syntax**

This characterisation of architectural morphogenesis as the spontaneous emergence of form from an open-ended process of formation opens a second front for space syntax: namely against end-governed design-principles. Such principles are primarily known from Aristotle – and it is exclusively his formal philosophy that is discussed by space syntax (cf. Hillier et al., 1976, p.151; Hillier and Hanson, 1984, p.205-206; and Hillier, 1996, chapter 10) – yet the principle of end-governed creation is an integral part of the whole peripatetic
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tradition stretching from Aristotle via the Neoplatonists to medieval scholasticism. If end-governedness or ‘teleology’ forms a crucial counterpoint to the doctrine of the inverted genotype it is because it invokes an ontology in which things strive towards a predetermined end – for example, the way the acorn strives for its realisation in a tree, or Man for coexistence in society – with this end effectively guiding the formation of the thing. The ‘end’, then, is a dynamic but also immutable principle driving individuation. Devoid of a principle of formal experimentation, it invokes a ‘final cause’ that guides the ontogenetic process the way a blueprint guides a builder. Whilst a certain level of material efficacy is acknowledged in this process – a tree for instance cannot grow where there is no sun, or where the soil is not fertile – it is as a reactive rather than active principle. This demotes the efficacy of material causes, and the genera and species that Aristotle discusses are therefore locked in rigid schemas of development determined by their final causes (e.g. Aristotle, 1984, p.338-358).

It is easy to see why space syntax finds itself in opposition to this ontology. Aristotelian teleology is fundamentally incompatible with the open-ended process of the minimal initial system which, for its part, explores a principle of formation closer in logic to those found in various ‘materialist’ enquiries, e.g. the materialist philosophy of ancient Atomists (e.g. Lucretius, 2007), the expressive philosophy of Spinoza (1996) and the more recent philosophy of difference associated with Gilles Deleuze (1968) and Gilbert Simondon (1964). It would have been interesting if space syntax had drawn on these philosophies in contextualising the genotype doctrine, but Hillier prefers a much less obvious source of inspiration: Newtonian physics, more specifically, the principle of inertia (Hillier et al., 1976, p.151; Hillier and Hanson, 1984, p.205; Hillier, 1996, p.296-305). This is an odd choice seeing as the principle of inertia concerns movement rather than form. The rationale behind it seems to be that the principle constitutes a kind of causal-mechanical interaction that is compatible with the design principle described by the genotype doctrine because it is not grounded in either a substantial form or a final principle. Newton’s universe thus is not governed by ends – i.e. metaphysical goals or purposes – but by mechanical movement and the stochastic encounters to which these may give rise.

There are, however, at least two problems with using Newtonian inertia as a model for the design principle that Hillier has in mind. Firstly, it is never explained how the concept of inertia – a principle of movement – may be translated into a principle of formation or design. At a push, mechanical collisions may be employed in explaining the momentary emergence of a form but this cannot explain its perpetuation over time. The principle of inertia might thus explain how a given form materialises from the random material collision of a series of bodies at a time, $t_1$, but not how this form retains its shape from $t_1$ to $t_2$. In order to explain this, it would be necessary to introduce an emergent ordering principle that could compel the different bodies to retain the global shape over time, thereby bestowing on the form a principle of endurance. It is effectively the emergence of such an ordering principle that characterises the movement from outside to inside described earlier, yet one searches in vain for such a principle in the *Principia*. What is more, Newton’s discussion of the problem of design surely would disappoint Hillier. A ‘Natural Philosopher’, Newton subscribes to a deist cosmology which ultimately sees the order of the universe guaranteed by a divine and benevolent agent (see for instance his correspondence with Bentley (1756)). This squares rather awkwardly with Hillier’s random genesis of form and his disavowal of the ‘unmoved mover’ evoked by Aristotle (Hillier, 1996, p.294-297). Secondly, it is uncertain why the principle of inertia is deemed to be better suited for the job than other
similar principles. Newton, in fact, is not the first to describe a universe of mechanical collisions. A whole series of philosophers and scientists pre-dating him have described similar scenarios – in physics: Buridan, Benedetti, Kepler, Galileo; in philosophy: Democritus, Epicurus, Lucretius – yet these are neither mentioned nor discussed by Hillier.

**Spinozism and architectural form: The genotype as mode**

Taking stock of the theoretical landscape in which the genotype doctrine is situated, several paradoxes thus emerge. There is the paradox of the designation itself, with the principle stipulated by the doctrine in fact going against the biological definition of genotypes. There is then the unsatisfactory discussion that space syntax engages in with structuralism and the meagre results that this engagement yields. Lastly, there is the problem of defining a credible anti-Aristotelian position; one which may account for the emergence and perpetuation of forms from mechanical encounters. It is clear that what Hillier and Hanson have in mind is a formal principle that can describe the emergence of forms from an ongoing random process. ‘Without the anteriority of an unordered reality,’ they write, ‘we would be forced into an Aristotelian stance, assuming as natural that which needs to be explained’ (Hillier and Hanson, 1984, p.205). But the claim that the principle of inertia ‘allows a formal theory to emerge unencumbered by the metaphysics of ultimate causes and unmoved movers’ (Hillier and Hanson, 1984, p.205) is unconvincing.

Ultimately, this is the central problematic around which the whole of the genotype doctrine turns: how can the process of formation give rise to certain forms without taking these forms away from the random variations of the minimal initial system? How can one have both formal variation and perpetuation, difference and repetition, without the one compromising the other? This paper believes that a resolution exists to this problem and that it is to be found in the writings of Spinoza.

More specifically, it will try to show that the inverted genotype may be likened to a ‘mode’ in the Spinozist sense of the term, and that the particular form of modal individuation that Spinoza discusses in Parts I and II of the *Ethics* offers a satisfactory model for the description of the movement from outside (minimal initial system) to inside (genotype) that the genotype doctrine implies. In order to make these points, the paper will first have to introduce and mobilise certain key terms from the Spinozist lexicon – substance, attributes, modes – even if such an introduction can only be cursory. This is a necessary exercise as it is impossible to understand modal individuation without first grasping how substance relates to the attributes and the attributes to the modes. Only once the relationship between these concepts has been defined can the paper establish in more detail their relevance to the particular problem of form and formation. This task is undertaken in the sections that follow.

**De Deo: From the infinite power of God or Nature to the partial power of his modal expressions**

The first part of the *Ethics* is entitled *de Deo*. It discusses God – an infinitely powerful being that Spinoza equates with ‘substance’ (ElI6; Elp11) – and prepares the ground for the detailed explication of modal individuation and interaction that follows in the subsequent parts. Substance is characterised by its uniqueness (there can only be one substance), its absolute infinity, and its eternal nature (Elp11-14). Significantly, substance also exists necessarily (Elp11dem; Elp17corol1), which is to say that it cannot be created or extinguished by any other thing (Elp6). As nothing can cause substance to exist or to cease existing, it is said that the essence of substance involves existence (Elp7; Elp7dem). This being so, substance must be the cause of itself or *causa sui* (ElI1), and it therefore is
understood to cause or produce itself. God’s ability to cause himself may be seen as an expression of his infinite power (Elp11dem). Indeed, the essence of God, Spinoza writes at the end of de Deo, is identical to his power (Elp34). This has led some, e.g. Matheron, to theorise Spinoza’s philosophy as ‘an ontology of power’ (Matheron, 2000, p.197) and the notion of power is indeed central to the treatise. Above all, this power is a causal or productive power and God or substance in a sense becomes a byword for pure productivity. Participating in God or substance therefore means participating in an ongoing process of production; a process which, according to Spinoza (Ep. XII), has no starting point or end point (it is an infinite series), something which subverts the idea that God – or anything else – may be a first mover. ‘All the things’, writes Gueroult, ‘are in God which is to say in a state of productive causality [cause productive]’ (Gueroult, 1968, p.341; this author’s translation; cf. Carraud, 2002, p.472-473; Laerke, 2008, p.642-650).

Attributes express a particular and distinct aspect of substance (EId6; Elp10schol). By EId6, there is an infinity of attributes, yet Man only has access to phenomena unfolding in two of these: the attribute of Extension and the attribute of Thought. The latter expresses all the ‘thoughts’ in nature (the notion of thought referring to both a cognitive phenomenon and a modal essence) and outside of it there can be no thoughts or essences; the attribute therefore is said to be infinite in its own kind. Similarly, the attribute of Extension expresses all bodies in nature, as well designating a phenomenon infinite in its own kind. Whilst the attributes are distinct, they explicate or express the same thing: God’s power. For this reason, the attributes may be said to express parallel realities in which the power of God is explicated in distinct but corresponding ways, e.g. as bodies and thoughts. That the realities that they express are parallel simply means that the attributes explicate the same cause from different but corresponding perspectives. In this sense, a mode expressed in the attribute of Extension (a body) will have a mode that corresponds to it in the attribute of Thought (an essence), and indeed in every other attribute. Whilst the attributes express the same thing, the way they express themselves – their modi operandi – differ fundamentally. God thus produces differently in the different attributes. The attribute of Extension expresses itself in an infinite causal chain where extended bodies collide with and recoil from each other; this is sometimes referred to as ‘the common order of Nature’ (e.g. Ellp29corol). The attribute of Thought, on the other hand, is expressed in a non-causal noetic reality in which an infinity of thoughts are implicated with one another in what constitutes the mind of God6.

If an attribute is something that expresses God or substance in a distinct but nevertheless infinite way, the ‘finite modes’ express the power of God in a finite and determinate form (EId1; Elld7). The limitation of its nature means that the mode is different to God or substance on several counts. Unlike God or substance, the essence of a mode does not imply existence (Elp24). Existence therefore does not pertain to the essence of the mode as it does to substance. Rather, the mode must be determined into existence by another force. Ultimately, this determination comes from God or substance who is the principal (but not ‘primary’ in the aristotelian sense) cause of all things (Elp16corol.3). Yet the way the mode is determined differs from attribute to attribute. A mode expressed by the attribute of Thought is determined immediately, that is, without a mediating cause. Substance simply causes it to appear in the infinite mind of God through a process that involves no intermodal causation7. A mode expressed by the attribute of Extension, however, is very much involved in a causal reality. Unlike a thought, the existing mode is determined into existence by the infinite series of causal events unfolding in the common order of Nature. It is thus
brought into existence by another mode, which itself was brought into existence by another mode, and so on to infinity (see Elp28). As such, it is produced mediately – by way of an infinity of other extensive modes – rather than immediately.

The means of production is not the only difference between the modes. Modal existences or bodies ‘endure’ which is to say that they have duration and are finite. More specifically, they are engendered in the common order of Nature in which they exist until they are annihilated. Modal essences are not involved in such a causal reality and thus are characterised not by transience but by eternity or ‘sempiternity’ (cf. Gueroult, 1968, p.309).

**Essence and existence: Thought, body and conatus**

Having provided a brief overview of the most important concepts of the Ethics, it is necessary to further explicate the relationship between the essential mode and the existing mode. As was just shown, the two are parallel – expressing the same thing (God’s power) under different attributes – but how do they relate to each other? Spinoza explains that essences are thoughts or ideas that an existing mode or body has of its own being (Elp13; Elp13dem.; Elp13schol.). Following the principle of parallelism, one may say that an idea implies noetically what the body expresses corporeally. But this is still too abstract. A better way to conceptualise the relationship is to reaffirm that the modal thought is in fact an essence that corresponds to the modal body. More specifically, the essence or thought may be said to designate an abstract pattern or structure [fabrica] that the body strives to realise and stabilise in the common order of Nature. Given that a body will be made up of other bodies, the essence of the body may thus be defined as a particular relationship [ratio] between bodies. This resembles a morphological syntax of sorts, if by ‘syntax’ one understands a particular relational state. This is an apt comparison. As Spinoza asserts in the ‘little physics’ inserted in Part II of the Ethics, a body is characterised by a particular relationship of ‘movement and rest’ that it imposes on certain other bodies (Elp13lemma1). This relationship corresponds to its essence insofar as it constitutes ‘that without which the thing can neither be not be conceived’ (Elld2; emphasis added).

An existing mode will aspire to express to the fullest extent possible its own essence as if it were unaffected by other bodies. This, however, is not always possible. The existing mode is constantly brought into contact with other modes which influence and destabilise it. Insofar as such changes to the mode are not brought about by its proper essence, they are qualified as ‘passions’, i.e. as something the mode must suffer. Broadly put, a passion designates an alteration of the relationship between modal essence and modal existence brought on by a corporeal encounter. When two existing modes collide in the common order of Nature their bodies may either agree or disagree with each other. If the latter is the case, they will reject, impair or consume each other causing sadness in the modes or outright annihilation. But a mode does not just suffer; it also has a capacity for rejoicing. Joy occurs when the body manages to subsume within itself other bodies, or when it manages to engage in mutually beneficial relations with other modes (IIP7). When the latter occurs, new modal relationships are explored. When the former happens, the mode brings external bodies under its control, enslaving these according to a principle that agrees with its proper nature or essence. The mode may thus enslave other modes – something which amounts to exerting a kind of force or power [vis] on its immediate surroundings.

The identification of essence and power points to a central truth in the philosophy of Spinoza, one to which both mode and substance adhere. An essence – whether substantial or modal – expresses a power, and more specifically, a power
of causation. In this there is no difference between the essence of God and the essence of things and Spinozism thus takes on a ‘fractal’ characteristic. However, while substance cannot be caused by anything but itself, the existing mode – submerged in the common order of Nature – can and is. In this the two differ radically. What the essence of God expresses is a necessary existence – a power that is infinite and eternal. Conversely, what the modal essence expresses is a power of existence that is not necessary and that is finite and transient. Its power, rather, designates a form of perseverance (conatus) that pertains to the finite existing mode as long as it endures in existence (EIIIp3-6). This finite modal power might express little more than a small part of God’s infinite power and it might have received the vital impulse that brought it into existence from another mode (and ultimately from God). But in the end its essence is its own. It is a power that derives from its own nature and it continues to order the bodies that it subsumes according to this nature as long as it endures.

Beatitude: Modal individuation and the three kinds of knowledge

Modal power is thus central to the understanding of the mode’s persistence in duration. But it is also what enables the mode to engage in constructive encounters with other modes should their essences agree. This second aspect of modal power concerns not the perpetuation of already existing corporeal relationships but the spontaneous creation of new ones. How does this occur? Perhaps surprisingly, the answer to this seemingly ontological question is epistemological, that is to say, it involves different orders of knowledge. This in fact should not be surprising inasmuch as the thing that is being affirmed is a thought, yet the complexity of this phenomenon necessitates a closer examination. In order to adequately comprehend the way a modal essence is affirmed in existence, one must first understand the different kinds of knowledge that the Ethics mobilises. In EIIIp40schol.2, Spinoza defines three kinds of knowledge which he calls Imagination (knowledge of the first kind), Reason (knowledge of the second kind) and Intuition (knowledge of the third kind). As Deleuze has forcefully shown (1969, p.273-288; 1988, p.54-58), it is in comprehending the relationship between these different kinds of knowledge that the modal affirmation of a new essence (or ‘thought’) must be understood.

Imagination designates the cognitive outcome of the more or less random encounters that might befall the existing mode, these encounters corresponding to passions or ‘images’ in its mind. Whether they provoke sadness or joy in the mode, such imaginations do not provide the mode with an accurate comprehension of the mode that it encounters, nor do they express its own essence in a clear and distinct way. They therefore do not constitute an adequate form of knowledge, either of the mode encountered or of the mode itself, and so a more permanent relationship between the modes is excluded (by EIIIp25; EIIIp25dem; EIIIp26corol.). Reason operates in a radically different way. It establishes between bodies a common ground or principle – known as a ‘common notion’ [notione communes] (EIIIp37-40) – that these bodies may agree in. One may think of the common notion as the platform on which the premises for an ordered relation can be tentatively established between modes. It thus constitutes a zone of modal experimentation. A common notion may be simply that the two bodies agree in the fact that both are existing modes and therefore are i) extended things, and ii) subsume within themselves other bodies. But a common notion also may be more specific, thereby making possible a less general (and more durable) kind of agreement between the modes. When this is the case, the bodies will begin to adapt themselves to one another, thereby gradually entering into a relation of composition which will be more or less stable.
depending on the agreement between the modes and other local variations in the common order of Nature. In this way, an embryonic form of modal relationality is explored. However, at this moment it still is a matter of discrete bodies standing in an external if beneficial relation to each other and so an essential mode still is not actualised.

The moment a new mode is actualised only occurs with the transition to the third kind of knowledge, Intuition. Like Reason, Intuition concerns adequate ideas but unlike Reason these ideas are not general nor are they submerged in the common order of Nature. Where Reason concerns bodies, intuition concerns an essence, i.e. a powerful relational schema particular to an existing mode. The affirmation of an intuition signals the actualisation of an essence in duration; that is, the passing into existence of particular relational schema. The common notion paves the way for this actualisation, but it is only with an intuition that an experimental external relation is solidified in an essential and internal principle. When this occurs, the powers that pertain to the essences of the modes converge spontaneously and a new essence is actualised.

In this way, the transition from an external state to an internal state is facilitated. This is a beatific or joyful moment, but the joy that the mode experiences is not a passive joy as this may be experienced in the passions. It is – to the extent that it ensures the expression of a new mode – an active joy; one that proceeds from and corresponds to that mode’s essence or power. Crucially, such an active joy is not imposed from without but radiates from within the mode itself. Action thereby amounts to the spontaneous affirmation of a new essential relation in duration. The journey from Imagination via Reason to Intuition, then, is a journey of comprehension but also of modal individuation and affirmation. It describes a movement from passions to actions; that is, from affections that are still imposed from without (passion) to joys that radiate from within the essential nature of a mode (action). But it also describes the moment a new modal relation is realised in duration.

If this is said to constitute a ‘beatific’ or ‘blessed’ thing, it is because it manifests a link between the temporality of the common order of Nature and the eternity of Divine thought. ‘The word blessedness’, as Deleuze writes, ‘should be reserved for these active joys: they appear to conquer and extend themselves within duration, like the passive joys, but in fact they are eternal and are no longer explained by duration; they no longer imply transitions and passages, but express themselves and one another in an eternal mode, together with the adequate ideas from which they issue’ (Deleuze, 1988, p.51).

This, then, is the significance of beatitude in Spinozism: from the more or less random material collisions unfolding in the common order of Nature – animated as they are by the pervasive productivity that characterises Spinoza’s God – an ordering principle spontaneously emerges between a series of existing modes. This ordering principle is an essence, and it expresses the infinite power of God in a finite and determinate way. Whilst qualified as an essence, the ordering principle in fact does not refer
to a prior principle or ‘end’ but rather to a principle that emerges from the collective work of the modes themselves. Nevertheless, it enslaves these modes in a mutual relation until some material event causes this relationship to break down thereby bringing to an end the existence of the mode. Individuation therefore occurs when an eternal essence begins to express itself in duration, thereby actualising a new relation of movement and rest between bodies.

**Expression and built form**

Having discussed the processes involved in modal individuation and perpetuation, the paper may now return to its initial problem; that of outlining a conceptual framework for form and formation more congruent with the genotype doctrine. This framework needs to demonstrate that its explanatory potential exceeds that of structural anthropology and anthropocentric models of representation. It also must allow for the emergence of a formal principle from a random series of corporeal collisions and provide an explanation for corporeal perpetuation once a form has been actualised. Lastly, this must be achieved without inventing new formal principles or appropriating such principles from doctrines that in fact are not amenable to a discussion of form and formation. The argument advanced here is that the Spinozistic doctrine of modal expression provides exactly such a framework. Indeed, I believe it describes the formative process defined in the genotype doctrine more clearly than other doctrines in the philosophy of form. The contours of an expressive logic of architectural form and formation may thus be outlined.

This logic begins with the random collisions of bodies. In space syntax, this is the activity known from the ‘minimal initial system’; in Spinozism, it constitutes ‘the common order of Nature’. From these collisions, the tentative (but still unfulfilled) formation of a relationship between a series of bodies then takes place. In space syntax, this is designated as the ‘morphic language/phenotype’; in Spinozism, it is known as the ‘common notion’. From such probing attempts, a ‘form’ is finally affirmed, the latter thereby beginning to act in existence as an active principle of individuation. In space syntax, this occurs when the syntactic logic is retrieved and perpetuated first in a phenotype, then across a series of phenotypes thus engendering a genotype; in Spinozism, it is when an eternal essence affirms and expresses itself in existence, thereby actualising a metaphysical principle (the essence, understood here as a power) in the physical world (the extended body). Strictly speaking, there thus are two aspects of expression. There is an individuating aspect, whereby a relationship between bodies emerges. And there is a ‘conatic’ aspect, whereby that relationship is perpetuated in duration. Both of these aspects are relevant to space syntax. Together, they ensure that the movement from an experimental outside (the minimal initial system) to an expressive inside (the genotypical drive expressed in the phenotype) is accomplished and consolidated so that the bodies that once were external to each other come together in a relation that both endures and is entirely the architectural mode’s own.

To say that this formal relation is the mode’s own – that in fact it arises with it and pertains to it – is to say that the mode does not receive its form from an outside agent, whether that agent be ‘society’ or some other force. In fact, if there is any force at stake, it is the mode’s own; this force being identical to its essence and corresponding to a particular way of ordering material relations that emerges in the actualisation of the mode itself. A Spinozist essence then is an autopoietic essence: it arises from a material process that – spontaneously – it comes to dominate and order. Of course, this does not mean that the mode is not influenced by other forces. Being immersed in the common order of Nature, it is in a perpetual struggle with other modes – each of which expresses a force
of their own – and it only is able to exist as long as its existence is not in some way contradicted either by the network of modes that surrounds it or by the one that it subsumes. Ultimately, this is a question of distributed modal power-struggles and the emergent material resolutions to which these give rise. In the individual mode, such struggles may manifest themselves internally (disintegration or corruption) or externally (consumption or annihilation), and its continued existence depends on its ability to resolve such issues.

Whilst the Spinozist notion of modality may be employed with respect to a variety of syntactic notions (e.g. genotypes in housing, the beady ring), it is in fact a particularly apt analogy for cities as space syntax conceptualises them. According to Hillier, the ‘fundamental settlement process’ that is manifested in cities results from the implementation of a formal principle that emerges in and begins to express itself through the formal process itself (Hillier, 1996, p.264). Urban structures thus emerge from an ‘aggregative process in which built forms progressively construct patterns of open space’ (Hillier, 1996, p.282). In this sense, the actualisation of a global urban form may be said to arise spontaneously from an explorative formal process which it comes to dominate. Such systems are not stable and must constantly adapt to changes arising either internally in the configuration of their street-systems or in their external environment (e.g. the regional hinterland). The resilience that cities show to such challenges is a demonstration of their essential power; that is, of their ability to sustain a relation of corporeal movement and rest that corresponds to their essence. Local changes will be influenced by local and regional planning policies – that is, to measures implemented by society – but the way the city resolves such issues is not reducible to a social logic, sensu stricto. What is more, the way the city resolves local problems will have an impact on the ongoing formation of social relations that constantly unfolds within it. Not directly, but by influencing patterns of movement and interaction which in themselves hold a sociogenetic potential.

A dual form of expressivity thus takes place: that of the urban spatial system, and that of the urban social system. Ultimately, these are systems systems gravitating around each other without the one being reducible to the other, and foregrounding either therefore constitutes an analytical error. This complex relationship between society and space perhaps constitutes the key insight of space syntax; one that this author finds conveyed neatly in the expressive logic of Spinozism where modes adapt to each other in an open-ended process.

It is debatable whether this complex expressive logic is pursued in a satisfactory manner in the Durkheimian brand of sociology currently being revived by space syntax scholars (e.g. Marcus, 2015). Durkheim, of course, holds an important place in the space syntax pantheon, his ideas being discussed by Hillier and Hanson with respect to encounter patterns and social organisation. There even are sections in his manuscripts that discuss ‘the geographical space that society appropriates’ (Durkheim, quoted in Marcus, 2015, p.4). But there are also limitations to the Durkheimian approach to space. Most problematically, there seems to be no concepts for describing the open-ended formal process that leads to the establishment of different morphological types. One therefore ends up exploring the morphological influence on encounter patterns without an understanding of the morphogenetic process that informs it. Durkheim’s habitual foregrounding of what is known as the ‘social fact’ makes the affirmation of such a spontaneous artefactual principle difficult, and one searches in vain for principles of artefactual autopoiesis in his oeuvre. The argument advanced in this paper is consistent with the position of Leroi-Gourhan – one of the great thinkers of the relationship between technology and society – in his critique of the way technology is

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8 See also Liebst, L. (forthcoming) ‘Reassembling the Durkheimian sociology of space’ in S. Griffiths and A. von Lünen, Spatial Cultures: Towards a New Social Morphology of Cities Past and Present. Farnham, Ashgate.
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perceived in conventional sociology. With explicit reference to Durkheim and Mauss, he writes: ‘While Durkheim and Mauss cavalierly [luxueusement] defend “the total social fact” they have merely assumed the existing techno-economic infra-structure’ (Leroi-Gourhan, 1964, p.210; this author’s translation). I would expand on this statement by asserting that theoreticians of the social fact tend to ignore the theorisation of the artefact – i.e. the particular logic that it expresses – with a tendency to make their analyses one-dimensional and unsatisfactory.

To those interested in exploring the complex relationship between artefact and social fact, Leroi-Gourhan’s own Gesture and Speech I & II (1964; 1965) provides a contrasting perspective to that of Durkheim. In this two-volume work, Leroi-Gourhan describes the many material and technological processes involved in the production of an artefact (Tome I: Technics and Language), and the way artefacts act back onto the ongoing formation of the social group without its proper logic being in any way reducible to it (Tome II: Memory and Rhythm).

There are in fact many commonalities between his account and that of Hillier and Hanson (1984) as regards the theory of the architectural artefact. In Leroi-Gourhan, each technology or artefact is thus said to pertain to a given ‘technical lineage’ whose logic they express, just like Hillier and Hanson’s architectural phenotypes are said to participate in a genotype. Technical lineages furthermore express a certain ‘rhythmic potential’, a concept which is congruent with the space syntax concern for ‘natural movement’ (Hillier et al., 1993). Given the uncommon nature of his account, it is no small irony that Leroi-Gourhan’s description of urban artefacts – i.e. settlements, cities – is in alignment with the most representative accounts available. Indeed, the only kinds of built form that Leroi-Gourhan investigates are those that represent a prior cosmological or a social fact. However, this does not make an extension of his artefactual philosophy to the philosophy of built form impossible, provided that architectural forms are treated as artefacts and not social facts. Such a thought may even have been on Hillier and Hanson’s (collaborative) mind when they wrote The Social Logic of Space, the epigraph of which is a quote by Leroi-Gourhan. I am of the opinion that considerable rewards may be reaped from further exploration of the link between space syntax and Leroi-Gourhan (see Weissenborn, forthcoming). So far, however, this epigraph remains the only reference to this important philosopher of artefacts in the space syntax literature.

This paper has pointed out some of the deficiencies concerning the theoretical context in which the notion of the inverted genotype is developed by Hillier and Hanson (1984), and it has tried to establish whether a more satisfactory conceptual framework could be found in Spinoza’s doctrine of modal expressivity. The paper found that the formal principle of modal expression accommodates the genotype doctrine better than the theoretical architecture currently associated with it (e.g. structuralism, Newtonian physics), thereby highlighting aspects of this concept that are often neglected. More specifically, the process of architectural morphogenesis was found to be congruent with the beatific process of modal individuation as this is imagined by Spinoza. The problem of morphogenesis, however, only constitutes one of several fronts where space syntax and Spinozism may engage in fruitful dialogue. Putting processes of architectural formation to one side, Spinozism also has much to say regarding the effect that the architectural entity asserts on human movement and sociogenesis. This is significant inasmuch as it constitutes the other aspect of the problematic that space syntax deals with, viz. the social logic that space exerts on society. Spinozism thus offers a fully-fledged alternative to the theoretical models currently in space syntax theory whether those be structuralist, Newtonian or Durkheimian.

Notes:
9 The quote, rendered in the original French by Hillier and Hanson (1984), reads: ‘The foremost human trait is perhaps less the creation of tools than the domestication of time and space, which is to say, the creation of a human time and a human space’ (Hillier and Hanson, 1984, p.1.; this author’s translation).
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