

'AITIAI' CONCERNING GENETIC ART

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This paper adapts an essential aspect of Aristotle's concept of 'aitiai' suggesting an analogous interpretation in new media 'Genetic art' theory called the 'Proto – animate Condition.' I argue that fundamentally, causal properties underlying the concept of aitiai are characteristically pending action requisites and that this property is somewhat analogous to the causal properties of proto – animation.



Fig 1. proto-animate20, 2011, Andre Brodyk, gmos, semi-readymade chalk, variable. ©Andre Brodyk, Photo : Symbiotica.



Fig 2. john doe 0324, 2011, Andre Brodyk, transgenic E.coli, recycled timber, Plexiglas Petri dish, variable, ©Andre Brodyk, Photo : Andre Brodyk.

Introduction

This paper adapts an essential aspect of Aristotle's concept of 'aitiai' suggesting an analogous interpretation in new media 'Genetic art' theory called the 'Proto – animate Condition.' [1] The idea is therefore to ruminate on one aspect of aitiai within a contemporary translation rather than suggest an equivalence to Aristotle's overall philosophy.

I argue that fundamentally, causal properties underlying the concept of aitiai are characteristically pending action requisites and that this property is somewhat analogous to the causal properties of proto – animation. The Proto – animate Condition, which I will now refer to in this paper simply as the 'proto – animate,' is a novel concept on Genetic art, which I developed and is concerned with the inner causal properties of specific types of molecular materials and processes. Generically, these are called non – coding materials and they include introns, ncRNAs and pseudo genes for example and I explain why they are referred to as non-coding molecular materials. In fact the non – coding quality of these are crucial to the argument of the pending condition advanced here.

So I draw upon my interpretation of this essential condition of the ancient philosopher's cause theory, which entail the operations of internal factors to advocate a novel pending condition of matter and form understanding at the internalized structures at a molecular level.

From this molecular perspective, the aitiai causal responsibilities are therefore perceived of as existing in a pending, proto – animated causal state. This is one, which approximates the recondite proto – animate condition operating inside the genomic matter / form matrix of living organisms.

I begin with a brief interpretation of aspects extracted from the concept of aitiai that are relevant to this discussion. I then briefly connect this in a discussion of the basics behind the theory of the proto – animate to show a comparable condition between each as the main argument of the paper. Finally, I also suggest how this causal condition can be expressed tangibly in Genetic art materiality. That is, by the creation of synthetic novel genes comprised of non–coding molecules, which exist in a pending condition as the fundamental expressive elements in my Genetic art.

Aitiai

The Greek word aitia (or aition) does not have a precise contemporary literary equivalence in English. However, as a composite meaning it can refer to an explanation, a responsible agency or cause for example. "Essentially *aitia* derives from the adjective *aitios*, meaning 'responsible,' " so the causal conditions responsible for something may sum this up in the context of my argument. [2] Besides referring to physiological agents, what is also noteworthy is that aitiai (plural) also refers to non-sentient items or what causes i.e. "*aitiai* the inferred inner, structural facts causally responsible for the outcome." [3] In my artistic interpretation, the central condition found in aitiai can provide a parallel to the essential quality of causation i.e. proto – animation, in a biotechnical art context.

In terms of outcomes referred to above, this can be anything from a biological entity such as man, to an inanimate thing such as a sculpture of a man. Aristotle's thinking is therefore also inclusive of non–sentient aspects, which also expand into asomatous terms and pre-conditional causal constructs. So not only are these inanimate, importantly they are also corporeal things, which used here mean potential circumstances. So this is important in my analogy because as I will demonstrate, it also connects the

idea of causal responsibility to inert properties located within non-coding, molecular, biological conditions. Therefore the pending, (potential) property of causal responsibility is also the intrinsic agency responsible for the causally outcomes in proto–animate bio–matrices.

Because Aristotle advocated the view that the aitia causes apply to and operate between the components of all generated compounds natural or artificial, such an atomistic or molecular disposition is therefore arguably an apt frame of reference for a molecular and genomic art context. That is, one involving what is both natural and artificial bio–molecular compounds considered in a contemporary genetic technology mediated environment. This includes the molecular spaces between these compounds. I explain what I mean by this shortly after illustrating what I consider to be relevant in aitiai.

Aristotle’s concept of aitiai, advocates four factors being responsible to explain matter and form relationships more completely i.e. four types of cause.

“An aitia can be a reason or motive or explanation, as well as a cause (as we understand that term). The four types of cause Aristotle identified were the material, formal, efficient, and final.” [4]

Because his four factors are explicatory causal types these are not passive by definition. As such each cause has a performative role as this abridged extract indicates.

“*material*: that from which something is generated and out of which it is made, *formal*: the structure, which the matter realizes and in terms of which the matter comes to be something determinate, *efficient*: the agent responsible for a quantity of matter’s coming to be informed, *final*: the purpose or goal of the compound of form and matter,” [5]

So while the four causes are designed primarily to account for substances, they also derivatively account for events and processes as the definitions above indicate. This is also important in a genetic, biotech context to explain regulatory processes involving non – coding materials. This is since molecular material processes are the root cause of organic expression involving matter (non–coding DNA) and form i.e. protein expression.

The composite of these four causes is collectively what can be considered as aitiai. Now beyond providing the above brief definition of these, I need to point out that I am not interested in the explicating the specifics of these causes per–se. Rather, I am explicitly interested in what amounts to the collective property of potentiality, which I see as the composite condition behind them, i.e. the potential.

Because this four–causal framework of explanation collectively represents potential as a performative explanation, it therefore represents the equivalence of a pending causal condition. This is something, which I advocate is characterized by its latent and temporal nature as well as recondite property. It is specifically antecedent to activity or animation as its potential is as yet realized; therefore it is in a pending state. That view is central to my argument.

For example, for Aristotle, “matter is *potentially* some *F* until it acquires an actualizing form, when it becomes actually *F*.” [6]

While aitia is this overarching causal frame of reference, Aristotle's account of matter and form interrelationships, which he referred to as 'Hylomorphism', is also integral to this pending context. This pending condition is illustrated succinctly as this following quote indicates.

"For Aristotle, matter, from the Greek *hyle*, is the common material stuff found in a variety of things; it has no distinct characteristics until some form is imparted to it or until the form inherent in a thing becomes actualized." [7]

So the interrelationship of form and matter or Hylomorph, is a potential condition and also therefore a pending one.

Aristotle view of aition shows organic development as a fundamental paradigm for explaining all material change and physiological processes. To continue, this involves the chemical processes going on inside living organisms being not dissimilar to those in the inert chemical world. So Aristotle's thinking is important because it provides an established early account involving a specifically organic model with associations to inert chemical materials. And as is indicated by Green and Groff, "parallels between organic and inorganic processes reinforced Aristotle's physiological model." [8]

So Aristotle's organic / inert association concept of aition is an account, which describes a pending condition "that because of which something comes to be" which is relevant to my idea of the pending nature of proto-animation involving a molecular paradigm.

The above account sketches the salient point of the potential condition inherent in aitia. The pending condition intrinsic to the idea that is aitia can translate here into a fundamental bio –molecular organic proposition. The following sketches the molecular equivalence.

Proto – animate

The central tenet in the concept of the proto – animate is the character of a pending condition, which I call proto – animation. It is used for explaining important material changes and physiological processes whereby "something comes to be", inside organisms specifically at the molecular level.

The pending condition explicated by art modelled on genetics involves so called non –coding molecular material in a predicament, which I argue is essentially a proto–animated material – form – space within genomes. A brief account of the science behind this helps to explain this.

According to eminent scientists such as Professor John Mattick Founding Director of the Institute for Molecular Bioscience in Queensland, non–coding materials such as ncRNAs and introns can be considered to exist within a particular molecular configuration inside genes. This is within an influential substrate layer under the coding layers of DNA. The coding DNA are called exons. Non–code molecules are considered to be inert because they were thought to be non – coding, that is being able to affect material changes in genotype output, as exons do. That is to effect physiological processes in organic form expression meaning protein expression. What is important about these latent molecular substrates is that while they are not directly responsible for coding proteins and as such are considered to be inactive, this position has been subject to conjecture in recent times.

It is now understood that the ostensible inert status of non-coding ncRNAs and introns is wrong and that they actually have a causal responsibility which is a regulatory role in orchestrating exons to effect coding through numerous intermediary stages. In other words the perfunctory coding capacity and ultimate affect of exons to code for proteins which manifest physiologically is co-dependent on so called non – code causation. The recondite nature of the functioning responsibility of such effects by these agencies of change is difficult to ascertain currently. Just like aition is, "that because of which something comes to be", this causal property and consequential affect, materialises essentially as a state of unfolding understanding. [9] This is a causal effect, which exists as a pending (and temporal) condition.

Furthermore this can be considered in that way because the causal responsibility of the recondite regulatory functions of non-coding molecular materials entails operations which involve an 'on' and 'off' state. This pending on or off state is thought to be responsible for directing coding elements in genes in different circumstances inside the genome. I suggest that non-coding elements i.e. introns and ncRNAs are a kind of recondite substrate; something which appear to have no fundamental properties at all, yet have the potential to cause anything, depending on what properties can be assigned to it. By this I mean the directional property to organize coding DNAs to make any one of an infinite number of physiological outcomes i.e. the colour of an iris for example.

Therefore rather than considering these non – coding substrates to be either inactive or active, I consider that their causal and performative qualities to be latent. Therefore I consider them to exist in an – between state of animation neither entirely active nor inert, but rather an anticipatory state of potential and pending action. This is a proto-animate condition which links inert chemical compounds i.e. DNA and organic affect i.e. coding through an anticipatory molecular space inside coding and non-coding layers within genomes. Essentially this is the concept of the proto-animate.

The importance of such a causal predicament in the genomic context can be estimated by virtue of the fact that this non – coding material has been preserved essentially un-mutated, over millennia. Furthermore its quantitative correspondence to organism complexity is such that the more complex organisms such as homo sapiens, have more of this regulatory, causal, non – coding material than less complex organisms such as bacteria have. So I suggest that in a similar way that Aristotle's matter needs some form imparted to it otherwise it remains un-actualized, so too the form of molecular non – coding materials needs to be actualized as a causal agent of protein expression.

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Genetic art

The proto – animate condition can be expressed within Genetic art through the conscious use of such ostensibly inert molecular materials and processes, involving non – coding materials such as introns or ncRNAs. By using recombinant molecular processes involving these non – coding materials which have been reconfigured within novel gene sequences, their pending status is put into question. This is because the realignment of non – code molecular introns can be seen to potentially orchestrate a new and biologically viable reading, by altering the composition of a sequence. That means that the integration of

a reconfigured non – coding script inside a gene could cause and affect a changed reading by the internal chemistry mechanisms of an organism at a molecular level such that a coding exon could be created.

This Genetic art brings into question the veracity of the orthodoxy surrounding the status of non-coding elements as inert agencies when engineered creatively within such synthetic genomic trajectories created in the molecular biology lab.

Conclusion

In the biological molecular terms of reference being advocated here, I have suggested that the in – between or inter – genetic substrates of non – coding materials are molecular equivalences to matter not yet combined with form. This is because these are asomatous intercalating agents, which constitute a type of formless space within a chemical matrix occupying the space between two adjacent layers of coding DNA. Introns for example are circumscribed materiality, i.e. as strings of chemical bases, but they are considered formless matter here because they have not been comprehensively described in terms of activity causes. This is since such causation is known only in terms of regulatory transfers, which in most cases today are pending or unknown translations. This is why knowledge of causation, of how introns or ncRNAs affect coding outcomes as an exemplar or established paradigm is itself an intangible form.

So the crucial fundamental idea in my argument advanced in this paper concerns the pending nature of molecular non – coding materials, which I see connects with the composite potential condition inherent in Aristotle’s four factor causal idea. This is a re-interpretation of the central composite pending property in Aristotle’s *aition* translated into a contemporary frame of reference.

I have stated that essentially the claim that molecular biological is similarly, “matter is closely connected to potential or power; the potential or power to become some particular sort of thing”. [11] Paraphrased, Only by giving it form can it be made actual (i.e., made into an actual object of a particular kind). (By this I mean a protein expression output). Most importantly, I have said that this causal position evident in *aitiai* is a pending condition of animation and is therefore comparable to a proto – animate state of existence inside a biotechnology mediated matrix.

Since the causal effects of non – coding materials such as introns are intangible, they have not yet been given form; they therefore entail asomatous spatial associations between introns and exons. In order to demonstrate this potential existence in a pending condition I have proposed expression of such pending form via Genetic art. This entails using recombinant genetically engineered scripts taken out of the latent substrate layer realm and into novel realignments of introns with other non – coding molecular materials as potential proto – animates.

References and Notes:

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