ART, MIND AND EVOLUTION

by

Alyssa Robichaud

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ABSTRACT

Philosophical theorizing about art, its nature and purpose, is recorded as far back as Plato and Aristotle. In recent decades, evolutionary theories of art have been proposed, some suggesting that art, if it is an adaptation, must have utility, and others suggesting that art, not having utility, must be an evolutionary byproduct. This thesis examines adaptationist arguments for inherited behavioral tendencies in general and adaptationist arguments regarding art behaviors in particular. Adrian Thompson's insights into experiments with evolvable hardware are examined and repurposed to provide counterpoint to the ease by which evolutionary arguments are often formulated and accepted. I argue that the fact that the purpose of art is still open to theorizing is perhaps one of the stronger arguments for art behaviors being instinctual. After exploring and critiquing a selection of evolutionary theories of art proposed by others, I then outline a tentative adaptationist theory of art, suggesting that art behaviors are an inherited behavioral tendency by which human beings instinctively and unconsciously tweak their environment so that it fosters an expanded conceptual and perceptual range of the minds of the human population. Possible effects of the theory upon the practice of art are considered. In closing, it is suggested that Thompson's insights regarding the limits of engineered circuit design equally apply to philosophy.

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CHAPTER ONE – INTRODUCTION

1.1 THE MYSTERY AND WHERE WE ARE GOING WITH THIS

Were we to observe any species and find its members spending considerable time and resources on completely non-practical activities, we might wonder whether those activities have some hidden practical purpose. Alternatively, we might question how such a species could possibly have persisted. This is the genuine mystery posed by human beings, who, as a species, universally and since the depths of prehistory, have spent considerable time and resources dancing, singing or listening to songs, telling or listening to untrue stories about non-existent beings, decorating, ornamenting, etc. We not only spend considerable time and resources doing these things, we apparently have no understanding of why we do them beyond that we like to. This fact − that we are at a loss to explain why art has had such a prominent place in human lives − is itself reason to suspect that art behaviors are an inherited behavioral trait, that art behaviors are instinctual – it is this suspicion that we are going to explore.

A casual survey of philosophical texts will reveal that there is a variety of available stylistic and structural models available for the presentation of philosophical argument. Some texts tend to a likeness to scientific papers in which the hypothesis and the means to evaluate it are clearly introduced from the outset and the remainder of the thesis is a detailed presentation of relevant data, a filling out of the evaluation in light of the data, and a summary conclusion. My tendency is toward a more exploratory narrative. When setting out on a philosophical inquiry, instead of setting a firm destination in mind and then seeking to discover whether or not I can reach it, I tend to get my bearings of the local terrain, scout out what appear to be promising potential paths, and then see where the more interesting routes might take me; once I reach a location that appears non-trivial and perhaps uncharted (or at least little-considered), I then again survey my surroundings. I believe that texts that document these philosophical journeys best represent them by reflecting their exploratory nature. That may appear to be a bit meandering in comparison to those structured like scientific papers. Arguments given by others may be picked up and evaluated, then tossed aside, adopted or adapted – their inclusion here is not an endorsement, merely a consideration. Consideration or acceptance of one argument by an author is not a subscription to their oeuvre – this isn't a search for schools to join (nor is it particularly concerned with how it fits in the existing literature); it will use whatever is useful and discard whatever is not, regardless of their (perhaps shared) source.

If you wish to follow the trail of thought as it was originally trudged, you may skip now to section **1.2 A Preliminary Definition of Art**, as what immediately follows is what movie reviewers tend to call Spoilers. For those who prefer to know where they are going before they set out, this part is for you.

We will first round out this introductory chapter with establishing some preliminary definitions. We need to be able to point to what we mean by art in order to discuss it and potentially discover something new about it, but we don't want to deform our inquires by imposing non-essential criteria concerning what will qualify for consideration; to this end (following some discussion) I will follow Moravcsik's lead and choose for initial consideration a set of uncontroversial specimens of art; it is from analysis of these specimens that a definition may eventually be formed, then tested through consideration of more controversial specimens. I will then present the principle of natural selection with discourse on how divorcing thinking about natural selection from its origins in the biological sciences may assist in thinking about evolutionary explanations. Chapter Two will discuss Evolutionary Psychology and the types of arguments that get made concerning natural selection and hypothesized behavioral adaptations, providing framework to how considerations of natural selection may apply to art behaviors. Chapter Three attempts to determine what criteria must be met for one to suspect that *any* behavior may find a biological, evolutionary explanation and then evaluate art behaviors in light of these criteria. It then examines human use of fire to show how genetic and environmental/cultural factors can intertwine and inter-affect so as to obscure causation. Thompson's insights into experiments with evolvable hardware are examined and repurposed to inject further caution into the inquiry. Chapter Four argues that the ease by which an "art for art's sake" perspective of art has been historically sustained, and the difficulty traditionally encountered in proposing convincing utilitarian functions for art, might in themselves suggest that the drive for art behaviors may at root be instinctual and inherited, not learned. Previously proposed evolutionary explanations of art are considered in Chapter Five, and the theory of play as an adaptation and pre-cursor to art behaviors is given further consideration in Chapter Six, which discusses the relatedness and differences of play and art behaviors in terms of active participation and fictions and concludes that art behaviors appear unique in that they seem to be introducing novelty for its own sake. Chapter Seven considers what value might be found in the apparently non-utilitarian introduction of novelty, and the introduction of randomness is found to have utilitarian value in several processes, most significantly for our line of inquiry, in enabling a system to better approach optimal variety. Chapter Eight presents the argument proper – that some biological sub-systems have an evolved incompleteness with selective biological processes by which to further develop in response to the environment in which the organism finds itself. One such sub-system is the immune response; another is in neuronal development of the brain. Art behaviors are proposed to be an inherited instinct to introduce novelty into the human environment so as to optimize the perceptual and conceptual complexity of that environment in such a way as to increase optimal variety in the human cognitive system, increasing the perceptual and conceptual range of human beings raised in such an environment. This theory is found to provide explanation for other aspects of art behaviors. Some potential criticisms are then considered and addressed. Chapter Nine considers the potential impact of the theory upon human art behaviors and wraps things up with recognition of the limitations of the theory and its inherent uncertainty.

1.2 A PRELIMINARY DEFINTION OF ART

In attempting any philosophical analysis of art, I feel one might best embark with a soft tread and measured step. For the last century or so, much philosophical discourse regarding art has been concerned with defining what "art" is, critiquing proposed definitions, or questioning whether such definitions are even possible (Carroll 103, Moravcsik 425, Davies 169-178). I will eventually propose a functional definition of art, or at least a contribution to what I believe could be a more complete functional definition of art, by which I mean that I will propose that entities (artifacts or actions) that are classified as art are recognized as such due to specific functions of those entities. I say "eventually" because, in developing such a functional definition of art, we should not start out from such a definition lest we find ourselves gathering a collection of red marbles and then discovering, on examination, that all marbles invariably appear to be red – reasonable attempts will be made not to malform, with our preconceptions, the sample set under consideration.

Harold Osborne's assertion that the question *What is a work of art?* has two different meanings, each on different logical planes and often conflated, is a valuable one. By one interpretation, *What is a work of art?* is a factual question relating to the proper use of the phrase "work of art": What things in the world does the phrase "work of art" properly refer to? By an alternate interpretation, it is a philosophical question: What criteria must be met to properly refer to anything at all as a work of art? Notes Osborne, "A great deal of futile discussion in aesthetics has arisen simply out of confusion between these two questions and the sort of answers they require" (Osborne 3). As Osborne acknowledges, these two interpretations are not unrelated. We would assume that if one were to attempt to answer the first question by setting out to point out entities in one's surroundings as being works of art ("That is art, that is art, that's not…") then one would need some sense of what "work of art" means – one must have some sense of the answer to the philosophical question before being able to make the practical distinctions. It is also true, however, that "work of art" is not a technical concept instituted by philosophers to rectify a void in the common language that left unexpressed a philosophical concept. It is a found-in-use concept; the concept antedates philosophical speculation concerning it and philosophers must look to how the concept is used and has been in use, must try to ferret out the criteria that are in fact employed, in order to *discover*, not *stipulate*, its meaning. "As often in life, we know adequately for practical purposes what we mean by calling anything a work of art until we are compelled to ask ourselves what we mean. Then we don't know. We possess practical skills and accumulated conventions which involve inarticulate knowledge not readily accessible to us. It is one of the jobs of philosophy to make such inarticulate knowledge articulate" (Osborne 4).

This stance is similar to one taken by Wittgenstein in *Philosophical Investigations*: "the meaning of a word is its use in the language" (Wittgenstein 43); the task called for would be to "[not] think, but look!" (Wittgenstein 66) But this is not as simple a task as it may first appear. One must not presume uniform use of the word throughout all the instances of its application, as if a simple sampling of usage is sufficient to represent the whole. If one is to look to the use of a word to discover its meaning, one needs to be prepared to bracket that meaning in the context of its use ("In this instance, this person means *this* by art (as determined by their use of the word in this instance); in that instance, that person means *that* by art") or, if one is looking for a fundamental, a universal, meaning of the word, one must account for instances of eccentric, deviant, and incorrect usage. Eccentric, deviant and incorrect usages would need to be flagged as such; inclusion of them in the uncovering of the meaning would threaten the resultant hypothetical meaning with incoherency. But as we are looking to the usage to uncover the criteria for usage, we cannot defer to criteria of usage to justify the exclusion of eccentric, deviant and incorrect usage. If one is looking to usage for the meaning of the word "fish", for example, one must be able to account for the use of the word by people who consider whales to be examples of fish and others who consider whales to be not fish but mammals; and in so doing we cannot refer to dictionaries or technical zoological classification schemes to referee the dispute. If usage were the sole criteria for meaning, we would have a closed, looped system in which we could not use a word incorrectly – if we intend to mean what others mean by saying "dog" when we say “cat” and use “cat” so, that would be our contribution to the meaning of “cat” and our usage conforms to that meaning and is thus correct. (This example may appear pedantic but one might consider this to be the very substance of the challenge presented by Duchamp’s readymades – Is an entity to be considered art as a consequence of it merely being designated so by an artist?) The difficulty that this poses is compounded when we attempt a cross-cultural understanding of the concept in question. We must then find equivalents of the word in other languages (or even the “same” language in a different cultural context), assuming that such equivalent words exist, and such equivalency must also be determined only by usage.

Julius Moravcsik, who, like Osborne, insists that “the task of specifying what is art and that of explaining the meaning of ‘art’ remain separate” (Moravcsik 426), proposes a means of bypassing such an impasse. “Can we study the ‘relevant’ entities without gathering these under an antecedently given definition?” (Moravcsik 426). It is done, and done successfully, in other fields. For example, “fruitful analyses and hypotheses” concerning generative grammar have been accomplished “without presupposing or forging definitions of ‘language’” (Moravcsik 426). Linguists studied what would be considered uncontroversial specimens of language – English, Greek, German, etc. One needn’t define “language” to recognize these being languages; they are regarded as languages due to pre-theoretical intuitions, and should any theory be proposed that defined language in such a way that it excluded these specimens, such a theory would be considered faulty (Moravcsik 426). Similarly, with art, “we can try to use pre-theoretic intuitions and single out artforms… as prima facie subject matter, and see how much we can say about art on this basis” (Moravcsik 426).

Moravcsik also qualifies that use of the word art by art experts or specialists is not sufficient to delimit everyday use of the word art (Moravcsik 426), and I will adopt this presumption in my own project. If we are to uncover anything fundamental about art, we must be careful not to arbitrarily discriminate – if we were to set out assuming that some types of art are not "real" art, our conclusions would necessarily be distorted. For the purpose of this thesis, we need to temporarily scuttle any distinction between good and bad, high and low, pure and impure art. Noel Carroll in "Historical Narratives and the Philosophy of Art" notes that someone viewing Ronnie Cutrone's 1984 postmodernist painting *Idolatry* (which includes representations of a Smurf, John Wayne, Elvis, Our Lady of Guadalupe and a leopard) might reject it as art, finding it indistinguishable from "romper-room or adolescent wall decoration" (Carroll 105). But Carroll claims that the Cutrone piece is art as it can be intelligibly situated in an artworld historical narrative (unlike wall decoration, presumably). According to my strategy, I will not assume that "adolescent wall decoration" is not art. Whether a piece is considered being worthy of hanging in a gallery or finds recognition in official art history narratives is not my concern. I want to eventually account for not only Van Gogh's *Starry Night* and Duchamp's readymades, but also black-velvet Elvis paintings, Smurf cartoons, tole-painted mailboxes and prison tattoos; not only Bach's *Goldberg Variations* and Cage's *4'33"*, but also Vodun drumming, *Wooly Bully* and the *Oscar Mayer Wiener* song. Though some might consider most advertising or propaganda art to be horribly impure, and for that reason not really art, many of those same individuals might consider Michelangelo's Sistine Chapel ceiling to exemplify not only art but art of the highest form, even though it was painted for hire and was no less propagandistic in its time, and thus, presumably, no less impure. Though a young child's efforts to draw a kitty with crayons may be of little interest to anyone except a parent or child psychologist, I will consider this art as well. I will initiate this project being inclusive and only consider later whether this inclusiveness is justified or whether Rembrandt's *Self Portrait* is really, truly of a different kind than General Mills' *Count Chocula.*

One possible hidden assumption we must not leave unchallenged is that an art entity is necessarily *homogenously* art. We may point about and say "This is art", "This is not art", "I suspect this is art, but am not sure", "Others say this is art, but I don't agree" – the impression is that "art" is a noun, it is a type of *thing*, and that if we were to properly define what it is that identifies such a thing as being that type of thing then we will have settled the seemingly impossible definition of art. But this thing-ness of art is perhaps an illusion generated by our language, by the grammar of our use of the word art. We might similarly point about and say "This is red", "This is not red" but if someone points to a red apple with patches of yellow and brown and says "this is red" we intuit that the person is pointing out objects that have a high degree of redness or are ideally considered red, and if they were to point to the same apple and say "this is not red" we would intuit that the person means, by "red" in this instance, "wholly red", such as an ideal ripe cherry or perfect red candy apple might be. We adjust our use and understanding of language concerning "red" on the fly – we say an apple on the table *is* red until someone cuts it into slices, then we are more apt to say that *part* of the apple *is* red or the apple *has* red skin. "Red" can be explicitly defined – a hue in the visual field of a human observer evoked by radiant energy of a frequency between x and y. Such a definition has clear boundaries. But "red" is an adjective, a property, an aspect of objects; and an object, having that property, is not necessarily saturated with it – having redness does not exclude also having not-redness. Draw a circle and place red objects within it and not-red objects outside of it. Where would you place the red apple with yellow and brown patches? Or a stone speckled with red, green and white spots? This conundrum is similar to that posed by avant-garde artworks. Draw a circle and place art within it and not-art outside it. Where to place Duchamp's store-bought urinal? Or John Cage's composition consisting of 4 minutes and 33 seconds of *not* playing an instrument? Where to place other liminal art objects such as those usually designated "craft", such as a tole-painted mailbox or needlework rose on a handkerchief? Despite the inertia within our language concerning this, we should allow for the possibility that we should not be considering art as entities but art as a property of entities that may be present within a range of degrees. We should expect that some entities might straddle any boundary that however-clearly delineates a property – a binary categorization of a property might provide a fuzzy set of entities that have that property. This means that if "fish" is a classification term for entities, then we should expect that whales are either fish or not-fish, but if "art" is a classification term for a property or cluster of properties then a tole-painted mailbox may have both art properties (the tole-painting) and not-art properties (those that give it utility for receiving and sheltering mail). Considering the art properties of the mailbox would in such a case introduce no incoherency to our concept of art; to the contrary, our concept of art would be impoverished and perhaps distorted were we to consider as art only entities which were suffused with the property, such as many of the art works commonly found in galleries.

I begin, then, with an extensional definition of art, considering as members of the set, for the purpose of analysis, those entities to which the word art is uncontroversially applied in everyday use. This reduction of samples is provisional, and I do not assume that the refined sample set is identical to the whole. All attempts will be made to avoid normative judgments such as those that distinguish art from craft, kitsch, ornament, etc. In addition, I will attempt to avoid the assumption that criteria for membership are ultimately due to the identity of the entity, considering that perhaps membership can be attributed to a property or properties of that entity.

1.3 THE PRINCIPLE OF NATURAL SELECTION

In proposing functions of art that will in turn provide a functional definition of art, I will be using an evolutionary, and, more specifically, a natural selection explanatory model. It is necessary that here, too, I tread softly and be very explicit about precisely what I mean by natural selection and how I believe it applies, what specifically I am claiming and what I am not. Should one disagree with my conclusions, one should at least have the means available to retrace the line of reasoning: given *this* concept of art and *this* concept of natural selection, does it follow *that*…

Darwin encapsulates the theory of Natural Selection in *On the Origin of Species* thus:

> If, during the long course of ages and under varying conditions of life, organic beings vary at all in the several parts of their organization, and I think this cannot be disputed; if there be, owing to the high geometric powers of increase of each species, at some age, season or year, a severe struggle for life, and this certainly cannot be disputed; then, considering the infinite complexity of the relations of all

> organic beings to each other and to their conditions of existence, causing an infinite variety in structure, constitution, and habits, to be advantageous to them, I think it would be a most extraordinary fact if no variation ever had occurred useful to each being's own welfare, in the same way as so many variations have occurred useful to man. But if variations useful to any organic being do occur, assuredly individuals thus characterized will have the best chance of being preserved in the struggle for life; and from the strong principle of inheritance they will tend to produce offspring similarly characterized. This principle of preservation, I have called, for the sake of brevity, Natural Selection. (Darwin, 1859, 98)

Natural Selection, argued Darwin, results in "Divergence of Character" of organic beings and can result in an increase in their complexity and functionality (Darwin 1859, 98). One argument made for the existence of god has been that, given the apparent orderliness, complexity and functionality of much of the natural world, we should infer that, for lack of any other apparent causal explanation, this is the product of intentional design, and this necessitates there be a designer. This is articulated by the fictional theists in Hume's *Dialogues Concerning Natural Religion*: Consider the anatomy of human beings as reported by Galen, says Philo, "600 different muscles… in each of them, nature must have adjusted at least ten different circumstances in order to attain the end which she proposed… But if we consider the skin, ligaments, vessels, glandules, humors, the several limbs of the body… the number and intricacy of the parts so artificially adjusted! …All these artifices are repeated in every different species of animal, with wonderful variety, and with exact propriety, suited to the different intentions of nature in framing each species" (Hume, 109). Cleanthes argues that, considering the "structure and contrivance of the eye", "the male and female of the species, the correspondence of their parts and instincts", and "millions and millions of such instances", "only the most perverse, obstinate metaphysics" could reject that these are the result of a "contriver" (Hume, 36). Darwin's causal-mechanical Natural Selection has been the only successful explanation for the complexity, order and functionality of organic beings that obviates recourse to intentional design and designers. Order from chaos without intention – that was its brilliance and the root of the controversy it gave rise to.

It could be argued that Darwin, with Natural Selection, was making two different but related claims, claims of two different orders requiring two different types of evidence (though this is not articulated, nor probably intended, by Darwin). The first claim is of a particular algorithm, a process by which given *this* and given *this*, then *that* will probably follow. The second is that organic beings are of such a sort, and their circumstance of such a sort, that this particular algorithm can be said to apply and provides explanation for the variety of species and appearance of design.

The algorithm can be simply illustrated. Consider a set with four members. These four entities each have two traits. The first trait we will label by color, and we will consider it so that the four entities differ in their first trait. We will classify the entities by their first trait, so we'll call the first one Red, the second Blue, the third Green, the fourth Yellow. The second trait of each is a numerical value. We will consider Red to have a second trait valuing 1; Blue, a second trait valuing 33; Green, 66; Yellow 100. So we have a set {[Red, 1], [Blue, 33], [Green, 66], [Yellow, 100]}. To this set we apply a transformation. Each member is either removed from the set and not replaced, or removed and replaced with either one or two members. The replacement member(s) retain the first trait. The second trait of any replacement member(s) is either the value of the original member's second trait plus 1 or the value of the original member's second trait minus 1, the plus or minus 1 being randomly applied with a 50% overall probability for each. So, with the first transformation, if the first member of our starter set were to be replaced with only one replacement member, the set would then contain either [Red, 0] or [Red, 2]. If the first member were to be replaced with two replacement members, there are four possible results (or three possible combinations, one of which is twice as likely as either of the other two); the set could now contain:

[Red, 0], [Red, 0]

[Red, 0], [Red, 2]

[Red, 2], [Red, 0]

Or

[Red, 2], [Red, 2]

Now let us say the transformation occurs as such:

1. If the second trait of a member is less than or equal to 0 or greater than 100, the member is removed and not replaced.
2. If the second trait is greater than 0 and less than 10 or greater than 90 and less than or equal to 100, the member is replaced with one new member.
3. If the second trait is greater than or equal to 10 and less than or equal to 90, the member is replaced with two new members.

So, with our starter set of {[Red, 1], [Blue, 33], [Green, 66], [Yellow, 100]}, when the transformation is applied, Red will be replaced by one new member, Blue by two, Green by two, and Yellow by one.

There is only one resultant Red member, either [Red, 0] or [Red, 2].

There are two resultant Blue members, either

[Blue, 32] and [Blue, 34],

[Blue, 32] and [Blue, 32],

[Blue, 34] and [Blue, 32],

or [Blue, 34] and [Blue, 34].

There are two resultant Green members, either

[Green, 65] and [Green, 67],

[Green, 65] and [Green, 65],

[Green, 67] and [Green, 65],

or [Green, 67] and [Green, 67].

There is only one resultant Yellow member, either [Yellow, 99] or [Yellow, 101].

As there is only one Red member, and there is a 50% chance that it is [Red, 0] following the first transformation, there is a 50% chance that the Red member will be removed and not be subject to a second transformation; while if it is not removed, it is replaced with a single Red member that has moved one step closer or one step further away from being annihilated with the following transformation. The same holds for Yellow, also having a 50% chance of exceeding 100 with the first transformation. With the second transformation, the two Blue members and two Green members will each be replaced by two new members, giving now a total of four Blue and four Green members.

The transformation is reapplied after each transformation.

At any particular step we cannot predict with certainty the numerical-value traits of the membership of the set following a transformation (due to chance variation) and we cannot always predict the number of members with the color-value traits following the next transformation (due to the number of resultant replacements being dependent on a chance-varied trait). But we can predict with a high expectation of accuracy that, following a large number of transformations, the set will probably contain no Red or Yellow members and consist only of Green and Blue. How can such a process apparently be both stochastic and semi-deterministic? Keep in mind that it is only the raw material of the process that is subject to chance variation, and the filtering process, the algorithm, introduces order by non-randomly allocating the probability of success in reproduction. We might compare the scenario to a casino. The outcome of any particular roll of the dice or spin of a wheel is unpredictable, but it is fairly predictable that the house, and not the average individual player, is going to be the ultimate financial winner each night. This is because the rules of the games, the payout schedules, consistently reward different chance outcomes differently, and in total create a house edge. Yes, there is a chance that some individual will get a run of luck and break the bank, but casinos remain relatively stable businesses.

The algorithm describes a filtering mechanism; the membership eventually will become specialized by the parameters of the transformation. This holds regardless of how much we complexify it, assuming that the filter remains constant. Given members with thousands of traits, transformations that trait-sensitively affect the rate by which each of those members are replaced, general fidelity but some variation in the traits of replacement members, and a large number of iterations of the transformations, a probability space containing all possible transformation formulas will tend to be populated by sets consisting of members with traits specialized – adapted – to their local parameters, so long as those local parameters remain constant in the relevant ways. That is the mathematical outcome of "replicator dynamics" formulas: For any particular "environment", if the entities of a type (or with a trait) reproduce at a frequency higher than the population average, the frequency of that type will increase (Brady and Harms). Variety, differential reproduction, and inheritance are the sole necessary criteria − as Susan Blackmore sums up generic natural selection: "[I]f there is a replicator that makes imperfect copies of itself only some of which survive, then evolution simply must occur" (Blackmore 11).

This claim, what we might call Abstracted Natural Selection, would be of a type similar to a geometrical theorem, and what Ayer wrote of geometrical theorems applies: "The axioms of a geometry are simply definitions, and… the theorems of a geometry are simply the logical consequences of these definitions… All that the geometry itself tells us is that if anything can be brought under the definitions, it will also satisfy the theorems" (Ayer 327). Abstracted Natural Selection can be logically and mathematically sound (or not), but its truth is tautological. Had some other explanation been found for the apparent design of biological entities, this would not have disproved the algorithm – it would have merely rescinded its apparent relevancy to the problem.

The articulated claim of Darwin's Natural Selection is an empirical one: Organic beings tend to produce offspring with similar traits but with some variation; the environments of such beings make some variations on traits advantageous to survival and others not; those beings with variations on traits advantageous to survival have a higher chance of reproducing than those with less advantageous traits; advantageous traits are therefore more likely to be preserved and multiplied through successive generations of a population than are less advantageous traits; over time, advantageous traits are accumulated and less advantageous traits are eliminated from a population. This theory has since been refined and some details filled in. Whereas Darwin could only speak of a "strong principle of inheritance" concerning organic beings, and there being some occasional variation "in the several parts of their organization" (Darwin 1859, 98), the development of Mendelian genetics revealed the mechanism of inheritance and genetic mutation fulfilled the role of providing variation. The component of survival of individuals became more accurately articulated as "differential reproduction" within a population, the survival of individuals to the age of reproduction being a strong, but not the only relevant, factor that effects reproduction.

I emphasize the difference between these two different claims, the Abstracted Natural Selection and Biological Natural Selection, for a couple reasons. As Natural Selection was introduced, and gradually refined, within the field of biology, this has produced a technical language concerning evolution that has the potential to obstruct clear thinking. Terms like "fitness", for example, were originally used because the common language meaning was thought appropriate to what was intended to be technically expressed; as the theory was refined, the word was retained but its technical meaning gradually adjusted to new understandings; eventually the existence of the common language "fitness" could serve to distort the differing technical use of "fitness". Metaphors of competition and struggle for existence suggest images of nature consisting of continual fights to the death between living creatures; even more recent metaphors, such as Dawkins' "selfish gene", suggest an intention required on the part of evolving entities (Dawkins 2006 xxi). Contrary to common-language meaning-traces sometimes retained in expressions of the theory, evolution is not synonymous with progress; entities or populations are not perfected by it in some ultimate sense. Fitness is always relative to an environment (a trait that proves adaptive at one point in time or place may prove mal-adaptive at another). It is distortions like these that made natural selection amenable to be used to justify racial superiority, class inequalities (Kraus and Keltner), and eugenics. Such distortions and others might be rectified by at least temporarily reframing a problem in terms of the Abstracted Natural Selection algorithm; the problem can be cleansed of some of the distortions introduced by language and metaphor.

For example, it is generally known that increased prescription of antibiotics for some bacterial diseases has resulted in some bacteria adapting to have a resistance to some antibiotics. If we are not strict in our thinking about this, the language implies intention, a strategizing, on the part of bacteria in response to antibiotics (due to "adapt" being a verb). We might think of such bacteria in the same way we think of ourselves adapting to the weather – if it is raining, we put on a raincoat (granted, biologists would be much less likely to make this mistake, yet discussion of adaptations still often have a whiff of this fallacy). The loaded word "adapt", in speaking of bacteria, needs to be unpacked, and thinking in terms of Abstracted Natural Selection assists in this. We need to think of bacteria as a population of entities with some variation in their heritable traits. Antibiotics are prescribed because in general they kill the bacteria, but in any particular population of bacteria there may be some bacteria that, due to natural variation, have some resistance to antibiotics. When exposed to antibiotics, the vast majority of such a population dies (and as a consequence their potential to reproduce is reduced to zero) but the few bacteria that have traits that provide some resistance have a greater-than-zero possibility of reproduction. Given time, and iterations, a population of bacteria with high resistance to antibiotics may result, but no particular individual bacteria are "adapting", none are (as in "not one bacterium is") changing in response to the antibiotics. If the human population adapted to the weather in the same way bacteria adapt to antibiotics, we would need to think of a population in which a small minority of people had an eccentric, heritable compulsion to put on a raincoat whenever it rains and then starting one day everyone who stepped out into the rain not wearing a raincoat was shot to death on their doorstep.

Because historically the concept of Natural Selection was introduced and developed via inquiry concerning biological evolution, there is also a tendency to think that it is only with biological reproduction that natural selection occurs. But the algorithm itself is not domain-specific – if any entities and their circumstance meet the definitions of the algorithm, the theorem applies. Divorced from biological thinking, we can consider, for example, that the entities need not be *self*-reproducing for natural selection to be relevant – as long as copies are made of entities with fidelity but some variation in traits, and as long as the reproduction rate of entities is trait-sensitive, natural selection will occur. Or consider the relevancy of death to biological evolution – Is death necessary for natural selection? As long as there are trait-sensitive factors that affect reproduction rates of entities, favored traits will tend to become more dominant with each successive iteration and ill-favored traits less dominant – natural selection does not require the complete disappearance of traits or entities to be relevant; were we to encounter beings that had the same mechanisms for reproduction and same principle of inheritance as humans but these beings, once born, had infinite lives, natural selection would still be relevant to understanding the distribution frequency of traits throughout their population. And the filtering factor, whatever element or relationship of elements that makes the reproduction of an entity trait-sensitive, need not be environmental (as it is often expressed to be in discussion of biological evolution). A mutation of a trait could itself directly reduce or increase the fertility of the entity; a fertility-boosting mutation might quickly spread throughout future generations while a fertility-dampening one might quickly disappear (in a mortal species, not in the hypothetical immoral one), all relatively independent of environmental pressures.

D. T. Campbell in 1960 applied the concept of non-biological natural selection (which Campbell termed "blind variation and selective retention") in a theory of the process of creative thought (Simonton 310); Dawkins, in *The Selfish Gene* proposed that "unit[s] of cultural transmission" might evolve via natural selection (Dawkins 2006 192); computer algorithms modeled on biological natural selection have found extensive commercial, scientific and educational application (Thengade and Dondal 29). Although the theory I will be presenting concerning the functional nature of art is largely a biological argument, it may also include aspects involving other types of natural selection.

CHAPTER TWO – ON EVOLUTIONARY PSYCHOLOGY

"Psychology will be based on a new foundation," predicted Darwin in *On the Origin of Species*, "that of the necessary acquirement of each mental power and capacity by gradation" (Darwin1859, 359). William James argued that not only body and brain but mind could be understood as the product of evolutionary forces, and that not only the mind's powers and capacities but also a significant portion of human behavior (by means of instincts) can be considered products of natural selection (James 1.324-325).

When it comes to resistance to evolutionary theory, a final line of defense appears drawn about Mind, and the last bastion tends to be the most earnestly defended (Bonner and May, xxii). We may accept that our eyes, the functioning of our liver, the composition of our blood or even the physiology of our brain are all the result of biological natural selection, but many of us near-reflexively reject acceptance that our behavior, our *thinking*, might in part be result of blind, arbitrary forces. Why is this so?

For one, evolutionary psychology smells of behavioral determinism. It is an affront to our sense of self to have to consider ourselves less than free agents. Schopenhauer wrote, "Man can do what he wills but he cannot will what he wills," but we can suspect this didn't get him invited to many parties. Such determinism not only is an insult to our personal sense of freedom and agency, it also gives us the sinking feeling that it licenses *everyone else* to do whatever they want – for they could do no differently. For another, evolutionary psychology is an affront to some sense of pride and birthright we have in being human. Are we no different than animals? When Descartes drew the line − we have souls, *they* are soulless automatons – he was not introducing a new theorem, but articulating a long-established assumption: Man was made in God's image and set to rule over all the creatures of the earth, etc. As James noted, "Nothing is commoner than the remark that Man differs from lower creatures by the almost total absence of instincts, and the assumption of their work in him by 'reason'" (James 2.389).

It is our blindness to the complex workings of our own minds that has allowed any number of folk, philosophic and scientific theories of mind to flourish unchallenged. Leda Cosmides and John Tooby, two recent proponents of evolutionary psychology, take direction from James and assert that we suffer from "instinct blindness": "[O]ur natural competences − our abilities to see, to speak, to find someone beautiful, to reciprocate a favor, to fear disease, to fall in love, to initiate an attack, to experience moral outrage, to navigate a landscape, and myriad others − are possible only because there is a vast and heterogeneous array of complex computational machinery supporting and regulating these activities. This machinery works so well that we don't even realize that it exists…" (Cosmides and Tooby 1997).

Any alternative psychology, according to Cosmides and Tooby, is untenable: "A psychological architecture that consisted of nothing but equipotential, general-purpose, content-independent, or content-free mechanisms could not successfully perform the tasks the human mind is known to perform or solve the adaptive problems humans evolved to solve − from seeing, to learning a language, to recognizing an emotional expression, to selecting a mate, to the many disparate activities aggregated under the term 'learning culture'" (Cosmides and Tooby 1992, 34).

Wittgenstein's discussion of the problems that arise in considering how a child might be taught language can be interpreted as circling this very issue – how do you teach a blank-slate? "[A]n ostensive definition can be variously interpreted in every case"

(Wittgenstein 28). The teacher points to a red ball and says "This is red"; does red = the color, red = ball, red = sphere, red = an object 3 feet distant on the floor, red = *that*? We might imagine the teacher specifying, pointing sequentially to a ball, chair, jacket, and apple and saying "This color is red." But how, then, did "color" get defined (Wittgenstein 29)? How do you unambiguously point at color (Wittgenstein 33)? How does one know that pointing even indicates a direction (Wittgenstein 454)? One possible answer is that children already have remarkable conceptual complexity prior to the acquisition of language. Study of infants bears it out: infants code human acts in terms of goals and can infer intended goals even when witnessing only unsuccessful attempts (Meltzof 66); infants understand an adult gaze as being directed at a something (not being simply a body movement) (Meltzof 69); newborns imitate facial movements in others despite having never seen their own face (Meltzof 70); infants recognize when they are being imitated (Meltzof 62); infants attribute intention to humans but not to machines moving similarly (Meltzof 63).

Kant argued that all knowledge of concepts cannot follow (be inferred from) experience of phenomena but that knowledge of some concepts (categories) must precede experience, as apprehension of empirical objects would not be possible without them (Kant 1781, 149). We need not relegate a priori functions of understanding to the transcendental, however, when we can ascribe them to known mechanisms. Konrad Lorenz articulated that natural selection provided an origin for Kant's categories, asserting that our "categories and forms of perception, fixed prior to individual experience" are adaptations – a posteriori for the species (Lorenz 233).

Cosmides and Tooby present an Apostles' Creed-like statement of tenets of evolutionary psychology as they see it:

> a. the human mind consists of a set of evolved information-processing mechanisms instantiated in the human nervous system;
>
> b. these mechanisms, and the developmental programs that produce them, are adaptations, produced by natural selection over evolutionary time in ancestral environments;
>
> c. many of these mechanisms are functionally specialized to produce behavior that solves particular adaptive problems, such as mate selection, language acquisition, family relations, and cooperation;
>
> d. to be functionally specialized, many of these mechanisms must be richly structured in a content-specific way;
>
> e. content-specific information-processing mechanisms generate some of the particular content of human culture, including certain behaviors, artifacts, and linguistically transmitted representations;
>
> f. the cultural content generated by these and other mechanisms is then present to be adopted or modified by psychological mechanisms situated in other members of the population;
>
> g. this sets up epidemiological and historical population-level processes; and
>
> h. these processes are located in particular ecological, economic, demographic, and intergroup social contexts or environments (Cosmides and Tooby 1992, 24).

In the introduction to *The Adapted Mind*, the premises are summarized:

1. There is a universal human nature that consists primarily of evolved psychological mechanisms, not cultural behaviors;
2. These evolved psychological mechanisms are adaptations constructed by natural selection;
3. These adaptations were shaped not by modern conditions but by those of the previous two million years that humans lived as hunter-gatherers and previous to that several hundred million years as foragers. (Cosmides et al. 5)

The incest taboo might provide an illustrative example of the explanatory methods of evolutionary psychologists. It is said that in every society there exist prohibitions concerning incestuous unions (though there is variety in how widely or narrowly the relationships that constitute such unions are defined) (Royal Anthropological Institute of Great Britain and Ireland 113). Anthropologist Claude Lévi-Strauss argued that incest taboos have utility in that they encourage exogamy and forge alliances between unrelated lineages, thus promoting social cohesion (Lévi-Strauss 492-496). But detailing potential benefits to a behavior is not sufficient to establish that the existence of the behavior can be explained by the benefits it provides. The incest taboo is not such an obvious solution to social cohesion problems that it would be continually discovered and adopted by multiple diverse societies to such an extent that it would become universal. It is now known that inbreeding increases the frequency of birth defects. Such a consequence, however, is difficult to impossible to deduce from experience – the effect is multi-generational and statistical – so it would be difficult to posit incest-avoidance as a conscious strategy for birth-defect avoidance. Imagine, however, a hereditary trait that triggered disgust at the thought of sex with a sibling. Creatures with such a trait would tend to have lower incidences of birth defects than creatures without such a trait. If such birth defects affected the differential reproduction of the line, if it made some progeny infertile, more likely to die before age of reproduction, resulted in a deviation in appearance significant enough to trigger avoidance behaviors in otherwise potential mates or otherwise affected the frequency of reproduction, a trait which lessened the incidences of such defects might, over thousands of generations, come to dominate a population due to natural selection. Such creatures would not require conscious awareness of the detrimental effect of inbreeding, nor of the beneficial effects of exogamy – an incest avoidance trait becomes universal through retention and does not require prediction, inference or computation (Cosmides and Tooby 2005, 48). Such a trait does not even require sophisticated insight into the genetic makeup of potential mates – a simple approximation accomplishes it sufficiently: Edvard Westermarck proposed in 1891 that children reared together display as-if-kin effects regardless of biological descent, and ethnographic studies show evidence of sexual aversion in non-related adults raised together as children (Barlow 447). So, a sexual aversion between those raised together in early childhood can be considered an adaptation for avoidance of the adverse consequences of inbreeding. This theory has the additional benefit of explaining non-human mammalian avoidance of incest, something that sociological explanations cannot do. Human incest taboos appear to be cultural articulations of a biological mechanism. Similar explanations have been proposed for the ease with which humans learn language (Cosmides and Tooby 1992, 70), altruism and kin-favoritism, a predisposition to detect and punish cheating (Wright 190), morning sickness and eccentric food preferences during pregnancy (Pinker 1998, 39), mate selection criteria (Singh 293), etc.

As insightful as the arguments and illustrative examples of Cosmides, Tooby, et al., might be regarding evolutionary psychology and evolved brain/mind mechanisms, one should be cautious about extending the arguments beyond any specific instances for which there may be evidence. Consider this argument by Symons:

> It is no more probable that some sort of general-purpose brain/mind mechanism could solve all the behavioral problems an organism faces (find food, choose a mate, select a habitat, etc.) than it is that some sort of general-purpose organ could perform all physiological functions (pump blood, digest food, nourish an embryo, etc.) or that some sort of general-purpose kitchen device could perform all food processing tasks (broil, freeze, chop, etc.). There is no such thing as a "general problem solver" because there is no such thing as a general problem. (Symons 142)

This argument displays a couple errors. Firstly, it presumes that the brain as a whole has to be either a general-purpose problem-solving mechanism or a conglomerate of content-specific, functionally-specialized mechanisms. This is clearly a false dichotomy − if the brain might be composed of an integrated collection of mechanisms (as is asserted in the second alternative) that such a collection might be composed of a variety of mechanisms both specialized and/or general-purpose, and evolved and/or learned ("and/or" because one might imagine a mechanism specialized for general-purpose functionality, or an evolved tendency or competency for a learned behavior). Secondly, a general-purpose mechanism need not solve "all the behavioral problems an organism faces" to be considered a general-purpose mechanism. The hand with fingers and opposable thumbs is a pretty general-purpose tool – it assists in eating, defense, communication, grooming, tool-making and tool-using, etc. We would be hard pressed to say the hand as it is evolved as it did for any one particular function. The fact that we do not use our hands to breath, digest food, or pump blood does not change their general-purposeness; having limited-context functionality does not mean they are not general-purpose. Similarly, even if it is successfully argued that the brain has to consist of some content-specific, functionally-specialized mechanisms, we can still imagine, without contradicting such a claim, that such a brain might also have limited-context but general-purpose mechanisms, that in fact the organism might be more fit were this the case. A couple of general-purpose mechanisms that immediately come to mind are the ability to generalize (to be able to provisionally treat like objects or processes as if they were the same), and metaphoric thinking (to be able to posit that knowledge of one object or process might have relevance in consideration of a seemingly unrelated or loosely related object or process).

So, to tweak Cosmides et al.'s summarization of the assumptions of evolutionary psychology to be more in line with our argument:

1. There are *elements of* human nature that consist primarily of evolved psychological mechanisms, not cultural behaviors;
2. These evolved psychological mechanisms are adaptations constructed by natural selection;
3. These adaptations were shaped not by modern conditions but by those of the previous two million years that humans lived as hunter-gatherers and previous to that several hundred million years as foragers.

4. Any one such adaptation may or may not be content-specific and functionally-specialized.

CHAPTER THREE - WHY BELIEVE THAT NATURAL SELECTION IS RELEVANT TO ART?

3.1 CRITERIA

To determine whether we should believe that natural selection is relevant to our understanding of art it may be first beneficial to ask what is generally accepted as evidence for any trait or feature being the product of natural selection.

Let us first consider these criteria for an undeniably physiological trait – having eyes. What would be considered evidence that eyes are the product of natural selection? One argument would be that the eyes are complex biological mechanisms and the process of natural selection is "the only explanation for the origin of organs with complex design" (Pinker and Bloom, 726). That raises a question, though: what would be considered complex design? One could argue that a single cell amoeba gives the appearance of complex design; we might, with some study, conclude that its behavior or physiology are readily understood and that there are no outstanding mysteries concerning amoeba as there might be concerning vertebrates, but we would certainly be put to task to build one from scratch nor would we expect one to spontaneously spring into being as the result of random events – and in that way it cannot be considered simple. It could be argued that if an entity is living, by that very fact it meets the criteria for complex design. And even the "simplest" trait of an organism might be considered inseparable from the complexity of the whole of the organism. Does it follow that all physiological traits, being part of the whole of an organism, are therefore the product of selection? No.

Imagine that an explorer discovered a tribe of humans that have been isolated from other humans for an extraordinary length of time (this illustration is suggested by Gould and Vrba 4). It is discovered that they have, on average, a much greater lung capacity than other humans. It is posited that, due to the high altitude at which they are living, this tribe adapted to have a greater lung capacity over time, a product of natural selection due to the thinner air. Would this be a valid assumption? Perhaps not. The tribe may be genetically indistinguishable from other humans in alleles pertinent to lung capacity. Perhaps the increased lung capacity is the result of being born and living one's entire life in an environment of depleted oxygen – an acquired, non-inherited trait. This would be similar to increased muscle mass and strength found in someone who does frequent weight lifting – the body is plastic enough to affect physiological change of this sort to better meet challenges presented by the environment. As the environment is an invariant for all members of the tribe, this might give the illusion that the lung capacity is an inherited trait that has reached fixation in the population. That said, selection is not irrelevant to the tribe's lung capacity – the phenotypic plasticity, the range and limits of lung development in response to the environment, may be a selected trait. But the fact that members of this particular population consistently display measurements at the far end of the inherited capability's range cannot be attributed to natural selection.

Setting aside any "all biological systems are complex" rhetoric, we do tend to think of there being a range of complexity in traits – it seems obvious that having an eye is a more complex trait than having a particular lung capacity, for example.

We must be wary of our use of the word trait, which can be applied to different biological categorical domains and introduces an imprecision into discussion of traits: one could say having eyes is a trait; having a light-detecting organ is a trait; being able to detect a particular range of color is a trait; the degree to which one can focus, see at a distance, or perceive depth, whether one has eyes on either side or the front of the head, the pigmentation of the iris, all of these are traits. Organs can be considered traits of organisms and can themselves have traits. Can the complexity of a part be considered equal to the complexity of the whole?

Complexity, when discussing traits, might best be considered as referring to the minimum number of simple developmental steps that must be taken by an organism lacking a trait to reach a state of having that trait. Nilsson and Pelger, for instance, in "A Pessimistic Estimate of the Time Required for an Eye to Evolve," attempt to estimate the number of generations that would be required for the evolution of a fully developed, lensed eye from a light-sensitive patch of tissue (Nilsson and Pelger 53). This may appear to be introducing some covert circular reasoning. Nilsson and Pelger, for their "pessimistic estimate," presumed that the eye was the result of natural selection and thus, in figuring out a developmental sequence, restricted themselves to positing only incremental steps that each in themselves made the organism more fit compared to available alternatives (Nilsson and Pelger 53). If (at least with the example at hand) our measurement of complexity presumes natural selection, how can it be relevant to a consideration of whether complexity is in any way an indicator of natural selection having occurred? Consider this – natural selection, being a filtering process, introduces non-randomness to the bound randomness of the process of differentiation; it allows us to assume that adaptive traits, once acquired, will with some probability greater than random be retained. What this means is that any developmental sequence of randomly-occurring incremental steps being shaped by selective forces must tend to be shorter than a developmental sequence accomplishing the same final trait by random incremental steps alone with no selective pressure. Which is to say, when comparing the developmental sequences of two traits, to presume the restrictions of natural selection is to insure that the developmental path with minimum number of steps is being considered for each. If you want to determine which grocery store may be closer to your home, there is no need to consider all possible routes to each – only the most direct. The logic is: if number of steps to trait X (assuming Natural Selection) is greater than number of steps to trait Y (assuming Natural Selection) then trait X can be justly hypothesized to be more likely the product of Natural Selection than Y; and the greater the difference, the greater the confidence one might feel in the judgment. Nilsson and Pelger estimate that 1829 steps (requiring 364,000 generations) (Nilsson and Pelger 56-58) are required to move from a flat light-sensitive patch of tissue to “a focused camera-type eye with the geometry typical for aquatic animals” (Nilsson and Pelger 56).

Now say that all human beings currently have brown eyes. How many steps are needed to move from having brown eyes to having blue eyes? One step, according to a team from the Department of Cellular and Molecular Medicine at the University of Copenhagen; mutation of a single allele acts as a dampener on the OCA2 gene that produces melanin, reducing the amount of melanin being produced in the iris and giving the person blue eyes (Eiberg et al. 186). In terms of relative complexity, one could say that the trait of having a primitive eye is 1,829 times more complex than the trait of having blue eyes (a number that I expect is relatively meaningless outside of the purpose of comparing complexity as we are doing here). Please note that the functionality of the trait has no bearing on this consideration of complexity (a trait is a trait, functional or not) the question being whether consideration of complexity can add to our knowledge of a trait regardless of whether we have knowledge of its function (or lack of). Using this method of calculation, the complexity of the trait of increased lung capacity as seen in the tribe above would equal zero, as it required no genetic change, no developmental steps, to accomplish the trait. This is the sense in which complexity can act as an indicator for a trait having been selected for and the expectation that further information should conform to what we expect of selected traits: If you were to enter upon some previously unexplored island in the middle of the Pacific and discovered it populated by monkey-like creatures of genetic structure similar to known monkeys but all lacking in having eyes, and then, of the thousands of these creatures you encounter you find one single creature that did have eyes, you could feel safe in betting on a few things: 1) this creature's eyes are the result of natural selection, 2) this creature with eyes cannot be a lone mutation but must be the most recent representative of hundreds of thousands of generations of ancestors displaying an increasing complexity in this organ, and 3) this creature represents a different type from the eyeless creatures you have encountered and it is either a last survivor of its native population or has somehow become separated from it. If, however, you discovered the island populated by monkey-like creatures all of which had brown eyes and then you encountered one that had blue eyes, you could assume nothing about the existence or history of others of its blue-eyed type – it may well be a singleton.

This example of the development of the eyes uncovers a couple more criteria by which we can ascertain our confidence in whether a trait is the result of natural selection.

Setting aside consideration of complexity, the fact that, barring some very rare mutation or organic disorder, all human beings are born with two eyes but only a fraction of them are born with blue eyes, we should feel more confident in an assertion that having eyes is the result of natural selection than we should in an assertion that having blue eyes is. This is not to say that we can discount the possibility that the frequency of blue eyes in the population is the result of selection; it is to say only that a trait that is universal, that has reached fixation, is more likely to have done so due to there being selective forces favoring it than due to genetic drift or other possible explanation. Similarly, the greater the number of generations the trait and its immediately preceding versions has been fixated in the population, the more confident we can be that the trait is the result of selection. One reason is that over great numbers of generations, the less likely it is that a trait not contributing positively to fitness will remain unchanged. Another is that there are a minimum number of generations required for a mutation to reach fixation in a population, and the more complex a trait, the more serial or parallel mutations are required to produce it where it did not exist previously. So, for human beings, going only by fossil record, we know that the trait of five-fingers-per-hand-ness was already extent in the first hominids 5-7 million years ago (Young 167) – the reasoning I'm proposing suggests we should feel relatively confident that the trait of five-fingers-per-hand-ness is the result of natural selection as it has remained unchanged for 5-7 million years. If it were discovered, however, that average height of human beings has increased by 20% in the last 500 years, it would be improbable that this is due to selection as there has been no radical selective pressure favoring height to account for such a shift in the distribution of height-affecting alleles in such a large and geographically diverse population in such a' short period of time; we should expect that the explanation for the change in average height will more likely be found in nutrition, climate, or medical technology – that is to say that the difference in height is more likely acquired than inherited. Furthermore, the more complex a trait, the more likely that we should expect to see a gradual historical development of that trait in the species, and, if there are gaps in the historical record, some value can be accorded by the record or existence of homologous developments in other species as this suggests either the trait existing with ancestors shared between the species (dating the trait even older than the species) or parallel development of the trait in separate species (and appearances of the same trait in multiple species is even less likely to have occurred by drift than is its appearance in a single species) .

So, if a physiological trait is complex, old, universal and is homologous with traits of other species, we should have good reason to believe that the trait might be the product of selection. If it displays obvious selective advantage, so much the better. It does not follow, however, that any trait that is complex, old, universal, etc., is therefore necessarily currently adaptative. A trait may have contributed to the fitness of the organism at some time in the past and for sufficiently long to become fixed in the population but, with changes in environment, may have become sufficiently useless that there would be no selective pressure to maintain the trait and it may become non-functioning. It would be a mistake to assume that the non-seeing eyes of cave fish living in lightless environments somehow provide or provided a fitness advantage to the fish – it is generally accepted that the ancestors of this species evolved functioning eyes through natural selection in an environment in which vision provided an advantage, but then they got cut off from the world of light, and have since been adapting to a world of darkness

(Jeffery 12). This is termed regressive evolution (an unfortunate term, in that it implies running counter to progress), the loss of traits over time when they no longer serve a purpose. Notes Jeffery: "humans would be as hairy and tailed as other primates if regressive evolution did not prune unused ancestral traits" (Jeffery 2). Which is to say: if we assume that because we have a tailbone it must therefore have an adaptive function, we will be literally and figuratively chasing our tails. Other traits may be the product of selection but peripheral to the adaptation. Gould calls these types of traits spandrels or architectural constraints (Gould and Lewontin 2). The whiteness of bone, for instance, provides no fitness benefit; it is a neutral side-effect of the presence of calcium, which does have a function in that it allows for the rigidity and hardness of bone (Cosmides and Tooby 1997).

Note as well that traits that are the product of selection are not *necessarily* complex, universal and old. That a trait is selected need not mean that the trait need be complex; the higher complexity of the trait merely provides more confidence in a hypothesis that the trait was the product of selection and not of drift. Similarly, that a trait is selected need not mean that the trait is universal in a population; consider a trait that makes its appearance in a population and, due to selection, over thousands of generations reaches fixation – the distribution frequency at any stage of that path to fixation is the product of selection, not solely that of the final stage. Fixation may never be reached, but that does not mean that we need to look elsewhere than selection for an explanation for the trait's frequency. An illustrative example of this would be the allele that causes sickle-cell anemia; homozygotes (people who have a matching pair of the allele) suffer sickle-cell disease, while heterozygotes benefit from a ten-fold reduction in the risk of severe malaria (Kwiatkowski 171). In much of the world, where malaria is not endemic, the allele has only negative effects and could be expected to be selected against; in areas suffering from high infant-mortality rates due to malaria, the allele is strongly selected *for*. As long as the earth's climate remains as it is, we should have no expectation of ever seeing the sickle-cell anemia allele reach fixation in the human species – yet the geographic distribution of red cell disorders provides one of the better-supported cases of recent natural selection in the human population (Kwiatkowski 184-85). And that a trait is selected need not mean the trait is old – it need be only sufficiently old to allow for its complexity and frequency in the population.

How one might estimate the complexity of an instinct for art (consumption or creation) to help determine whether it is a product of natural selection? Given the way we've been considering complexity – as relative comparison of necessary accumulated genetic change if the phenotypic feature were the product of natural selection – this is practically unanswerable. Consider that the drive and the skills of art creation are near indistinguishable from the drive spurring, and the skills developed for, the creation of tools and other practical artifacts. Now consider that variations in the burrow architecture of oldfield mice are found to be genetically determined and that specifics such as entrance tunnel length and presence or absence of a secondary escape tunnel have been found to result from genetic variation at "a surprisingly small number of loci" (Weber et al, 404). |This places the oldfield mouse's phenotypic behavior of adding an escape tunnel to its burrow in the vicinity of the phenotypic physical trait of human beings having blue eyes, in terms of complexity. And perhaps art-making is a simple escape-tunnel-like addition to a burrowing-like tool-making instinct. Consider as well that were a person to be totally lacking in innate aesthetic interest or discrimination this might never come to the awareness of their fellow human beings as a) the same behavior is easily feigned or learned, b) aesthetic interest manifests in different ways in different folks, many of them private, and c) we may momentarily consider someone not sharing our particular aesthetic interests to be odd (such as perhaps when, for example, someone says, "I don't really care for music") but it is generally not considered something of importance. Someone born aesthetic-blind (in the way someone might be born color blind) would unlikely come to public attention, and if they were to, would probably not be considered someone that merited medical study. There appears little incentive for study into possible genetic contributions to apparently near-universal aesthetic drives and, in the absence of data that such study might provide, there is little by which to judge whether the behavior, as phenotype, would be complex or not, as ultimately our consideration of complexity has been a consideration of relative accumulated genetic alterations. The burden of evidence must fall to criteria other than complexity if we are to reach a convincing argument for the selectedness of an art instinct.

We need to consider, as well, that whether or not a trait is the product of selection is ultimately an empirical question, not a theoretical one, and this being so any ultimate evaluation of a trait must be restricted by limitations in the availability of evidence. When establishing the "age" of a physiological trait within a species, for example, the longevity of any remnants can greatly affect the amount of available evidence; surviving evidence of resilient biological structures such as bones or shells are rare enough; preserved remnants or traces of soft tissue structures are much rarer still, as decay generally preempts fossilization (Edgecombe et al, 2). Our understanding of the history of differential reproduction is affected by differential preservation of organic matter and its traces.

This issue is compounded when considering behavioral traits which leave no fossils and often leave no artifacts, and for which there may be little (or little understood) physiological evidence in even living samples of the species in question. For example, what physiological traits distinguish humans as a language producing species? And how does that information allow us to date the birth of spoken language? A very specific variation in the FOXP2 gene distinguishes humans from other primates (Krause et al., 1908); this gene was discovered to contribute to human development of language skills because a rare mutation in this gene has resulted in the affected individuals suffering a language impairment (in production more than in comprehension), producing deficiencies in grammar, semantics, pronunciation and verbal IQ (Vargha-Khadem et al., 132); when the FOXP2 gene was "humanized" in mice (altered to match the human variation), it accelerated learning (Schreiweis et al., 14254), altered vocalizations made by the pups, and produced changes in the neural structure that in humans is relevant for speech production (Enard et al., 966-68); when this gene's expression was inhibited in songbirds, their ability to learn species-common vocalizations was impaired (Enard et al., 968). All research suggests that this particular gene plays a contributory role in the human ability to speak and use language. In 2007 it was reported that a team had retrieved DNA from Neanderthal remains and found the FOXP2 gene to have the same configuration as modern humans; they place the fixation of the gene with common ancestors to Neanderthals and modern humans prior to 300,000 – 400,000 years ago (Krause et al., 1911). Does this mean that Neanderthals and other hominids had language? It does not. Even if the FOXP2 were believed to be the sole genetic contributor to the human predisposition for language (which it is not), there is no reason to believe that it was the enablement of language that gave the FOXP2 adaptive advantage, pushing it to fixation – the FOXP2 may have conferred some other functionality and only once having reached fixation in the population, in combination with other genetic factors, may have played a factor in language predisposition. Another study reports that transcranial Doppler ultrasonography reveals that modern humans engaged in stone tool production display "common cerebral blood flow lateralization signatures" with those engaged in cued word generation, suggesting a "shared neural substrate for prehistoric stone tool-making and language" (Uomini and Meyer, 1). Does this suggest that the capacity for tool-making and the capacity for language co-evolved, allowing us to date traceless language from the existence of tool-making artifacts from some 1.75 million years ago? Not necessarily. Modern humans, in attempting to replicate Acheulean knapping, may not be engaged in the same mental activity as originally were Homo habilis; even infant and adult contemporary humans have a strikingly different capacity for language acquisition, for example, and it would be reasonable to posit that they are learning by related but different mental activity. That is to say that modern adult humans may perform cued word generation by way of a means analogous to mental stone knapping (or vice versa), but Homo habilis may have done stone knapping by way of a means analogous to how a modern infant picks up language. And tool-making may have long preceded language or vice versa – adaptations build on previously-existing phenotypes, and either propensity may have exploited existing neurological structures and cognitive and behavioral capacities.

So how does one build a plausible case for a behavioral trait being the product of selection in the absence of historical physical evidence? Consider Matthew Gervais' and David Sloan Wilson's discussion of the evolution and function of laughter. Gervais and Wilson note:

1. Laughter is a universal human behavior found in all cultures
2. Found in practically all individuals
3. One of the earliest social vocalizations made by infants
4. Emerges spontaneously within two to six month's age
5. Has been known to occur in cases when the individual has never experienced the laughter of others (e.g., in congenitally deaf and blind children)
6. Is distinctive and has a characteristic, stereotypical form
7. That is universally recognized
8. Bears resemblance to primate play display, which has been argued to be a precursor (Gervais and Wilson 397-98)

Here we see no appeal to complexity, but we do see recognition of universality (1, 2, 6 and 7) and a suggestion of ancientness (8). An interesting distinction is made between three not-necessarily-synonymous meanings of universal (1, 2, 6 and 7) – though apparently not the case with laughter, a behavior might be culturally universal (in the sense of "can be found in all cultures", not necessarily implying that it is a product of culture) but not individually universal (such as left-handedness, for example), or it might be both culturally and/or individually universal but vary enough from locale to locale that it not be universally recognizable (we can imagine a tendency toward in-group codes of politeness might be culturally universal but that specific instances of polite behavior of one group may signal rudeness to another). Gervais and Wilson also recognize the importance that the behavior occurs in the absence of learning, either very early in development (3 and 4) or in a social or perceptual vacuum (5), as this suggests the improbability of it being learned behavior as opposed to instinctual (instinctual here meaning unlearned, pre-wired, biologically pre-conditioned). Behavior that is old and universal is not necessarily instinctual – any obvious behavioral solution to old and universal environmental challenges might be expected to be repeatedly discovered and culturally transmitted so frequently so as to give it the same pedigree as instinct. The efficiency of yelling "Hey!" to get someone's attention, for instance, is immediately learned upon experiencing it – the behavior may leverage what is probably an instinctual reflex of becoming attentive and attending to abrupt loud noises, but there is no reason to believe the behavior itself is instinctive, merely that it is universally utilized due to being quite obviously universally effective. Babies do not yell "Hey!" or clap or snap their fingers to get someone's attention – but as nobody need teach them to cry or wail when hungry, we are safe to conjecture that *that* behavior is instinctual.

Gervais and Wilson, referencing Dacher Keltner and George A. Bonanno, make another distinction when discussing laughter that will be of use when considering art: the difference between Duchenne and non-Duchenne laughter. Keltner and Bonanno, in a study concerning laughter and smiling during bereavement, generalized and adapted Duchenne de Bologne's categorization of smiles (Keltner and Bonanno, 687). Duchenne smiles or laughter signifies those that are "stimulus-driven and emotionally valenced" while those categorized non-Duchenne would be "self-generated and emotionless" (Gervais and Wilson 396), "a learned facsimile of Duchenne laughter… different in kind from it" (Gervais and Wilson 400). This distinction has value beyond consideration of smiles and laughter – I suggest it has meaningful application to human instinctive behavior in general. Many instinctive behaviors have positive social consequences – this may be in part why they had adaptive value, or perhaps it is an instinctive positive social reinforcement for the behavior that had adaptive value or a mix of both. And since simulation of the instinctual behavior might also generate the positive social consequences, simulation of the behavior might be reinforced as the instinctual behavior is. This distinction can be critical when considering whether a behavior is an adaptation or not; if a behavior is instinctual and universal but in addition has positive social reinforcement, it can be expected that reinforcement of simulation of the behavior, and therefore its appearance as a learned behavior, may be universal as well. I.e., there may be learned behaviors that might have the same age, complexity and universality as instinctive behaviors they resemble because they have been reinforced by the embezzlement of the social benefit of those instinctive behaviors. By "learned behavior", we do not necessarily mean to imply conscious acquisition of the skill, and by "simulation" we do not mean to imply deceit − by the age of 10 months, and so well before they are capable of deception, infants display two distinct types of smiling – full-on Duchenne smiling for their smiling mothers, and cautious non-Duchenne smiling for impassive strangers. The first is a reflexive expression of joy, the second, a learned social signal (Messinger and Fogel, 338).

From this consideration of some characteristics of physiological and behavioral products of natural section manifest in the human species, we can form a loose cluster of measures that may not be definitive but are at least relevant to the consideration of human art behaviors as a product of natural selection: Is it old? Is it universal? Does it emerge in the absence of learning? Are there analogues to be found with other species? Does it provide any obvious selective advantage?

3.2 HOW OLD IS ART?

A portion of what we consider art is ephemeral (song, dance, performance) but much of human art-making has been in the form of the making of artefacts, so we should expect to be able to date its origins more readily than some more traceless human behaviors. A miniature mammoth-ivory carving of the human female form found in southwestern Germany has been dated to be at least 35,000 years old, making it one of the earliest discovered pieces of figurative art (Conrad, 248). Also from this period are found the earliest preserved musical instruments, carved from bone or ivory and ornamented with notches (d'Errico and Stringer, 1066). Red disk patterns found in caves in Spain have been analyzed and found to be a minimum of 40,8000 years old (Pike et al., 1409). Use of ochre "probably for symbolic behavior" on the south coast of South Africa has been estimated at a minimum of approximately 164,000 years ago (Marean et al., 905). Geometric designs engraved into shells have been dated to approximately 500,000 years ago (Joordens et al., 228).

Considerable caution should be taken in acceptance of any particular ancient artifact as art; we've discussed the difficulty in defining art and recognize that there is controversy about whether some artifacts from even recent history, even some which are claimed by their creators as being works of art, qualify as being art. It is even more difficult to feel assured that some object separated from us by tens or hundreds of thousands of years can be accurately understood, assessed and categorized as such. As

Powell wrote in *Prehistoric Art*, “Art is a term too readily borrowed in archaeology to explain things from the far past that are not obviously utilitarian” (Powell 7). Bradley suggests two sources of interpretive distortion concerning ancient artifacts: the antiquities trade removes these objects from their original contexts and presents them within a new context in which “their associations are ignored and their visual appearance changes them into works of art”; these in turn may inspire contemporary artists “equally unconcerned with the primary roles of those objects” and the resulting new art works create and/or amplify the original objects’ similarity to those found less controversially in an art context (Bradley 203).

This readily brings to mind scenarios such as extraterrestrials in the future landing on earth and interpreting compact disks as being reflective ornamental objects. But the critique runs more subtly than that. Paint may be applied to a body to camouflage or to inspire fear in an enemy or to attract the attention of a mate; patterns may be carved into objects to show ownership much as we brand cattle or sew a kid’s name into their clothes before they leave for camp; patterns carved into shells or stones might create from them a type of currency or evidence of skill; wind instruments may be used for transmission of signals much as a referee uses a whistle, or a trumpet might be used to maneuver soldiers during battle; paintings of animals may serve as teaching aids or mnemonic devices for recalling previous hunts; a carving of the female form may be intended to magically bring fertility or attract a mate; an outline of a hand in ochre on a cave wall may be merely an “I was here”. When we think of more modern analogs of these possible pragmatic interpretations of what get classified as ancient artworks, the critique becomes clearer – we do not tend to view camouflage, diagrams in instruction manuals or dictionaries, traffic cop whistle tweets, license plates, the images on bonds or bills, company logos, etc., as being representative of what we mean when we say "works of art" or "art works". We may consider them related to art, but generally marginally so. This is to say that, whatever art is, the intention involved in its creation or the use to which it is put appears to be relevant and the technique or medium used appears to be not paramount. This is less obscured with some forms than with others. In the medium of written language, for example, we recognize that there are works that we can without controversy consider art (whether good or bad, high or low) such as poetry, literature, or genre fiction; there are other works which we would not consider to be art such as classified ads, news articles and reportage, or instruction manuals; and there are some works that we tend to consider being somewhere in a continuum between, such as some novelistic nonfiction or some advertising prose. With other forms or mediums, the scarcity of utilitarian uses of the form or medium (such as with music, for instance) may give the false impression that the form or medium is what defines the object as a work of art – and we know that impression is false because if it were not otherwise the definition of art would become a trivial thing. As all that we have of ancient artifacts is form and medium and we can only surmise the intent behind them, we must retain some skepticism about any particular ancient artifact proposed to be art.

3.3 IS ART UNIVERSAL?

There are art theorists who assert that art is universal, though given the inherent difficulty of proving or providing evidence for a universal generalization, the assertion often appears in their theorems as a conspicuous assumption, not a reasoned and evidenced conclusion. That said, the same would hold for claims concerning the universality of many human behaviors.

Steven Pinker: "In all societies people dance, sing, decorate surfaces, and tell and act out stories" (Pinker 2002, 404). Denis Dutton: "Art itself is a cultural universal; that is, there are no known human cultures in which there cannot be found some form of what we might reasonably term aesthetic or artistic interest, performance, or artifact production − including sculptures and paintings, dancing and music, oral and written fictional narratives, body adornment, and decoration." (Dutton 2000, 267) Ellen Dissanayake: "No human society has been discovered that does not display some examples of what we, in the modern West, are accustomed to call 'art.'" (Dissanayake 1980, 398) As an anthropology textbook states: "All cultures have artistic objects, designs, songs, dances, and other ways of expressing their appreciation of the aesthetic. The aesthetic impulse is universal, although cultures vary in their ways of expressing it and in the social functions and cultural meanings they attach to it." (Peoples and Garrick 362)

In light of the universal generalization, a pertinent question to ask is whether there exist societies that do not have art, as such would presumably disprove the generalization. The Pirahã peoples of the Amazon might be contenders. According to Daniel Everett, the only ornamented or ornamental artifacts that they produce are necklaces, but these are not decorative but have a utilitarian function to protect from spirits. They are made primary of seeds strung on cotton string, further decorated with "teeth, feathers, beads, beer-can pull tabs" and "feathers and bright colors… to make them visible to spirits so that the spirits are not startled − like wild animals, spirits are more likely to attack when startled" (Everett 74). But even the Pirahã, though they do not have musical instruments, produce music of singing, clapping and stomping and love to dance (Everett 83). Another question worth asking is whether it matters that there might be a society that does not have art. Would minor exceptions to near universality mean that art cannot be the product of natural selection? Not necessarily. Consider phenotypic plasticity – the same genes may express themselves differently in response to different environmental stimuli or cues – much as after a fire some grasshoppers will darken their body color to black (Whitman and Agrawal 14), perhaps in some rare combination of conditions human art behaviors are dampened. Or consider that some instinctual behaviors have cue-based, if/then triggers – much as beavers build dams in response to the sound of running water, perhaps human art behaviors are contingent on near-universal environmental cues; or consider that instincts are often tendencies and may conflict or be subject to a hierarchy of applicability – much as social play behavior is instinctive in rats but is suppressed if the rats' primary needs are not being met (Vanderschuren et al. 309), certain preconditions might need to be in place before human art behaviors will flourish. And of course, as we are talking about humans, we should allow for the possibility that a society may be capable of developing a culture that suppresses art behaviors.

The example of the Pirahã peoples brings forth another consideration. How is it that Everett would know that their necklaces were not decorative but designed as they were solely to protect from spirits? Presumably, because the linguist was told by the Pirahã that this was the case. But if the Pirahã have no art, why would they have a word for art? And if they had no word for art, then they would not be able to express, "Oh, the necklaces? Not art. Sure, they look like art, but they are not art." This is to say that there is some likelihood that they expressed the utility, but left unsaid the art-status, of the necklaces. Which makes what may have been said indistinguishable from how it might be expressed in other societies that undeniably have art as we know it but have no word for art, as in those in which "art is integrated into virtually every aspect of their lives and is so pervasive that they do not think of it as something separate and distinct." (Peoples and Garrick 345)

Just as the absence of a word for art may create the illusion of the absence of art, we should also consider the flipside – does the presence of the word and fuzzy concept *art* create the illusion of the presence of art? Might the appearance of the universality of art be an artifact of language? Prehistoric man painted in caves, carved patterns into shells, applied body paint; the Pirahã fashion necklaces and sing and dance; the Dinka have no visual art or carving save a deep aesthetic interest in the markings they place upon their cattle (Dutton 2000, 267). What justifies us presuming that these are related activities? Dutton notes, "Art itself is a cultural universal… This does not mean that all cultures possess all the various arts" (Dutton 2000, 267) but the reverse can also be said: Various arts can be found in different cultures and, apparently, no culture has none; this does not mean that there is such a thing as art that is a cultural universal. Paul Oskar Kristeller, in "The Modern System of the Arts", makes the argument that the current, pervasive concept of art in the western world was only codified in the first half of the eighteenth century (Kristeller 17-24). "The grouping together of the visual arts with poetry and music into the system of the fine arts with which we are familiar did not exist in classical antiquity, in the Middle Ages or in the Renaissance century" (Kristeller 43). Larry Shiner notes that prior to the eighteenth century art tended to mean any skillful making or performing (i.e. there was an art of blacksmithing, an art of warfare, an art of painting, an art of diplomacy, etc.) but became in the eighteenth century "a high-status word for only certain kinds making and performing" (Shiner 467) – the "fine arts" became the totality of what art signified and created the appearance of unity where it had not existed prior. Shiner argues, "There is little disagreement over whether something like the idea of 'art' in the older and broader sense that was closer to 'craft' can be found in nearly all cultures of the world; where we will continue to disagree is on the extent to which particular aspects of the modern European ideals of (fine) art are also found in traditional small-scale societies" (Shiner 468). It is exploiting the ambiguity of our language to be using "the pre-modern sense of 'art' to claim universality, then using art in its modern sense… to claim that 'our' concept of art can be found in small-scale non-literate societies" (Shiner 467). Kant's conception of art, as found in *Critique of the Power of Judgement*, as being "intrinsically purposive" and "devoid of an end" (Kant 1790, 185) might be considered coherent in the modern sense of 'art,' but would have been nonsensical in the pre-modern sense of the word.

But none of this presents a definitive death-knell on the idea that this modern, Kantian concept of art might be meaningfully applied to pre-modern human activities or found to be universal. It would be reasonable to posit that the modern concept of art as limited to the various fine arts is due to a cultural awakening to a recognition that these things being referred to *are* of a related sort, distinct from others, that the modern, Western (as some would have it) concept of art articulates something that was previously known but inarticulate. One thing that does distinguish these arts from those other activities that were previously considered arts is that they *do* appear to be "devoid of an end" or lacking any utility other than providing an immediate satisfaction divorced from any apparent utility – and that holds for instances of these arts regardless of where they are found in the historical (or pre-historical) stream. We will examine this further in a bit, as an adaptation with no utility seems quite impossible (or, at the very least, an apparent contradiction in terms), but for the moment it is sufficient to acknowledge that even if the modern concept of art may have made its appearance only in the last 300 years, the objects and activities to which it refers, and the validity of the application of the modern concept to those objects and activities, could very well be timeless. One might liken the modern concept of art to the Western concept of 'zero', which can be traced as well, in use in Egypt nearly twelve thousand years before its introduction and acceptance in European mathematics (Joseph 86) – that does not mean that what one refers to by using 'zero' existed in some but not in other areas at different times, nor that 'zero' was imposed upon, or appropriated by, the Europeans, nor that the concept of zero is illusory, an artifact of language. Though it may be a reasonable question to ask "[e]ven if it is true that the absence of a word does not prove the absence of a concept, how can we prove the presence of a concept for which there is no word?" (Wierzbicka 408), what is of interest to us is not whether the concept of art is present, but whether art-behavior is present, regardless of how it may or may not be conceptualized.

Harkening back to our discussion of Gervais and Wilson on laughter, consideration should be given to the different possible meanings of 'universal' concerning art and the implications of this. For instance, Pinker, Dutton, Dissanayake, et al., assert that art is a cultural universal. But this is not the same as an artistic trait being universally found in all individuals. Left-handedness is culturally universal (again, meaning "found in all cultures", not implying it being of a cultural kind) but accounts for only 1/10 of individuals (Frayer et al., 52); albinism is also a cultural universal but accounts for approximately 1/1,000 to 1/20,000 of individuals (depending on the population being considered) (Greaves). As there is strong supporting evidence that *right*-handedness in humans is genetic (Ocklenburga 2789) and ancient (Frayer et al., 62), and that albinism is selected *against* due to individuals with albinism having a greatly elevated risk of skin cancer in geographical areas of high level UVB exposure (Greaves), we should be cautious in assuming that traits that are cultural universals are necessarily traits that have been selected *for* – there are traits that persistently and consistently appear in some individuals that have been selected against in the populations in which they are a member.

But art itself is not a trait – if it is the product of natural selection then it is so as an artifact, a product of a naturally selected behavioral trait in human beings (excepting those forms such as dance and acting in which the product and behavior are one). A significant question is: how individually prevalent is this artistic trait? If we look to children in North America, there is an appearance that children in general are drawn to creating art, to drawing and coloring, at an early age, but considering that even Aristotle advocated drawing as part of the development of youth (Kelly 11) and that modern educators have emphasized the value of early art instruction as part of child development since the early 1800s (Kelly 26), it might be difficult to distinguish what is spontaneous and what is learned of child art production. When we look to adults, the apparent childhood enthusiasm for creating art appears to significantly wither on the vine. According to 2001 census data, artists make up 0.8 percent of the total workforce in Canada (Hill Strategies Research 2). Is this a meaningful number? If we consider other individual traits which we know to be universal, we know that the number of people employed to exercise these traits (if any) does not in any way represent their prevalence in the population – if we had statistics on the number of people in the US who are paid to eat that would tell us nothing about the prevalence of eating, to point out an obviously absurd but accurate analogy. How many amateur or hobbyist artists are there? Unfortunately, that information isn't captured in Canadian census data, but the European Union is able to provide relevant statistics. According to the Statistical Office of the European Union, writers and creative or performance artists accounted for 0.7 percent of the workforce in 2009 (eEC 65) (comparable to Canada's 0.8 percent in 2001); amateur or hobbyist participation in singing, acting or other public performance was reported by less than 15 percent of Europeans aged 25–64 years; fewer still engaged in activities such as drawing, painting, sculpture or computer graphics (eEC 162). Cross-cultural studies, such as those considered in Anderson's *Art in Small-Scale Societies* (1989), suggest that art production by adults tends to be done by specialists.

There is a disproportion, however, that deserves consideration – considering the apparent relatively small percentage of art producers that comprise part of the adult population (as in Canada or Europe in the examples above), how do we account for the ubiquity of art (again, not meaning merely gallery-type art objects, but ornament and other "lesser" art as well) in the world around us? I would suggest that art is ubiquitous not because artists (as we tend to think of them when doing censuses) are such a significant portion of the population, but because the drive for art-consumption, art-collection or art-participation is so common in the species. Returning to European statistics, we find that 45 percent of those aged 25–64 reported attending a live performance, going to the movies, or visiting a cultural site (presumably a gallery, museum, or some such) at least once in the previous 12 months (eEC 161). 97 percent of Europeans watched television at least once a week; 87 percent watched television daily (TNS 5). And what percentage of homes would be lacking in any instance of pattern, design, ornament, décor? Do there exist human beings that navigate through their lives with no thought given to aesthetics? What I'm suggesting is that the question of why there are artists (who appear to form only a fraction of the population) may be merely a peripheral question; the central question may be why there are "consumers" of artworks (which appear to form a near totality of the population). Human beings as consumers of art may be considered within a continuum with those who engage in acquiring or seeking to passively experience art at one end and those who actively create it at the other and there being merely an insignificant percentage of the population that doesn't fall within the continuum at all. If we look back to prehistory, perhaps the mystery of why there were artists is no more a mystery than why there were axe head makers; the benefits provided by axes meet needs that are individually universal even if becoming skilled in axe making may be a specialty and an individual rarity. Axe makers exist due to the demand for axes, not vice versa – perhaps it is so also for artists, they exist to meet the demand for art (either for themselves or for others in addition to themselves). An apparent paucity of artists does not necessarily disprove the universality of art – it disproves not even that an art instinct is individually universal.

3.4 ART IN THE ABSENCE OF LEARNING?

As previously mentioned, modern educators in the West have emphasized the value of early art instruction as part of child development since the early 1800s, a fact that makes it difficult to evaluate what art behavior in children may occur without inducement. Additional difficulty in evaluating whether art occurs in the absence of learning is affected by what we should perhaps consider a stereotypic common concept of what qualifies as art. The overwhelming tendency is to consider as art only those entities/events which meet expected culturally stereotyped forms of art – paintings, drawings, sculpture, poetry, songs, skits, plays, etc. These stereotyped forms are most likely learned cultural norms, as expectations regarding them often change both interculturally and intraculturally over time (and intercultural dispersal of a form type tends to increase with ease of intercultural communication). The haiku, for example, was a form of poetry unknown in the West prior to its spread via Dutch traders in Japan in the 1700s (Verhart); the sonnet was introduced into Bengali literature in the 1860s and became a popular poetic form there by the early 19th century, some 500 years after the form's establishment as an Italian form (Das 4139); the limerick, though of disputed origin, came into undisputed ascendency in England in the early 1800s (Warnke 449) – which is to say that a poetic form transmits much the same way as smoking tobacco or the domestication and use of horses did, as learned cultural transmission, not as an allele does. And the tools and materials which are traditionally used to accomplish art within these culturally dictated forms (when needed) are most often culturally provided artifacts. A child does not produce what we recognize as a picture unless we have provided that child with paper and a crayon, marker, pencil, or similar instrument with which to draw upon it. This is to say that until a child's art behaviors are channeled into using recognized art tools and are seen as having attained or are aspiring to recognizable art forms, they may not be recognized as art behaviors. Another way of saying this is that by the time art behavior in a child is recognized as art behavior, they have already passed the threshold before which we could point to it and say the behavior is unlearned. Assuredly, if there are art instincts, if there are drives for art behaviors that pre-date exposure to experiencing art behaviors by others, it is unlikely that they are recognized as such, as art is commonly understood as a product and is only recognized as being such a product once it meets cultural expectations concerning that product. That these stereotypical forms are learned says nothing about the possible instinctual nature of the drive for the behavior, any more than recognition that languages are learned cultural products refutes the possibility of there being a human predisposition for language.

What might proto-art behavior in children look like? One could argue that it would be near-indistinguishable from play. Consider the five key characteristics of play as identified by Garvey:

> 1. Play is pleasurable, enjoyable...
>
> 2. Play has no [proximate] extrinsic goals. Its motivations are intrinsic and serve no other objectives...
>
> 3. Play is spontaneous and voluntary...
>
> 4. Play involves some active engagement on the part of the player.
>
> 5. Play has certain systematic relations to what is not play (Garvey 4)

All five characteristics hold for what we tend to conceive as art behavior. One might argue, regarding item 2, that some artists create art in order to make a living, or to gain recognition or fame; a similar argument is often made concerning professional athletes, that though we speak of them "playing" baseball, for example, it cannot really be play if they are receiving a paycheck. Kretchmar convincingly argues that one can both play a sport and work a sport, that one is able to alternate between them "and live the nuances of both" (Kretchmar 121). It is perhaps valuable to consider that a professional artist might both create art and work art similarly. Regardless, the complications introduced to the argument by consideration of professional athletes or artists are moot when we are considering the proto-art behavior of children – the spontaneous early play of children apparently serves only intrinsic proximate goals.

Another characteristic shared between art and play is that both have aspects of being "decoupled". If you are asleep and dreaming that you are being chased by a tiger, your body does not go running through the house in a panic – that is because the dreaming mind is decoupled from the body to great extent – your dream actions do not affect body actions. Cosmides and Tooby argue that a similar inherited ability to decouple is a "specialized computational adaptation" upon which much of human reasoning is dependent. To be able to strategize, to consider suppositions, to predict another's behavior, to set a goal, to invent – all of these require us holding mental simulations or counterfactuals in mind and to be able to consider them *as if* true without holding them *to be* true (Cosmides and Tooby 2000). Consider play: "All play requires the players to understand that what is done is not what it appears to be. It is this nonliteral attitude that allows play to be buffered from its consequences: in effect, it permits play to be play (Garvey 7) ", or, as Cosmides and Tooby illustrate, "… the child who represents her mother as pretending that the banana is a telephone does not store as true 'the banana is a telephone' … she does not become confused about the properties of bananas or telephones" (Cosmides and Tooby 2000). Consider art: Kant spoke of fine art as "a kind of representation" (Kant 1790, 185) and no representation is the thing itself; if an artwork is intended to be representational, even the most precise and accurately representational art is at best a simulation of what it represents; conversely, if an artwork is *not* intended to be representational, it concretizes something imagined in a way that allows it to be experienced as if real; relevant: Magritte's painting of a pipe with caption (in French) "This is not a pipe". We will consider the relationship between art and play further when weighing adaption theories proposed for art. For the moment, it is sufficient to recognize that children appear "naturally predisposed to engage in the arts in terms of mark-making, moving to music, singing, wordplay, dressing up, and inventing and acting out stories" (Aikin).

3.5 ART ANALOGUES IN OTHER SPECIES?

As said earlier, until a human child's art behaviors are channeled into using recognized art tools and are seen as having attained or are aspiring to recognizable art forms, there is some possibility that they may not be recognized as art behaviors. We could expect that the same veil might more so obscure the consideration of the behavior of other species as, not having "native" understanding of the general behavior of a particular species, we should hardly expect to recognize when a particular behavior may be truly art behavior as expressed by that species. Much in the same way that if one had no knowledge of Spanish (for example), one could hardly distinguish a Spanish prose poem from a Spanish weather report, similarly, we should expect little confidence in our discernment of whether a whale is singing, telling a fictional story, or merely making a general call to gather other whales together. When is the dance of a bee not a communication of the location of a food source and truly a dance? How would we know?

Most easily recognized as being at least peripherally related to the question of whether members of other species create art is the behavior of some animals in captivity that create objects conforming to recognized human art forms using tools used by humans for art creation. Elephants, seals, chimps, dolphins, ravens – all have created paintings resembling abstract or representational human paintings composed by a child, usually for the entertainment of human audiences (Kaplan and Rogers). Is this art? Kaplan and Rogers raise the point that if there is a significant difference between the perceptual range of humans and another species, but the art work created by members of the species conform to human perceptual expectations, one is justified in questioning the given narrative surrounding the creation of the art work. An elephant has color perception akin to some color-blind humans, having fewer pigments in the photoreceptor cells of their eyes (Kaplan and Rogers); were an elephant to paint a flower using the full palette used by humans (as some do), one must conclude that the elephant is being guided or is working by rote, as they would be incapable of seeing, and thus reproducing, the full-palette image of a flower as seen by a human. Ethologist Desmond Morris confirmed as much on observing painter elephants in Thailand, concluding that the elephants were being guided by their trainers via a system of subtle tugs to their ears then rewarded with food once complete (Morris 2009). These elephants are no more doing art behaviors than the horse Clever Hans was doing mathematics – though the case of Clever Hans didn't involve contrivance on the trainer's part. Should the produced paintings be considered art? Can art objects exist despite not being the product of art behaviors? On encountering a spectacular sunset, a brilliant neon blast of color pattern on a tropical frog or bird, a sublime mountain face or an expressive weather-beaten tree, we might have an aesthetic reaction much as we might to an art work, but we do not classify these as art. Our definition of art appears to require an element of intent – of art-making intent – and thus needs to be the product of an entity that is intentionally making art. That intent is a significant qualifier regarding art and aesthetic response can be seen in some of our oft-unconsidered reactions to art in comparison to similar, naturally-occurring aesthetic opportunities – we might pass dozens of trees in the course of a day and not consciously register the shape or color of a single leaf, but later encountering even merely a photo of some leaves in a calendar might momentarily bring to our awareness the effect of the image and the shape and color of the leaves therein; we may have that very hour encountered multiple instances of leaves that were as pleasant, beautiful, etc., but they went unnoticed simply because they were not framed by another human as something worthy of our aesthetic attention. The apparent essential nature of intent to our appreciation of art explains why even an accidentally or naturally produced effect might be merely selected and presented as art by an artist to qualify as art (such as with Duchamp's ready-mades, Cage's chance-produced compositions, Dada poems created by pulling words out of a hat, or, yes, calendar or postcard photography). Using this ad hoc minimum criterion of art, that it is intentionally produced (or chosen) to effect an aesthetic reaction, what appears to be art (to us) produced by another species might be art or not to members of their own species, and could be seen as art by us if we believe that the producer was intentionally attempting to effect an aesthetic reaction or if a human artist re-presents the object/action so as to effect such an aesthetic reaction in us. It could be said, then, that the paintings produced by the elephants in Thailand could be considered art – but the actual artists are the trainers, not the elephants, and the fiction that the elephants are spontaneously creating the paintings should be considered as much a part of the art work as the painting itself.

Admittedly, what is significant is not "Can *all* animals create art" but "Do *any* animals create art", so it may be beneficial to consider our closest cousins with whom we may be more likely to share instincts and perceptual biases. Apes in captivity – in particular, apes that have learned rudiments of sign-language – have provided some interesting data. The chimpanzee Moja and the gorilla Koko both have sketched what appear to be recognizable birds (showing what appear to be bodies with wings) and have also signed that the drawings were in fact of birds; the gorilla Michael restricts his palette to black and white only when painting what he signs is his black and white dog (Kaplan and Rogers). It appears that these apes are capable of not only of painting, but of deliberate representation with their painting. We should be cautious in our conclusions regarding this, however. Firstly, we are talking about symbolic behavior being manifested by apes that already, in learning sign language, appear adept in symbolic behavior, and it could be argued that signing is in fact more abstract than pictorial representation (in that the word "chair" bears no resemblance to a chair but a picture of one will). Secondly, we must be wary of how much (perhaps unconscious) training has preceded, or guidance has been provided during, these manifestations of representational painting – one of the criticisms that has been levied against many of the primate sign-language studies is that in a significant portion of interactions, the apes were merely repeating what the trainer has just signed or they were being subtly cued (much as Clever Hans was) – and that this had gone unrecognized until retroactive analysis of video tapes of the interactions (Jannedy et al. 29). Additionally, it could be argued that not all crafted representation is necessarily art. If our written language consisted of pictograms (much in the way some hieroglyphics might be considered stylized pictures of what is being referred to), a simple sketch of a chair might serve the same function as the combined written letters c-h-a-i-r do for us now, and have as much claim to being art (little to none, unless perhaps if we were considering calligraphy). Whether being done by a human or an ape, creating representational drawings is not necessarily creating art.

Desmond Morris, some forty-plus years before investigating elephants in Thailand, worked for two years with a chimp by the name of Congo, analyzing some 400 of Congo's drawings and reviewing other primate picture-making studies, publishing his findings in *The Biology of Art* (1963). Morris discerned some patterns in primate picture-making behavior that suggest that ape picture-making is related to human art-making. Most importantly (in part because it places this primate behavior in stark contrast to that of the Thailand elephants above), Morris found that Congo not only found art creation to be a self-rewarding activity, but if positive reinforcement in the nature of treats were provided, Congo soon lost interest in the work (Valentine; Sebeok 220). Were this to be found generally so in other picture-making apes, it would suggest that their activities lie outside of the realm of trained behavior and that they bear significant similarity to human artistic creation and appreciation, both which are also often depicted as being self-rewarding (i.e. art for art's sake). Five additional significant characteristics of primate picture-making as codified by Morris are: a preference for symmetry and repetition, a slow progression in complexity over the course of the oeuvre, a tendency to develop themes and explore variations on them, an inclination towards an "optimum heterogeneity" neither too simple nor too complex that contributes to the sense of when a picture is complete, and the appearance of species-typical imagery (Sebeok 222). When Morris speaks of primates, he includes in that category the "naked ape" – he presented these characteristics of primate picture-making as also characteristic of human child art. Such regularities appear to support a biological basis for an art instinct, but, as Sebeok asks, "why, if they have such a strong picture-making potential, have apes neither developed nor utilized it in the wild?" (Sebeok 221) A related, stronger question more relevant to our inquiry: if a heritable tendency never manifests in action, how can it be selected for? One possible solution to this quandary has already been posited – it is perhaps only once this art instinct is channeled into using a sheet of paper and pencil (or canvas and brush, etc.) – channeled into a human art form − that we are able to recognize the behaviors for what they are. The question remains troubling, however.

When humans perform art behaviors, in doing so they create art for either themselves or for other humans – it is species-centric behavior. It follows, as suggested before in asking whether we'd recognize were a bee to dance, that if art behaviors of the same or similar kind as that of humans are performed by members of other species, we should expect that this behavior, too, should be species-centric. If a dog does art, it would be reasonable to expect that it would meet whatever criteria would make an art work appeal to dogs. The non-human primates considered by Morris found pleasure in picture-making, but that parallels only part of what we seem to know of human art behavior. What there appears to be no record of, with these primates, are them having any interest in art works created by members of their species beyond the act of creating them themselves. What isn't recorded here is whether these created pictures are of any interest to other primates, or even whether the primate artist has any interest in the completed pictures once complete, whether they treat the pictures as special objects or spend any time revisiting and giving them further consideration. Human art appreciation behavior subsumes human art creation behavior; if human art behaviors are culturally universal it seems likely that this is because art appreciation behaviors are, near as we can tell, individually universal despite art creation behaviors apparently not being so. It is common that people who believe they do not have the skills for art creation often still have an appreciation for art or express aesthetic preferences, but were a creator of art, an artist, to not have art appreciation or aesthetic preferences, that would seem to be an absurdity. If other primates find pleasure in picture-making but display no species-general inclination towards an appreciation of conspecific art, their behavior could be said to be related, but hardly comparable, to human art behavior. We can safely say that not only has the apparent picture-making potential of apes gone unutilized in the wild, but there appears no indication that apes in the wild are attempting even décor, ornament or aesthetic arrangement of their environment on any significant scale; it follows that ape picture-making may be related to, but not necessarily of the same type as, human art behaviors.

Bearing closer resemblance to human art behaviors, in that both apparent art object creation and art appreciation are consistent, universal, untutored behaviors for the species, are those of bowerbirds. Of 18 bowerbird species, the males of 14 of them create elaborate, ornate constructs of no apparent practical purpose other than to appeal aesthetically to the females (Borgia 92). These bowers have species-specific and population-specific forms, including leaf-decorated floors, 3 meter high towers of sticks, and 4 meter diameter huts (Borgia 92, Diamond 31-32), and are decorated with "as many as several hundred or thousand flowers, fruits, mushrooms, snail shells, butterfly wings, stones, and other natural objects" (Diamond 31). Bowerbird apparent art behaviors differ from human art behaviors in significant ways – most significantly, there is a clear gender divide with solely males creating the art objects and females being the appreciators and evaluators of the males' creations – but do serve to illustrate that it is not preposterous to believe that these and even more subtle, unrecognizable art behaviors might be natural to other species. We will later further consider bowerbird behavior and how it compares and relates to human behavior.

3.6 A COUNTER-EXAMPLE AND CAVEAT

In comparing human art behaviors to other behaviors such as laughter or play, which are generally accepted to be inherited and instinctual, it appears that art appreciation behaviors might plausibly be hypothesized to be inherited and instinctual as there appears to be no obvious evidence to the contrary. There remains much uncertainty, however, and the appearance of the traits of human art behaviors conforming to those traits generally accepted as indicators of inherited, instinctual behavior could be illusory. To summarize: Estimates of the complexity of art behavior can produce such a range of possible reasonable answers that it renders the criterion valueless; estimates of the ancientness of art is dependent on our confidence in recognizing ancient artifacts to be in fact art objects, materials or tools; evaluation of the universality of art must recognize the possibility that a variety of behaviors with differing raisons d'être, grouped under the canopy term art, might skew our sense of the cultural universality of art, and that traits found culturally universal may be found manifest in less than a significant percentage of individuals; there is difficulty inherent in recognizing art behaviors that might be performed by children prior to cultural exposure as we do not necessarily know how to recognize art behaviors until they have been channeled into recognizable, learned forms; the spontaneity of art-like objects produced by other species in captivity is questionable and if art behaviors are being performed by other species in the wild, our recognition of them is potentially hampered by the intra-species focus of art.

The waters, however, get muddier yet. We have already noted that any obvious behavioral solution to old and universal environmental challenges might be expected to be repeatedly discovered so frequently and culturally transmitted so consistently as to give it the same pedigree as instinct. And we've also discussed Duchenne and non-Duchenne smiles and, following Gervais and Wilson's expansion of the concept to apply to laughter, considered that it might pertain to other instinctual behaviors − that for universal instinctual behaviors that have social pay-offs, learned simulation of the instinctual behaviors might also become universal. An additional factor complicates things even further – the fact that universal learned behaviors, given enough time, can create, or themselves *be*, environmental factors that can apply selective pressure to the genotype. Consider the human use of fire. Fire, once discovered, provided an extraordinary solution to a variety of human biological inadequacies and environmental challenges. Fire provided heat, offered protection from predators, extended light beyond the length of the day, repelled insects, hardened or softened materials for tool-making, could preserve meats by smoking and drying, and, perhaps most importantly, made a larger portion of available plants edible with the process of cooking and allowed for the preparation of meats and plants in such a way that greater energy and nutrients were extractable from the foods eaten. Experiments show the caloric gain from food due to cooking as increasing 12-35% for starches and 45-78% for protein (Wrangham and Carmody). Additionally, the metabolic work of digestion is significantly reduced with the softening of food (Wrangham and Carmody 5) – cooking essentially predigests meats and plants. This perhaps plays a role of great significance in the evolutionary path humans have taken. Fonseca-Azevedo and Herculano-Houzel, in analyzing data regarding the brain size, number of brain neurons, body mass and feeding behaviors of a variety of primate species, found that the three traits − body mass, number of brain neurons (a linear function of size of brain), and the amount of time spent feeding − all bear a direct relationship with each other (Fonseca-Azevedo and Herculano-Houzel 18572). They assert that for any particular body mass, an increase in number of brain neurons requires a steep increase in the number of daily hours spent feeding (Fonseca-Azevedo and Herculano-Houzel 18573); it follows that, as there are practical limits to the amount of time that can be spent eating (there are only so many hours in the day), there are consistent biological limits to the possible brains size of primates. Maintaining a brain is energy-expensive – a unit mass of brain has greater metabolic cost than a unit mass of other parts of the body – and it turns out that primates don't have the time (to dedicate to eating) to afford brains bigger than what they have for the bodies they have. Humans, however, appear to have broken the barrier. While early hominin species would have required daily feeding hours consistent with those of other primates, Homo sapiens should not have been able to afford the body mass/brain size they had, requiring more than 9 hours a day feeding while extant great apes have difficulty exceeding more than 8 hours a day (Fonseca-Azevedo and Herculano-Houzel 18573). A possible hidden variable that allows humans to be an exception in this matter, the possible difference that makes the difference, is diet – humans prove an exception to the formula as their diet is exceptional. As Fonseca-Azevedo and Herculan-Houzel conclude, “a metabolic limitation was overcome in the human lineage by the advent of cooking food, which greatly increases the caloric yield of the diet, as a result of the greater ease of chewing, digestion, and absorption of foods… that the combination of a newly affordable larger number of neurons with the accompanying time now available to use these neurons in cognitively demanding tasks that improved species fitness drove the rapid increase in numbers of brain neurons encountered in human evolution from H. erectus onward” (Fonseca-Azevedo and Herculano-Houzel 18575). The use of fire and cooking of food became so ubiquitous in the human lineage that it shaped the human genotype as any other environmental factor might, so much so that it has been asserted that “…no human population has ever been found living on raw wild food” (Wrangham and Carmody 8), not due to some universal preference but because human adaptation exploited the benefits of cooked food to such an extent that humans are biologically dependent on it (Wrangham and Carmody 25). I have gone into detail about the possible impact of fire on the genotype as it will prove useful in a later context. For the moment, it is sufficient to note that there are likely some behaviors that, in the absence of us having pinpointed specific genetic causative factors, cannot be classified as being learned versus being an adaptation from knowledge of traits such as age, universality, etc., as incentive for learning is often driven by biological needs, both pre-conscious and conscious learning is dependent on and exploits biological mechanisms, and physical human culture itself can be an environmental factor that shapes the genotype.

3.7 THE BLACK BOX OF ADAPTATION, OR CAVEAT II

In the mid-1990s, Adrian Thompson, a researcher in Department of Informatics at the University of Sussex, designed an experiment in applied evolutionary algorithms. Evolutionary algorithms are processes designed to find solutions to a given problem by simulating the mechanisms of natural selection – whereas populations of biological entities can, over many generations, through reproduction, genetic inheritance, mutation and selection, manifest solutions or accommodations to environmental challenges, so it is expected that computational or other processes modeled on reproduction, genetic inheritance, mutation and selection could manifest solutions to other problems. Thompson formulated a procedure by which he hoped to put into motion a process that would automatically evolve the circuitry of a chip towards a target behavior. Specifically, he chose that the chip should be able to distinguish an input of square waves of 1kHz from those of 10kHz, signaling with an output of 5V for one frequency and a 0V output for the other (Thompson 392). Thompson used for the base of his chip a beta-version Field Programmable Gate Array (FPGA). An FPGA is a reconfigurable chip that comprised of an array of 64 x 64 reconfigurable cells, each connected to its north, south, east and west neighbors and having a function unit able to "perform any Boolean function of two inputs or multiplexer function of three inputs" from up to three simultaneous inputs from any of the four neighbors and outputting to any or all of each of its four neighbors (Thompson 392-3). The configuration of each cell is applied by software on a host computer and held in on-chip memory, and each cell applies its function to inputs from neighboring cells to determine outputs to neighboring cells. Thompson limited his chip to using a 10 x 10 corner of the available cells on the chip. As the logical function unit and four outputs for each cell could be expressed by a string 18 bits long, any possible configuration of the 10 x 10 selection of cells could be expressed with a string of 1,800 bits (Thompson 392).

The procedure was set as follows: A population of 50 was used, so initially 50 random strings of 1,800 zeros and ones were generated. Each of the 50 strings, in turn was applied as configuration to the 10 x 10 corner of the FPGA. Each configuration was tested – a tone generator would send 5 bursts of the 1kHz wave and 5 of the 10kHz wave, the order randomly shuffled each time and the output of the FPGA would be analyzed by computer – the higher the difference between the average output resulting from 1kHz and the average output resulting from 10kHz, the higher the fitness rating that would be assigned to that particular configuration (Thompson 394). Once the 50 random strings were tested and rated for fitness, the next set of 50 strings would be generated as follows: the fittest string would be left unchanged, the remaining 49 members were derived from the mating of the higher ranked strings (with a mutation averaging 2.7 bits per string applied) and elimination of the lower ranked ones (Thompson 393). Test, rate, reproduce; test, rate, reproduce.

After the first 220 iterations, the best performing configuration was basically outputting the input. At 650 iterations, the 10kHz signal was still being sent to the output but for the 1kHz signal, the output occasionally dropped to a lower voltage; by generation 1,400, the output was mostly high for the 1kHz input, mostly low for the 10kHz input (Thompson 396). By the 4,100th generation, a configuration was generated that performed precisely as intended – a 1kHz tone generated a 5V output, a 10kHz tone generated a 0V output, and no delay was observed when changing from one to the other (Thompson 397).

As Thompson noted, one might think it trivially easy to design a circuit to distinguish a 1kHz tone from a 10kHz tone. If one were to conventionally design such a circuit, however, one would integrate a clock or some such by which the input could be timed. To design the same using only 100 generic logic cells was thought by colleagues to be impossible (Thompson 393). Yet it was accomplished by artificial natural selection applied to a population of 50 strings of entirely random configuration in just over 4,000 generations. Thompson's experiment provides an effective demonstration of what can be accomplished by natural selection, but what I consider more significant in their implications are some of Thompson's observations incidental to the success of the experiment.

Firstly, one might assume, going from general design principles, that any cells that are functionally disconnected from the rest of the cells and have no available path to the output cannot possibly affect the output. It was discovered, however, that there were 5 cells of the applied resultant successful configuration, functionally disconnected from the rest of the cells, that when disabled caused significant deterioration of the circuit's ability to distinguish tones. Notes Thompson, "They must be influencing the rest of the circuit by some means other than the normal cell-to-cell wires..." (Thompson 399). Secondly, the circuits are irreproducible. Choose another FPGA or another 10 x 10 section of the same FPGA and apply the same successful configuration and you would expect these new physical instances of the circuit to behave as did the original. Should you not be able to assembly-line knock out this circuit by the thousands as with other chips? Apparently not. When used to configure a completely different 10 x 10 section of the same chip, the fittest configuration deteriorated in performance by approximately 7%, while another, previously less fit configuration from the last generation now fell short of perfect fitness by only .1%. It required 100 new iterations of the evolutionary algorithm to stabilize a configuration on the new set of cells to perform as well as did the fittest configuration from the original set of cells (Thompson 403). Both these puzzles are symptoms with a common cause. The evolutionary process is constrained only by actual, physical constraints – all available resources are available to exploit, and those resources include miniscule variances in capacitance, chemical composition, mass, etc. No two "identical" chips are identical and no variance in the chip from its ideal is so subtle or incidental that it cannot become a critical component of an evolved solution (Thompson 403). Thompson makes the point that human engineers cannot design chips of the sort that were evolved by this evolutionary process.

> For a human to design such a system on paper would require the set of coupled differential equations describing the detailed electronic and electromagnetic interactions of every piece of metal, oxide, doped silicon, etc., in the system to be considered at all stages of the design process. Because this is not practical, the structure and dynamical behavior of the system must be constrained to make design tractable... conventional design always requires constraints to be applied to the circuit's spatial structure and/or dynamical behavior. Evolution, working by judging the effects of variations applied to the real physical hardware, does not... This sets free all of the detailed properties of the components to be used in developing the required overall behaviour (Thompson 403).

Here we have a 10 x 10 cell array that utilizes features so subtle and interaction of features so complex that it could not be intentionally engineered. I would argue that, for the same reasons it cannot be intentionally engineered, such a circuit would be difficult to impossible to fully comprehend. Any evolved circuit of even this "simplicity" is potentially so complex to be practically a black box. Yao and Higuchi consider this one of the reasons why evolutionary hardware has not proliferated in the way you might expect of a process capable of producing novel solutions to engineering problems: "Circuits evolved by EA's are often very difficult to understand and thus very difficult to maintain by human beings. They are basically black boxes" (Yao and Higuchi 91). And, given what was noted about no two "identical" chips being identical, even were one able to reach an understanding of exactly how and why one 10 x 10 cell circuit behaves as it does, that knowledge would be relevant but not necessarily transferable to understanding why a different 10 x 10 cell array with the same configuration applied behaves as it does. Hold that thought. Now consider the complexity of a horse or a squid or a monkey compared to a FPGA chip. I believe it is reasonable to suggest that there could be evolved biological traits that we are incapable of recognizing, understanding or evaluating due to their subtlety and complexity, and that for even recognizable adaptations there is the danger of understanding them too quickly and not fully understanding them.

CHAPTER FOUR - THE IMPLICATIONS OF HAVING NO OBVIOUS SELECTIVE ADVANTAGE

I cannot help but think with some disappointment that if only art behaviors displayed some obvious selective advantage, then one would have a much surer footing in asserting that art behaviors were naturally selected for. I suggest that there, hidden in plain view, is an argument for art behaviors being selected for.

Consider this quote by Ellen Dissanayake: “The ethological view of art presumes… that the behavior of art has (or has had) selective value, that it in some way enhances the survival of a species whose members possess that behavior. Such an assumption appears to controvert the premise that generally obtains in modern views of art since Kant, i.e., that it is ‘for its own sake’ and has no practical or extrinsic value. An ethological view generally assumes that any widely prevalent behavior has a function and is the way it is for a reason. Art would not exist universally if it did not possess positive selective value…” (Dissanayake 1980, 399).

Let’s break that down, as the germ of the argument lies here in waiting.

1. Art behavior is universal.
2. Behaviors become universal [on a world-wide scale] only because they possess positive selective value.
3. Art behaviors therefore possess positive selective value.
4. There is a predominant line of thought since Kant that asserts art has no practical or extrinsic value.
5. Behavior with no practical or extrinsic value cannot have positive selective value.

6. Therefore, despite assertions to the contrary, art behaviors must have practical or extrinsic value.

There are some points here worth considering further. First, we must recognize that Kant, et al., are referring to art *entities* (paintings, sculpture, music, etc.) not having practical or extrinsic value, while Dissanayake is talking about art *behaviors* having such. For one to have extrinsic value and the other not is not necessarily contradictory. Picture a child printing their ABCs over and over on lined paper in order to develop their printing; the resultant page of ABCs could be said to have no practical value – the practical value lies in the behavior, in the training, and the product is mere byproduct. The art behaviors in question, however, include what is analogous to both ABC-writing behaviors and ABC-appreciation behaviors, and "Art for Art's Sake" could be expanded to say that art exists "for its own sake" because it is appreciated "for its own sake", as no one denies that art is created for our own satisfaction, so it could be argued that there is sufficient justification to conflate art entities and art behaviors in this instance. Line number 2, the assumption that behaviors become universal only because they possess positive selective value, is patently untrue, as we saw with the case of fire, but showing also in the case of clubs, pointed implements, shelter, containers – any obvious solution to old and universal environmental challenges might be expected to be repeatedly discovered so frequently and culturally transmitted so consistently so as to give it the same pedigree as instinct behavior. We can, however, amend number 2 to read "Behaviors become universal only because they possess *practical value or* positive selective value" (granting that any behavior to have positive selective value must have practical value, but allowing that not all behavior of practical value is necessarily an adaptation, as it could be learned). This breaks this as an argument for art being an adaptation, but retains the argument that art must have practical or extrinsic value, contrary to Kant and others. Line number 4 presents a curious dilemma: If art behaviors must possess practical value or positive selective value, how is it that the idea that art has no practical or extrinsic value could take hold and become predominant for so long? If one were to posit, “Eating is for eating’s sake”, “Running is for running’s sake”, “Language is for language’s sake”, one can hardly imagine anyone giving them a moment’s serious thought, let alone these phrases becoming a significant part of our understanding of what eating, running, language are. One possible reconciliation of these two points is by considering that Kant was simply wrong (but persuasive) in asserting that art is “devoid of an end”, that it may be correct to assert only that art has no *obvious* practical or extrinsic value, allowing for the possibility that the practical or extrinsic value might exceed our comprehension, that it is too subtle and complex for recognition.

Let us consider in more detail the absurdity of the phrase “Eating is for eating’s sake”. What exactly makes it absurd? We might say: eating has obvious practical and extrinsic value. Eating is the means by which we take in energy, it provides the fuel by which our bodies are powered to act in the world and, in addition, it is the means by which we take in other basic materials such as vitamins, proteins, etc., which the body uses to build and repair itself – so obviously, when we eat, we are eating with purpose, not for its own sake. But is that really why we eat? If so, we are probably a very rare, exceptional animal. I think we are justified in thinking that we are the probably the only species with the minimum, cursory understanding of biochemistry required to understand this reason for eating – an understanding we acquire by hearsay long after we have already established a routine of eating. To state it differently, the world is teeming with creatures that far outnumber us that have no knowledge of the practical or extrinsic value of eating but continue to prioritize eating just the same. What they do probably know is that eating gives them satisfaction, and that not eating brings discomfort that can be alleviated by eating. And it is not only the other animals this holds true for: human babies do not need to be told the purpose of eating nor do they need to be taught to do it, and we know that early human ancestors were eating long before they developed language – they too did not require understanding of its practical and extrinsic value beyond perhaps that it brings satisfaction and alleviates the discomfort or pain of its absence. What this suggests is that knowledge of the practical and extrinsic value of a behavior even as simple as eating can be incidental to the performance of that behavior. And when we say that we eat because we need to fuel our bodies and provide the materials they need, this is less an expression of our reason for eating and more a rationalization for behavior we would find ourselves doing regardless. In this sense, it appears we do eat for eating's sake, as absurd as that may sound, as do the other biological entities on this planet.

Then there is the question of why we eat what we eat. Each of us tends to like certain foods, dislike others. Some of this is learned – we might grow to like a food that we previously disliked, or a food particular to one culture might be distasteful to members of another culture who did not grow up with it. Some of this is idiocentric – I just like baked beans on first try, you just do not. Despite variations in individual taste, it remains that the human species has what could be called universal taste preferences. Preferences for sweetness and fat and a dislike of bitterness are inborn and universal

(Drewnowski 241-2, 244), though they tend to change with age and can be affected by other biological and environmental factors (Drewnowski 242). Our taste receptors evolved so as to distinguish and categorize food into categories that are broad but effective in terms of aiding survival, and the brain has evolved to reward the organism with pleasure, or alarm it with repulsion, depending on which sensory buttons are being pushed – sweetness or fattiness being markers for foods rich in energy and nutrients, bitterness being a predictor of toxicity (Drewnowski 244). We tend to like what we like because we are wired for it – and our species always did, long before it could understand or rationalize it. "Eating is for eating's sake," "Running is for running's sake," "Language is for language's sake," none of these are quite so absurd when we consider that for each of these there are believed to be inherited, biological mechanisms in place that reward or prompt the behavior. "Art for art's sake" need not be dissimilar.

Absence of evidence is not evidence of absence. That we have difficulty conceiving of the positive selective value of art behavior does not mean that such a positive selective value of art behavior does not exist. In fact, I would argue that in this case absence of evidence implies evidence of presence. We may have difficulty in positing the practical or extrinsic value of art behavior (one couldn't posit "Art for Art's Sake" otherwise) – but we find ourselves behaving as aesthetically driven animals regardless. We dance because it feels good. We paint our walls or hang pictures because we like it better that way. We match clothing, watch movies, read novels, sing along to the radio, etc., because we like to, we enjoy it, it makes us feel better, it just feels right, etc. The very fact that we cannot explain why particular configurations of sounds, correspondences of colors and patterns, false stories about non-existent people, ornaments, decorations, representations, etc., have such prominent places in our lives is good reason to believe that the behavior is instinctual. We tend to know our reasons for the things we do, but if collectively the only reason we can posit for one of our behaviors is that it makes us feel good, that is a good indicator that we are wired with a tendency to do it, that there are biological rewards in place that obviate the need for obvious environmental rewards. There is no mystery to why we do things of practical benefit. When there is mystery surrounding why we do what we do, when universally, as a species, we find ourselves consistently exhibiting behavior of no apparent practical benefit, the lack of apparent practical benefit itself could be considered an indicator that the behavior is adaptive.

CHAPTER FIVE - PREVIOUSLY PROPOSED EVOLUTIONARY EXPLANATIONS OF ART

5.1 TYPES

Most evolutionary explanations fall within four different types − Random Genetic Drift, Byproduct, Sexual Selection, or Adaptation. It follows that evolutionary explanations of art can be typed similarly.

5.2 RANDOM GENETIC DRIFT

De Smedt and De Cruz, in "Toward an Integrative Approach of Cognitive Neuroscientific and Evolutionary Psychological Studies of Art", dismiss this possibility with a single sentence: "Its complexity makes it implausible that art would have evolved through random genetic drift" (De Smedt and De Cruz 704). I can find no one that has argued otherwise.

5.3 BYPRODUCT

Steven Pinker is a proponent of the theory that art is a byproduct of adaptations, that art appeals to us because it hacks biological, inherited preferences that had or have their adaptive value elsewhere. Pinker likens art to cheesecake: "We enjoy strawberry cheesecake, but not because we evolved a taste for it. We evolved circuits that gave us trickles of enjoyment from the sweet taste of ripe fruit, the creamy mouth feel of fats and oils from nuts and meat, and the coolness of fresh water. Cheesecake packs a sensual wallop unlike anything in the natural world because it is a brew of megadoses of agreeable stimuli which we concocted for the express purpose of pressing our pleasure buttons (Pinker 1998, 525). Pinker uses music to illustrate the analogy: Music, writes Pinker, "conveys no survival advantage… [it is] auditory cheesecake, an exquisite confection crafted to tickle the sensitive spots of at least six of our mental faculties" (Pinker 1998, 534), these being the mental mechanisms adapted for language, auditory pattern recognition and analysis, emotional signaling, processing of auditory clues relevant to habitat selection, rhythmic movement and motor control, and "something else… that explains how the whole is more than the sum of the parts" (Pinker 1998, 534-8). Expressed using a different analogy: "The mind is a neural computer, fitted by natural selection with combinatorial algorithms for causal and probabilistic reasoning about plants, animals, objects, and people. It is driven by goal states that served biological fitness in ancestral environments, such as food, sex, safety, parenthood, friendship, status, and knowledge. That toolbox, however, can be used to assemble Sunday afternoon projects of dubious adaptive value" (Pinker 1998, 524). Pinker cautions that despite there being good reason to believe that the major faculties of the mind are the product of adaptation, the fact that "art, music, religion, and dreams" seem "momentous activities" to us is no argument that they themselves are adaptations (Pinker 1998, 174). Pinker does consider one aspect of the arts, that of fictional narrative, to have adaptive value. We will consider that later.

There are some weaknesses that I find in the art as cheesecake argument. The first perhaps can be ascribed to poor choice of illustrative analogy. Fact is, contrary to Pinker's assertion, we *did* evolve a taste for cheesecake. On the face of it, this appears absurd because we know there were no cheesecakes on the African plains of our hunter-gatherer prehistoric ancestors. But we have no reason to believe that our food preferences evolved to target specific foods; it evolved to guide in food selection from known or untested potential-food candidates. In this sense, we did not evolve a taste for fruit or berries, either; we evolved preferences for particular tastes as this is a mechanism by which we would unthinkingly favor energy-or-nutrient-rich foods and disfavor poisonous or energy-and-nutrient-light foods, and many fruit and berries just happen to meet the criteria for which they would be favored. One can imagine that, should our hunter-gatherer ancestors have encountered a cheesecake on the plains and ventured to taste it, that it would have tasted good and edible to them. And their inherited biological food-guidance system would not have been tricked – the cheesecake would have been a great source of sugar and fats that the mechanism evolved to detect and reward the eating of. Dutton takes similar exception to the cheesecake analogy (Dutton 2009, 96). But I believe this is merely a weakness in Pinker's choice of analogy, not in his argument. Should Pinker have likened art to aspartame, which can give a sensory impression of sweetness equivalent to sugar but provide relatively insignificant calories, I think it would have more accurately represented his position.

Cosmides and Tooby point out what they believe is an inadequacy in Pinker's theory – Pinker suggests we have evolved mechanisms that reward us for paying attention to particular sensory patterns and that art is a means we developed for hacking it, for deliberately triggering that reward system. But Cosmides and Tooby point out that these systems that have evolved by which we perceive and navigate the world do not appear to be that naïve; "the most basic design feature you would expect to be built into a reward system for inputting information—an appreciation for its truth—seems to be completely switched off…" when it comes to art "…yet, when dealing with communication that is intended to be accepted as truthful, people are intensely interested in its accuracy" (Cosmides and Tooby 2001, 12). The switching off of the usual aversion to falsehood that is found in the enjoyment of art (and play) cannot be framed as a byproduct of any known or expected evolved psychological mechanism.

It was mentioned before that art is too complex to be the product of genetic drift; it should be considered, as well, that art might be too dynamic to be a byproduct. One feature of art of some interest to theorists is that of apparent aesthetic progression or evolution. Art has not been static. Expectations of art have not been static. Styles, techniques, typical subject matter, etc., change over time. As Henry Gilbert noted in "Progress in Art": "When we contemplate the history of an art − say the graphic art, drawing and painting – we discover a period when the laws of perspective were not understood. Later we discover a time when they were understood, and we notice that all graphic artists have availed themselves of them. This discovery of the laws of perspective cannot be considered as a purely individual idiosyncrasy – having no relation to the art which preceded and no effect on subsequent art, but must be considered as a step in the progress of the art itself. Likewise, in the art of music the discovery of harmony presents a similar case. This discovery can be attributed to no one individual but extended over several hundred years..." (Gilbert 173). This dynamism in art, its tendency to change over time, can be seen in the broad stroke classifications of art movements or periods (Expressionism, Cubism, Surrealism; Renaissance, Baroque, Romantic, etc.), or in the fine stroke variation seen in seasonal fashions, current movie listings or top-of-the-pops music playlists. This is a rare thing when it comes to the characteristics of human universals. A quick perusal of Donald E. Brown's list of human universals (as listed in Pinker 2002, 435-439) will quickly reveal how unchanging these universals tend to be. Consider the human of 10,000 years ago – the same basic tastes in food appeal, the children play games of similar types; humans cried, laughed, gossiped, were aroused to envy, anger, or embarrassment by the same things; they celebrated birth and coming of age and ritualized their reaction to death. Art, in contrast, appears to be cumulative – building on the art that came before, constantly changing; it bears resemblance to the accumulation and advancement of knowledge, with successive generations standing on the shoulders of those before. If one were sympathetic to Pinker's theory of art, one might posit that this change in art *is* an accumulation of knowledge, that we learn over time how to make better cheesecakes, refine the technologies we use to push our "pleasure buttons" (Pinker 1997, 525). Gilbert's examples of the discoveries of the laws of perspective and harmony seem to support that. Except art isn't progressive in that way – the history of art has not been teleological, developing new techniques to advance art towards whatever forms would be most effective. The discovery of the laws of perspective did not make earlier works of art obsolete nor did it mean that future works of art would need to incorporate perspective to be effective. The accumulation of art has been similar to the accumulation of knowledge in this sense, too: as much as knowledge or art advances on what has come before, that does not devalue what has come before – learning calculus does not mean one can dispense with addition and subtraction; the introduction of abstract art does not diminish the effect of a Turner seascape. Like the accumulation of knowledge, it increases in variety over time, it expands, it doesn't home in towards a singularity. This dynamism, to me, places art in a different category than cheesecake.

5.4 SEXUAL SELECTION

As Geoffrey Miller tells the story in *The Mating Mind*, Darwin was haunted by the peacock's tail. The large and colorful tail of peacocks is a hindrance – cumbersome, conspicuous to predators, metabolically costly compared to alternatives – and has no apparent utility in survival-enhancing activities. How to account for it within the theory of evolution? (Miller 35). Darwin noted the cross-species tendency for males to be more ornamental in their physiology than females and for males to have to compete for the favor of females – males fight for and court their mates, while females choose (Miller 40). Darwin argued that if females choose their mates and have preferences for particular traits, those traits "might in the course of time be augmented to almost any extent" (Darwin 1871, 124) much the same way that selective breeding of domesticated animals can create extraordinary differences in traits. The theory of sexual selection has produced several different models (Borgia 94) but all suggest the traits in themselves need have no survival value – the overall fitness of the female (of which the inherited preference for particular male traits is but one factor) and the overall fitness of the male (of which the inheritable traits attractive to the female is but one factor) affect the fitness of the offspring, and the combination of female-preference and male-fulfillment-of-preference may spread throughout a population due merely to what may start as a loose correspondence of preference and display traits to fitness traits. Some traits may more directly signal fitness than others – displaying symmetry in appearance tends to correspond to competence and a strong immune system, as disease or malnutrition can result in asymmetrical malformation – thus an inherited preference for symmetry in a mate's appearance would have better chance of reaching fixation in a population than would an inherited indifference or preference for asymmetry, but it does not follow that all displays that trigger this preference need have any direct relation to health or competence.

Amotz Zahavi introduced the "handicap principle" to sexual selection models. Some traits, like the larger than optimum tail of the peacock, can serve as indirect fitness signals because if large-tailed peacocks did not have other traits to compensate for the apparent handicap, the large-tail genes could not have come to dominate the population – unfit peacocks cannot afford extravagant tails (Miller 63). Another variation on sexual selection theory is that of the runaway model (Borgia 95). One can imagine that different but related heritable preferences might have the same effect: imagine, for example, the peacock at that stage of evolution before it developed its distinguished tail; peahens might develop a preference for peacocks that display a symmetry of length of tail to length of body or they might develop a preference for peacocks that have a relatively larger tail than their peers; until the average peacock's tail reaches a point where the length equals that of the body, the effect is the same – the preference will tend to prod the population toward longer tails; once, however, this point is reached, the two preferences diverge in effect – the preference for symmetry will act as a conservative force, maintaining what has become the status quo; the preference for longer than average tails might well push the peacock phenotype to its limits until checked by other preferences or dampening forces. Sexual preferences that favor variances in phenotype that might provide fitness value can overshoot and push an exaggerated trait towards being a handicap. One can see why the peacock might present an attractive analogy to art theorists of an evolutionary bent due to the common elements of the two puzzles: extravagant ornament and lack of discernable adaptive value.

A sexual selection theory of art would imply that the art does have practical value – in the attraction of mates. Miller summarizes it so: If hominid males varied in creative intelligence, if creative intelligence was heritable, if in hominid females there emerged a heritable preference for mates expressing creative intelligence – all the prerequisites for sexual selection of creative intelligence would be in place. "The sexual trait and the sexual preference would both spread through the population. The hominids would become more creatively intelligent, and demand more creative intelligence of their sexual partners. The key here is that creative intelligence need not have given the hominids any survival advantages whatsoever, but through runaway it could evolve as a pure sexual ornament." (Miller 73) The "handicap principle" of Zahazi provides an alternative theory of the sexual selection of art – being able to spend time and resources developing and applying impractical skills to create objects of no practical value or spending time and resources in seeking experience or ownership of such objects might signify someone who is wealthy enough that they can afford such extravagances, much as someone blowing money on fancy cars and bottles of champagne might signify they have money to burn (Dutton 2009, 157).

Miller specified that creative intelligence "…*could* evolve as pure sexual ornament." Granted. But a more robust sexual selection theory of art is possible: One might posit that creative intelligence, in general, would have had survival advantage (in strategizing, finding solutions, inventing tools, etc.) for early hominids; one might further posit that opportunities to display practical creative intelligence might have been rare –

rare enough that one might hardly distinguish oneself from others in the population in any meaningful way with only the practical application of creative intelligence. If we assume that for a sexual preference to be applicable, the trait must be discernable, practical behavioral displays of creative intelligence may have been too infrequent to qualify as a selectable trait. Impractical creative intelligence, however, has no bounds – one might frequently display impractical behavioral displays of creative intelligence; as competence in feats of impractical creative intelligence require much of the same dexterity of thought and skill as feats of practical creative intelligence, art creation behaviors might prove a consistent and reliable signifier of practical creative intelligence; art creation behaviors might therefore be augmented by sexual selection, but have persistence due to being reliable fitness indicators.

There are issues with the sexual selection model, though. Let us return to the bower birds. Of 18 bowerbird species, the males of 14 of them create elaborate, ornate constructs of no apparent practical purpose other than to appeal aesthetically to the females (Borgia 92). These bowers have species-specific and population-specific forms, including leaf-decorated floors, 3 meter high towers of sticks, and 4 meter diameter huts (Borgia 92, Diamond 31-32), and are decorated with "as many as several hundred or thousand flowers, fruits, mushrooms, snail shells, butterfly wings, stones, and other natural objects" (Diamond 31). The females actively prefer males depending on the quality of their bowers – there is a direct correlation between qualities of the bowers and the success rates of the males in attracting mates – the criteria for favor tends to be "Neat and well-built bowers with symmetrical walls, fine, densely packed sticks and a highly sculptured appearance" (Diamond 98); one successful male under study attracted 33 mates, while others attracted none. Different theories have been offered for how such behavior might signify fitness in a mate. Elaborate and symmetrical bowers might indicate age due to the time required for the refinement of skills, and age might be an indicator of hardiness (Diamond 94); as male bower birds attack and destroy the bowers of rivals, bowers that are relatively more elaborate than neighboring ones tend to signify dominance, as their creators are able to protect their own while attacking others (Diamond 99).

The bower birds display behavior that more than that of any other animal bears resemblance to human art behaviors. I would suggest, though, that the differences from human art behaviors are more telling than the likeness. The two theories mentioned above, as elaborate bowers signifying age or dominance, appear to have no basis for correlation in human art behaviors – humans do not require behavioral signifiers for age as our appearance provides a more reliable indicator of age than does our skill-set, and there is no indication of a history of human art wars where the art that gets prized is that not defaced by other artists. There is a clear gender divide with bower birds (and other, phenotypic ornamental displays in other species) that does not appear to exist with human art behaviors; male bower birds exclusively build bowers, female bower birds exclusively are bower appreciators. Male and female humans appear to often create art or express aesthetic preferences for their own pleasure; our sense of how valued or well-regarded artists are might be distorted by celebrity culture and the high price accorded to artworks by particular painters, but in general we tend to accumulate and appreciate many objects for their aesthetic value with no consideration given to the creator at all, or, if we do have an interest in who the creator is, it is often because that information can assist in locating more art of similar effect (another movie by the same director, for example); all male bower birds are bower artists of some degree of talent, whereas art creators appear to be a minority in the human population. And, as mentioned before in discussing the theory of art as byproduct, one could not codify or typify the criteria for successful human art in the way that one can successful bowers – it would require a different target for different individuals, and one that is often in motion.

Theories of sexual selection are generally resorted to in order to explain traits otherwise apparently inexplicable by natural selection – but just because it is frequently evoked to explain the exceptional does not mean that it applies only to the exceptional. A trait might emerge in a species that has fitness value that favors the spread of that trait over its alternatives in a population – via the mechanism of natural selection the trait may come to be dominant in the population – but, in addition, the trait of preferring that particular adaptive trait might also exist – sexual selection might accelerate the ascendance of even an adaptive trait in a population in such a case. Unfortunately, sexual selection can have limited explanatory power when it comes to some traits with some species – which isn't to say that the theory isn't true nor to say that any particular trait is or isn't the product of sexual selection. It is just to say that sexual selection provides a too-convenient wild card in theorizing about the history and origins of traits. For any trait for which one cannot imagine a plausible fitness value, one can with some little effort devise a sexual selection explanation – when any apparent handicap can be magically transformed into a signifier of fitness, when the game can be conveniently switched to Losers Win at whim, it is all too easy to classify all intractable traits as the product of sexual selection. We should be skeptical of sexual selection theories of particular traits unless we see specific evidence of mating preferences – and even then we should recognize that evidence of mating preferences toward a trait doesn't disqualify the trait from being an adaptation.

5.5 ADAPTATION

Despite the dominance of the art for art's sake doctrine, there are theorists who have argued for art behaviors being adaptations and have proposed purposes for art.

Dissanayake asserts that art, like ritual, is a means of making everyday objects or behaviors special (Dissanayake 1995, 53-59), of consciously using the "fundamental animal pleasures" of "rhythm, novelty, order, pattern, color, bodily movement, and moving in synchrony with others" (Dissanayake 1995, 60) to enhance participation in ceremonies that increased social cohesion, to make special "that [which] is important to the species, society, or culture" (Dissanayake 1995, 56). This provides adaptive value in augmenting social bonds: "Cohesive societies would have prospered more than fragmented and uncooperative ones, and the individuals within them would have had better chances for survival. Individuals who felt intrinsically part of their group would want to contribute to it and defend it" (Dissanayake 2015, 64). Note that this bears some resemblance to how Pinker represents art as cheesecake, as a conscious utilization of "agreeable stimuli… concocted for the express purpose of pressing our pleasure buttons" (Pinker 1997, 525), the difference being that Dissanayake considers this a means (to make special, to social cohesion), not an end in itself.

It is suggestive that Dissanayake writes that art, ritual and play "often interpenetrate" (Dissanayake 1995, 56), given that Cosmides and Tooby submit that art is a subset of play. Cosmides and Tooby argue that pretend play and adult art behaviors have many common features: both are intrinsically rewarding, non-instrumental, and involve fictions and mental states which allow for involvement in fictions without resulting in confusion between fiction and reality (Cosmides and Tooby 2001, 10). Play consists of activities that "develop, calibrate, or tune the appropriate neurocognitive system" (Cosmides and Tooby 2001, 15); when cats hunt a ball of yarn, when dogs or wolves play-fight, when little lambs frolic, they are behaving in ways that allow them test, push and refine social, mental and physical skills; when human children play tag, house, hide and seek, or wrestle, they too are testing, pushing and refining mental, physical and social skills. These activities have no extrinsic value in the sense that they are not pursued for any conscious goal other than the satisfaction taken in the activity itself – these activities do, however, "make adaptive changes in the immense and subtle internal world of the mind and brain" (Cosmides and Tooby 2001, 16), preparing the player for related activities that do have extrinsic value. Art behaviors, according to Cosmides and Tooby, do the same, engaging humans in perceptual, conceptual and counterfactual play in such ways as to test, push and refine related mental skills. Cosmides and Tooby note that many art behaviors may be vestigial, may no longer have the adaptive value they once did: "Just as we now culturally engineer foods whose flavors signal the presence of nutrients that may have been artificially removed, it is certainly possible that many modern recreations, entertainments, and aesthetic activities do not actually improve or ready our adaptations – although many undoubtedly do… the process emphasizes forms of preparation appropriate to the ancestral world, regardless of whether this prepares one for life in the modern world" (Cosmides and Tooby 2001, 22). As Boyd expresses the concept of art as play as an adaptation: "Ordinary play allows animals to extend and refine their competence in standard species behaviors to the point where their skills offer a new freedom that may be crucial in situations like attack, defense, or rearing offspring. The special cognitive play of art… allows humans to extend and refine key cognitive competences" (Boyd 190). Pinker's assertion that fictional narrative, unlike other arts, could very well be an adaptation is based on a similar, but narrower, theoretical adaptive value; Pinker references computer scientist Jerry Hobbs in saying, "Novels… work like experiments. The author places a fictitious character in a hypothetical situation in an otherwise real world where ordinary facts and laws hold, and allows the reader to explore the consequences" (Pinker 1998, 541).

Of these proposed theories of the adaptive value of art behaviors, Dissanayake's strike me as the weakest. Consider art as a technology for making special. Presumably, to have adaptive value, this technology for making special would need to be applied to making special those events or objects that themselves have inherent adaptive value – if "making special" were applied willy-nilly to most anything, then making special would have neutral adaptive value; if "making special" were applied to events or objects of negative adaptive value, then making special would itself have negative adaptive value. This reveals any "making special" technology to be redundant. A society would need to know what events or objects deserve to be made special – not merely which events or objects are important to the species, society or species, but more specifically which events or objects are important in terms of survival and reproductive success – in order to accurately make them special by overlaying them with art. This is to say that these events and objects of adaptive value must have already recognizable specialness in order for a species to accurately make special only that which isn't counter-adaptive. It is perhaps more vividly illustrated if we considered a technology by which a species marked something as dangerous or to be avoided, much in the way we put warning symbols on the containers of cleaning products; for an analogous process we would need to consider that the species develops an adaptation whereby they are inclined to take something repugnant (such as feces) and use this as a marker by smearing it on other things that should be avoided (such as poisonous plants, areas rife with predators, or disease-carrying neighbors). Obviously, one must already be able to recognize these dangerous objects if one is going to mark them, and if one can recognize them, then marking them would be unnecessary. In addition, as these are consistently dangerous and life threatening, we could expect that they would be significant as selective forces, and that we would be able to find, as adaptations, mechanisms already in place to automate a tendency to avoid these very things. So, we find that traits that make adequate predictors of a plant being poisonous tend to be distasteful to us and other mammals; we and other animals have a tendency to avoid members of our species that are showing symptoms of contagious disease; what we don't see in the animal world are adaptations as circuitous as the hypothesized human tendency to apply art to make special events and objects that have adaptive value. As "modern" humans we have devised ways of signaling that something is special (by putting a bow and gift wrap on it, for example) or dangerous (road signs warning of frequent moose crossings), but these come only with culture – any internal early warning systems of the vast expanse of the time of our ancient ancestors would have to be much more direct.

This argument holds, as well, for any theory that the value of art can be found in providing social cohesion. No other species in the animal kingdom has developed such a circuitous method of achieving social cohesion; if social cohesion in a society provides fitness value to its members, one might argue that members of a species that developed a natural pleasure experienced in the company of other members (or displeasure in their absence) would more consistently and less expensively affect adaptive cohesion than members that required art behaviors to accomplish it. Humans cohere in family units, extended families, tribes, etc., but there is little reason to believe that this is being accomplished via art. Humans tend to congregate and share meals, we take pleasure in the company of others when eating, eating is often a shared pleasure and we have developed many rituals around this – but similar to many art behaviors, eating is a pleasure that is also often solitary, and we certainly wouldn't look at eating and posit that its primary value lies in the social cohesion it provides. We can also consider language analogously – it is undeniable that shared language augments the social cohesion of a society, but that cohesion provided by language must be considered a side benefit, certainly not as central as its value as a means of communication, of sharing knowledge. And shared language could only emerge in a species that has already evolved a certain minimum of social cohesion. Similar can be said about art – that it provides instances of enhancing social cohesiveness does not mean that that has been its adaptive value; in fact, as art often has a communicative function much as language does, many art behaviors would probably not emerge in a species that has not already accomplished significant cohesion.

The theory of art as an adaptation as a subset of play has apparent strength of argument for art as an adaptation, as play behaviors are generally accepted as adaptations due to being ubiquitous among non-human animals. Such an argument is dependent, however, on the viability of classifying art as play, and this has its challenges. Art may have many similarities to play in being pleasurable, voluntary, lacking extrinsic motivations, and involving fictions, but the differences between art and play are significant. Many of the key characteristics of play as identified by Garvey (Garvey 4) are in common with those presented by Cosmides and Tooby as being shared characteristics with art (Cosmides and Tooby 2001, 10). But Garvey, in addition, asserts that play requires active engagement on the part of the player (Garvey 4). While it is indisputable that art *creation* behaviors require active engagement on the part of the creator (in that the *doing* of anything requires active engagement), a significant portion of what we recognize as art appreciation or consumption behaviors is passive. In fact, in that the *doing* of anything requires active engagement (as said), it would appear that Garvey's characterization of play as involving active engagement is done specifically to distinguish play from the act of observing play – watching play is not playing. This marks a significant difference between what we understand of play and art, for although play, considered as limited to those activities involving active engagement, remains universal and pan-species, art, if considered as limited to those activities involving active engagement, in being limited to behaviors of only art creators in the act of creation, becomes a minority activity in the human population, though culturally universal. But perhaps this point is being clouded by the stereotypic examples that come to mind when we think of play. We might tend to think of play-fighting puppies, playing tag, playing house or other make-believe, playing baseball, football, etc., when we think of play, and such types of active engagement do present a stark contrast to someone contemplating an oil painting, listening to an opera, or watching a movie. But there are other, less active, activities that we tend to recognize as play – playing chess, doing crosswords, doing jigsaw puzzles, posing and answering riddles. The active engagement of playing chess is not the physical shifting of chess pieces about, nor is the active engagement of doing crosswords the dexterous utilization of the pencil – the active engagement of these activities is mental, not physical, and it doesn't take too great a leap to consider that contemplation of a play, piece of music, movies, painting, are active engagement of a similar sort. It remains, though, that even recognizing this type of active engagement does not account for the totality of the apparently passive art behaviors; all of our art appreciation and consumption behaviors do not have the focus required to be classified as even this type of active engagement. A good portion of our art consumption is deliberate but unthinking – we put on music that we then barely give conscious attention to, we decorate our homes with patterns, colors and images which then immediately become merely background – we tend to make aesthetic choices deliberately filling our periphery with art to which we barely give attention. A great portion of our art behavior could be classified as building and inhabiting an art-full ambiance.

We might be able to stretch the definition of play to include any number of behaviors, but behaviors do not inherit fitness value simply by virtue of sharing a classification with other behaviors that do. There are studies that show play increases the plasticity of the brain, that complex interaction of rats (for example) in an enriched environment stimulates brain growth (Hughes 241), but studies concerning play also suggest that that physical interaction between individuals (in play or training) is necessary for the observed brain growth, that an abundance of stimuli, an enriched environment, is not sufficient (Hughes 241). Which is to say, those traits of play indicative of providing fitness value are absent in many art behaviors. An additional question must be asked: we tend to have a fairly flexible and encompassing sense of what classifies as play (in that it includes a very diverse set of behaviors) and we tend to have a fairly flexible and encompassing sense of what classifies as art (in that it includes a very diverse set of objects and behaviors); in recognizing something as play or recognizing something as art we seem to be satisfied with these things meeting what appears to be a fairly liberal standard of family resemblance; this being the case, why, if art is a subset of play, do we not in our daily lives tend to consider art to be play?

CHAPTER SIX – ART AS PLAY AS PRECURSOR

Gould and Vrba, in "Exaptation – A Missing Term in the Science of Form," introduced the concept of exaptation, which would be useful to consider at this juncture. Adaptations are traits that are as they are because they were selected for due to the positive contribution they made to the overall fitness of the organism; exaptations are traits that "…evolved for other usages (or for no function at all), and [were] later 'coopted' for their current role. They are fit for their current role, hence *aptus*, but were not designed for it, and are therefore not *ad aptus*, or pushed towards fitness. They owe their fitness to features present for other reasons …" (Gould and Vrba 6). In a later paper, Gould gave the following example (specifically chosen by Gould for its analogy potential in discussing the human brain): "If I put a computer in the business office of my small company, its capacities are not limited by the purposes of my installation. My computer, by virtue of its structural complexity and flexibility, maintains latent and unused capacities that must vastly outnumber the explicit reasons for my design or purchase. And the more complex the computing device, the greater the disparity between its field of potential and my explicit purposes..." (Gould 57). Let us extend this illustration further. Say you put a computer in the business office of your company for the purpose of running software to do payroll and accounting. Your staff put the computer to further use, using the computer for checking their personal email and browsing Facebook. Over time, updated software for payroll and accounting gets released and soon it is discovered that the computer purchased for that purpose does not have the minimum computing capacity to run the new software. A new computer is purchased to do payroll and accounting. The old computer is not thrown away, however, but is repurposed – it is put in the staff cafeteria so that employees can use it to continue to check their email and Facebook but now on their own time, when on their breaks, thus having a positive effect on productivity. Use of the computer for email and Facebook, in this illustration, would be what Gould and Vrba have termed an exaptation – the computer wasn't purchased for that purpose. This example illustrates, however, that exaptations might become adaptations – the computer was able to "survive" beyond its original purpose due to its secondary, unintended use providing fitness value (and Gould acknowledged that exaptations could become adaptations (Gould and Vrba 8)). Gould held the opinion that thinking about adaptations had gone off the rails, that theorists were prone to believing that every trait for which a function could be found or theorized was *ipso facto* an adaptation (Gould and Lewontin 581); introduction of the term exaptation appears intended to counter this.

There is a subtle error in the justification of the use of the term exaptation, however, a hidden hint of the teleological, in that even with adaptations, no trait is ever *for* a purpose, *for* a current role, *for* anything. If we return to our discussion of Abstracted Natural Selection earlier, we can remind ourselves that traits do not have purposes, any utility they have is found ad hoc with any instance of the trait, and in this sense traits have potentials, not functions. The term exaptation poses the risk of introducing confusion by implying that *this* trait evolved *for this* purpose, *that* trait (however useful) did not, as all current value of any trait is independent of the value that trait had historically – even if our eyes are good for seeing, they are not *for* seeing, they do not have that or any purpose, but find utility in seeing in each instance. I believe this is important because although it is convenient shorthand to talk about adaptations as if they were designed for express purposes, the use of such an analogy places limits on our understanding of evolutionary processes in the same way that designing chips using conventional design principles must forgo possible solutions that are available to evolutionary algorithms. Design-think allows us to speak with much more apparent confidence and certainty about adaptations and their utility; but we must be prepared to forgo the vocabulary of confidence for a vocabulary of accuracy. Gould and Vrba discuss a theory in the adaptation of birds – that feathers, "an adaptation for thermoregulation" (Gould and Vrba 8), found utility as an exaptation for catching insects, which, through adaption, became longer and broader the better to catch insects, which, through exaptation enabled them to prolong their hops and leaps and then, through adaptation, reached full utility in enabling flight (Gould and Vrba 8). But what we really have here is not the history of a species alternately developing traits for a specific purpose and finding alternative usage for those traits; we have a history of a trait (or traits) that had multiple utility at each stage of the evolution of birds and the combined and separate utility of the trait(s) in relation to the environment of the moment at any particular stage affected the future history of that trait(s) as found in each species of bird.

So, even though play, as discussed earlier, can be shown in some experiments to correlate with brain growth, we should be cautious in saying that play *has the purpose* of increasing the plasticity of the brain, and, similarly, even if we were confident that play has consistently displayed that utility over the course of history, that does not limit the possible utility of play to that. All that said, the fact that there appears to be a strong resemblance between play and art and the fact that play and art also appear to be distinct concepts can perhaps be reconciled in considering art as an exaptation of play, that historically certain behaviors which we might classify as play found additional utility in such a way that some of these behaviors may have diverged significantly from those other behaviors that we now still consider play. What might that additional utility have been? For that we need to look at the differences between art and play.

We have already discussed one apparent difference between play and art, the characteristic of active engagement, and posited that the engagement involved in some play such as puzzle solving, board game playing, etc. displays enough similarity to some art consumption behaviors that we might argue that some play mightn't be so active in its engagement and some art mightn't be so passive in its engagement, that we must consider them as different in this respect. We also noted that this does not account for the volume of ambient art which humans tend to surround themselves with. And this is significant − the time humans spent contemplating oil paintings would be minutely fractional compared to the time spent living with the ornament and décor they tend to surround themselves with, and while one may find comparison between solving a cryptogram and contemplating a Rembrandt, it would be hard to find play behaviors comparable to a person's enjoyment of having floral wallpaper in their periphery.

Of characteristics expressed by Cosmides and Tooby as being in common between play and art, those of being intrinsically rewarding and non-instrumental are relatively uncontroversial. The idea that both art and play involve fictions, that they allow for involvement in fictions without resulting in confusion between fiction and reality, might benefit from some unpacking, however. Does all play involve fictions? It appears so, or at least it can be said that it is relatively easy to point to the fictional component of a diverse variety of play behaviors. Pretend play such as playing house, cops and robbers, playing doctor, serving tea to one's dollies involve the fictions of being someone else or oneself in other situations doing other things; competitive physical games such as baseball, football, golf involve the fictions of an artificial environment composed of the rules of the game, as is also the case with strategy competitive games such as chess, checkers, crib, poker; play fighting such as boxing, arm-wrestling, chicken fights and even tickling involve fictional antagonisms and aggressions, or real aggressions and antagonisms bound by fictional rules of the game; mental play such as riddles, jigsaw puzzles, crosswords, who-dunnits involve fictional mental problems designed specifically to challenge one's reasoning ability. All of these to some extent involve behaving as if such-and-such were true.

Does all art involve fictions? Easiest to recognize are fictional narratives such as stories, plays, movies that are patently untrue and are knowingly consumed as such. Acting, being so related to pretending, is also easy to recognize. Then there are representational arts such as paintings, sculpture, sketches – to the extent that they *do not* represent anything veridical they present fictions; to the extent that that they *do* represent something veridical they are not the subject but something else, a representation, and thus, also, a fiction (This is not a pipe). Even photographs, documentaries, recordings, these could be considered fictions much in the same way one's face in the mirror is not one's face. The fictional element of music does not seem quite as apparent. One might point to the constraints or styles of music and compare them to the rules of a game, which we have already characterized as fictions. One might argue that, similar to painting, sculpture, etc., music is fictional to the extent that it does not represent anything veridical. This however only exposes the weakness of the argument that being non-representational equals being fictional – I've got a shovel in my porch that doesn't represent anything else either, that doesn't make it fictional. This recognition, that being non-representational does not equal being fictional, underscores the problem with ambient art as well, the apparently insignificant patterns, colors, tunes, etc. that comprises so much of the art around us. The polka dots on someone's tie, the stripes on the wallpaper – are they fictions? One might argue that such things do not appear naturally in the world and are therefore fictions, but that is falling back on the non-representation argument or on a naturalism argument that would redefine all human constructs as fictional.

I suggest that the characteristic that unites these diverse art behaviors is not that they involve fictions, but that they introduce novelty into the human environment. Paintings, sculpture, sketches, music, the polka dots on someone's tie, the stripes on the wallpaper, all are human productions that complexify the environment by the introduction of perceptual or conceptual novelty. I will argue that it is novelty for novelty's sake.

CHAPTER SEVEN - THE VALUE OF RANDOMNESS

Of course, novelty for novelty's sake, unbound by utility, approaches randomness. What possible value could that have? There are fields of study that have recognized the value of adding randomness to processes:

- In Game Theory, von Neumann provided a proof that in two-player zero-sum games, a player's optimal strategy must involve randomness even for games which do not involve elements of chance (Székely and Rizzo 688).
- In Anthropology, Moore has theorized that divination behaviors, often dismissed as superstition, might have proven utility in that they introduce random behaviors into strategizing. The Montagnais-Naskapi of Labrador, when needing to decide what direction hunters should take to locate caribou, would hold the shoulder blade of a caribou over the coals of a fire and interpret the resulting cracks and spots to get an answer (Moore 70). Such an oracle was in effect a randomizing instrument and reliance upon it served to break habit patterns and avoid fixed strategies in hunting which might over-hunt an area, which could result in sensitizing the caribou to the activities of the hunters or potentially critically depleting the caribou population (Moore 72).
- In Neurobiology, the phenomena of stochastic resonance allows signals that are too weak to be detected by a system to be boosted into the liminal range by adding random noise to the signal (Hindo and Chakrabartty 44-45), a process that has been effectively exploited for the creation of medical technology and for use in image processing.

- In Biology, random changes in an organism's DNA (mutations) can introduce phenotypic variety into a population, providing the base material for selection and evolution.

In writings about evolution, mutations are often characterized as errors in DNA replication:

"But now we must mention an important property of any copying process: it is not perfect. Mistakes will happen… Can we reconcile the idea that copying errors are an essential prerequisite for evolution to occur, with the statement that natural selection favours high copying-fidelity?" (Dawkins 2006 16-17)

"A point mutation is an error corresponding to a single misprinted letter in a book." (Dawkins 2006 31)

"There are even genes − called imitators − that manipulate the rates of copying-errors in other genes." (Dawkins 2006 44)

"DNA is copied with a high degree of fidelity in all organisms, but the number of mistakes made for every base copied varies a lot between species − for example the per-base error rate in mammals is a million times lower than the per-base error rate in HIV." (Bromham 91)

"Evolution is no more than the perpetuation of error. It means that progress can emerge from decay." (Jones 48)

Let us return our thoughts again, for a moment, to our discussion of the Abstracted Natural Selection algorithm; let us try to remove from this current train of thought the dross that tends to accumulate on well-handled concepts. Let us remind ourselves that *mutations cannot be errors in that one must have intent to err*; to err one must have an intended outcome that is not met and the process of replication is not a mechanism that was built for an express purpose, it is a natural mechanism that has a variety of outcomes, some more probable than others. Such is this mechanism that for the vast majority of the time the outcome is a copy of the original and very rarely the outcome is a mutation, a variation on the original. But that variation, that mutation, is not an error as the process has no purpose – *there is no correct outcome*. The idea that replication is a process that creates oft-times faithful or sometimes erroneous copies is a human projection upon an inhuman process, much like we might talk about weather being good or bad. I raise this not to be pedantic, or to suggest that the quoted authors necessarily intend "error" to be meant in some solely-literal sense, or to suggest that we need to be stricter in our language and use of words. I am merely suggesting that there is benefit to occasionally attempting to focus beyond the words, as language can have its own subtle currents and, similar to being in a boat on open water, just because you are not rowing doesn't mean you are not moving.

So, let us think of mutation, the random changes in an organism's DNA, as variety, not as error. In Systems Theory, one interpretation of Ashby's Law of Requisite Variety states that a system, to be stable, must have available as many or more actionable strategies for control as there are possible states of disturbance the system can be in (Ashby 1957, 207). Ashby at one point illustrates it thus: "In the biological world… [a]n approximate example occurs when an organism is subject to attacks by bacteria (of species *di*) so that, if the organism is to survive, it must produce the appropriate antitoxin *rj* . If the bacterial species are all different, and if each species demands a different anti-toxin, then clearly the organism, for survival, must have at least as many anti-toxins in its repertoire of responses as there are bacterial species... [I]f a fencer faces an opponent who has various modes of attack available, the fencer must be provided with at least an equal number of modes of defense if the outcome is to have the single value: attack parried (Ashby 1958, 192).” Ashby summarizes, “only variety in R[esponse] can force down the variety due to D[isturbance]; variety can destroy variety (Ashby 1957, 207).” By separating the two clauses of this summation, we find ourselves with hard and soft versions of the claim; Hard: *only* variety in response can reduce variety due to disturbance; Soft: variety *can* reduce variety. The hard claim is patently false; when playing poker, it is not necessary to have a variety of hands, each better than the possible hands that your opponent may have, to win; if you could choose the hand you are holding instead of being dealt it, it would be necessary to choose only a Royal Flush, a hand capable of beating all others − no variety of hands can better that single option. Similarly, a single handgun might effectively parry the moves of any fencing opponent regardless of the variety of fencing attack strategies in the opponent’s repertoire. The soft version of the claim, however, is indisputable – variety can reduce variety.

Ashby references Claude Shannon to express another point relative to this inquiry: “It might be thought that when messages are sent through a channel that subjects each message to a definite chance of being altered at random, then the possibility of receiving a message that is correct with certainty would be impossible. Shannon however has shown conclusively that this view, however plausible, is mistaken. Reliable messages can be transmitted over an unreliable channel...it is possible so to encode the messages that the fraction of errors still persisting may be brought as near zero as one pleases” (Ashby 1957, 190). This is to say that, if Shannon is correct, replication without error/variety is not an impossibility, so perhaps, instead of thinking of mutation as inevitable error in replication, it might be worth considering the possibility that the "frequency of error", the variety, that we see in DNA might itself be an adaptation.

If we think back to the illustrative example of bacteria becoming resistant to antibiotics, we noted that when this occurs it is because there already exists, in the population of bacteria, strains that have resistance to the antibiotics. When exposed to antibiotics, the majority of such a population dies but the few bacteria that have traits that provide some resistance might survive to reproduce and eventually reach fixation in the population. It is easy to see that a requisite amount of genetic variety must be present in the population of bacteria if, as a species, it is to survive the introduction of the antibiotics – if the bacteria were all genetically identical or varied in only trivial ways, it would be wiped out by the antibiotics as there would exist no resistant members of the species to carry on the species. That said, we should expect that there must also be a requisite amount of genetic constancy. If the frequency of mutations were too high, any fitness gains resulting from mutation could in following generations be quickly lost due to other, conflicting or retrograde mutations. Ochoa writes, concerning genetic algorithms, "The notion of error threshold is intuitively related to the idea of an optimal balance between exploitation and exploration in genetic search. Too low a mutation rate implies too little exploration; in the limit of zero mutation, no new individuals would arise and the search process would stagnate. On the other hand, with an excessively high mutation rate, the evolutionary process would degenerate into random search with no exploitation of the information acquired in preceding generations. Any optimal mutation rate must lie between these two extremes..." (Ochoa 160)

CHAPTER EIGHT - ART AND OPTIMAL VARIETY

8.1 SELECTIVE SYSTEMS

It does not require much of a stretch to consider play behaviors as cultivation of optimal variety – pretend play allows for involvement in a greater variety of mental, physical and social activities than the environment could provide if interacted with on only a factual basis. Fictional situations and non-instrumental behaviors might build a set of skills that exceed the demands that experience to that point in time otherwise presented the individual; additionally, the meta-skill of being able to permute existing skills to meet novel demands might be exercised, building not only a store of more varied learned responses but also the potential for more ad hoc variety. Play has the appearance of providing requisite variety (as an absence of play would reduce the number of skills available for response to environmental changes) and requisite constancy (play never varying so much from real-world activity that it will have no practical analog, never varying at such a frequency that skills cannot be reinforced to optimize retention), thus avoiding the extremes of stasis and chaos and tending toward optimal variety in the individual's learned available responses to environmental disturbance. Similar claims can be made for narrative fiction, as Pinker observed. Fictitious characters in hypothetical situations allow mental exploration of a greater variety of situations than can contemplation of only factual narratives; requisite variety is met by the utilization of fictions, requisite constancy is revealed in the relatively small number of plot structures to which fictional narratives tend to conform – seven, by one count: overcoming monsters, rags to riches, the quest, the voyage and return, comedy, tragedy, and rebirth (Booker vii).

As mentioned earlier, these characteristics of play and narrative fiction, finding utility in testing, pushing and refining mental, physical and social skills, appear to be those of quite a different beast than art; while much art might be characterized as conceptual or perceptual play, too much of art, the larger portion of it in our environment, appears to involve so little active engagement that it can hardly qualify. What could striped upholstery, polka dots on ties, floral patterns on plates or other peripheral, near subliminal (due to inattention), instances of art possibly prepare us for in terms of environmental change? Granted, it is necessary that only sufficient instances of art behavior provide sufficient fitness value in comparison to other (genetic) alternatives for that behavior to potentially flourish, as a trait, in the species. The point, however, is that art behaviours, a large portion of which does not involve active engagement, appear to differ significantly from play, for which active engagement appears a necessary component in near all instances. This suggests that the fitness value provided by art behaviours might rest otherwhere than in benefits of active engagement.

In discussing Thompson's experiment using evolutionary algorithms to evolve an FPGA chip to distinguish 1kHz waves from 10kHz, it was noted the discovery that once a successful configuration of the chip was arrived at, it deteriorated to a significant degree on being applied to another "identical" chip, this being due to the subtle incidental differences in the compositions of the chips and the fact that the algorithm had exploited such subtleties to reach its original fittest iteration. Thomson discovered it required 100 new generations of the evolutionary algorithm to raise the performance of the new set of cells to perform comparably to the original set. One can extrapolate further – imagine the evolutionary algorithm being run to determine a configuration that would perform optimally on the largest variety of "identical" chips. Two possible types of outcomes come immediately to mind: 1. The fittest configuration might approach resemblance to human-engineered chips, having discarded exploiting the subtleties of the composition of the chips due to the variance in these from chip to chip, or 2. The fittest configuration might program directly into the chip the ability to continue iteration of the genetic algorithm upon its own configuration on boot up, allowing each chip to approach optimal fitness by still exploiting the particularities of its composition. Of these two types of solutions, one might expect the second to prove the more fit, as the first, being a compromise solution, may have limitations the second might not, and the second would have a built-in fault tolerance that the first does not. Biological analogs of the second type of solution could either allow for some rewriting of the DNA in response to the environment (as proposed with the chip and its configuration) or, as an organism's "hardware" is pliable in a way a chip's is not, the DNA/configuration could produce biologic traits with sufficient plasticity to change in accordance with environmental conditions.

The human immune system appears to work in just such a manner. The body is able to restrict the negative effects of many bacteria or viruses, providing specific antibodies in response to each, not because the phenotype includes an armory of antibodies each designed for a particular invader (which would be useless against any novel bacteria or viruses) and not because it is able to analyze incoming invaders and design an antibody on the fly to thwart it. Neither strategy is efficient or effective. The human immune system instead randomly generates millions of different antibodies in response to a foreign protein being detected in the body; should one of these randomly generated antibodies prove a fit for the invading molecule (in the sense of being able to bind to it), a process would be triggered by which the bound antibody begins to divide and clone itself. This is a selective process – those randomly generated antibodies that have been triggered by alien molecules will reproduce and the body will thus have that much more of the antibody on the ready should such molecules be encountered again. (Edelman 76-77). As Edelman notes, “[E]volution, acting by selection on populations of individuals over long periods of time, gives rise to selective systems *within* individuals“(Edelman 74). Edelman calls these “somatic selective systems” (Edelman 74). Note that this mechanism lies between being general-purpose one (in that it is not specialized to any particular foreign molecule) and a functionally-specialized one (in that, analogously, one could hardly consider a pharmaceutical laboratory to be general-purpose even if it was manufacturing a random assortment of medicines).

Neurobiologist J. P. Changeux has argued that the complexity of the human brain, with its billions of synapses, exceeds the capacity of the genome to provide a blueprint for it, and proposed that organization of the brain might emerge from a selective process, that the genome might produce a large number of randomly formed synaptic contacts, some of which are then strengthened by sensory input or neighboring synaptic activity, and some of which are culled (reabsorbed) with disuse (Huttenlocher 6-7). This finds support in what is known of patterns of synapse formation – during the first year of life, a child will have developed twice as many synapses as that seen in adults, a number that then gradually decreases until reaching stability in late adolescence (Huttenlocher 41). Edelman, who won a Nobel Prize in Physiology or Medicine with his work on immunology cited above, proposed something similar, a “theory of neuronal group selection” in which “[s]elective strengthening or weakening of populations of synapses as a result of behavior leads to the formation of various circuits“ (Edelman 84).

If theories of neuronal or synaptic selection present an accurate model of brain development, we should expect that the mind might be particularly sensitive to shaping by environmental factors during periods of more active neuronal selection; as Huttenlocher writes, “…if sensory input is important for the formation of neural circuits, it should be possible to influence the type of connections that are made by modification of the input to the system from the external environment” (Huttenlocher 7). There is much evidence to suggest this is so. Kittens fitted with goggles from birth to 12 weeks that present vertical, horizontal or diagonal stripes to one or both eyes, result in abnormalities in cortical neuron distribution that suggest that what a cat sees is greatly affected by its visual experience as a kitten (Huttenlocher 90-91); deprivation of visual input in one eye of kittens or young non-human primates during a sensitive period of development results in a decrease in neurons corresponding to the occluded eye, something that does not occur with mature animals (Huttenlocher 91); human infants born with congenital cataracts do not have their vision restored with removal of the cataracts if this not done until adulthood but quickly develop normal vision if the cataracts are removed early enough in infancy (Huttenlocher 94); similar results are found with development of the auditory system – childhood deprivation of particular sound patterns affects our ability to distinguish sounds as an adult (Huttenlocher 94); children born deaf who have the impairment corrected only in adulthood demonstrate “severe deficits in verbal comprehension and production” even after years of restored hearing (Grimshaw et al. 237). Studies with children have shown that enriched environments can result in increases in IQ and decreases in cognitive and learning difficulties (Huttenlocher 164). Enrichment of the environment of rats has been shown to result in an increased density of neurons (Huttenlocher 177). I suggest art behaviors have provided fitness value by injecting an optimal amount of conceptual and perceptual novelty into the human environment.

8.2 ART AND BOOT-STRAPPING

Imagine that there exists an environmental factor that is able to affect change in the phenotype of a particular entity in such a way that the general fitness of the phenotype is thereby increased (analogous to getting a vaccination, in that exposure to a relatively innocuous substance prompts the body to create a defense mechanism that then protects against much more damaging diseases). Imagine that such an entity has within its capability the means to be able to affect that environmental factor in such a way that it can then indirectly positively affect its own fitness or that of its offspring. Should an allele or set of alleles which produces an inherited tendency towards such behavior arise in the population of such entities, it would appear to provide fitness value. Art may be a part of the extended human phenotype that acts as a catalyst for developing a conceptual and perceptual skill-set by complexifying, by enriching, the environment in such a way as to advance optimal variety in the development of their own cognitive capacities.

Concerning Thompson's evolved hardware frequency distinguisher, systems engineers could not determine how it was able to distinguish 1kHz waves from 10kHz; this is even with knowing the system was deliberately evolved to distinguish those two tones, a very specific task for which presumably we should expect a fairly limited set of strategies possible to accomplish. Compare that to evolved, inherited species' behavioral tendencies: the only criteria they need meet to have fitness value is that that they contribute to higher reproduction rates more than other existing alternatives; the set of strategies that might accomplish this are vastly larger than that set that can accomplish frequency distinction using a FPGA. If the configuration of Thompson's chip exceeds our ability to understand it, we should be hesitant to claim total understanding of the traits of much more complex biological systems. This is to say that perhaps we should not be set on finding *the purpose* of an inherited trait (which reeks of teleology anyway) and perhaps think more in terms of trying to glean the possible ways in which a trait may contribute to the fitness of the organism. With this in mind, three possible inter-related fitness value contributions seem plausible (not to discount possible others):

1. Art behavior, in common with play behavior, allows engagement with a larger variety of physical and mental experiences than would have been available to the individual otherwise, in such a way that it prepares the neurocognitive system for related activities that have extrinsic value.
2. Art behaviors may provide, for sexual selection, a reliable signifier of practical creative intelligence.
3. Art behaviors, in adding optimal conceptual and perceptual variety to the environment, tweak that environment in such a way that individuals born into it and immersed in it for the duration of the sensitive stages of brain development will tend to have increased conceptual and perceptual range.

8.3 RESULTANT EXPLANATIONS

This bundle of functions, which I will call the Optimal Variety Theory of Art, provides possible explanation of some disparate, otherwise perplexing, characteristics of art behaviors:

1. The abundance of ornament, décor, pattern, etc., actively applied by humans to their environment but thereafter given little conscious attention: perceptual and conceptual enrichment of the environment need not require conscious attention in order to positively affect the development of brain circuitry during that period of development when neuronal selection is most sensitive to environmental input.
2. The dynamic nature of art, its apparent aesthetic progression or evolution: the drive is to add novelty to the environment; each addition or change made is eventually perceived as part of the environment (foreground becomes background), becomes part of the basis to which further novelty will be introduced. It also follows that if this continual introduction of novelty over generations is enhancing the conceptual and perceptual flexibility or range of human minds, then such minds should become capable, over generations, of the creation of a greater range of novel additions or changes to the environment – a feedback effect that might result in an eventual acceleration of aesthetic progression (such as appears to have been occurring since the late 1800s).
3. The non-teleological nature of the progression of art: If art were truly progressive in the way that, say, scientific knowledge is, we should expect the history of art to be a steady progression from works simple to more complex, naïve to sophisticated, unskilled to technically advanced, etc. It would be difficult to argue

that many 20th century “advancements” in art (such as Primitivism, Cubism, Expressionism, Pop Art, Fauvism, Dadaism, atonal music, avant-garde, doo-wop, punk, metal, country, etc.) are what could be considered natural advancements of this sort on the paintings, sculptures, musical compositions, etc., that proceeded them. This would be because while art may be characterized as being progressive, it is in fact non-directional and while technical advancement and refinement does introduce novelty, it is only one of many means of doing so. “Regressions” and reintroductions of old forms can also introduce novelty. Art in this way can be said to be expansive, not progressive.

4. That “optimized” art tends to be unsatisfactory: As mentioned earlier, if human art was like bower bird art we should be able to determine the requisite criteria to create maximally effective stereotypic art. Academic art, which generally conforms to what are elsewhere claimed to be evolved preferences, is often held in low esteem by art critics (De Smedt and De Cruz 711). Kitsch and sentimental art, which often appears to take direct aim for popular appeal, also tends to be little valued by a significant portion of the population. Two conceptual artists, Komar and Melamid, conceived a project in the 1990s for which they hired professional polling companies to survey members of the populations of various countries about their preferences regarding subject matter, style, size, color, etc. in painting and then created sample “Most Wanted” and “Least Wanted” paintings for each country (Dutton 2009, 13-15). The resultant paintings are clever in context, but remarkably trite if encountered outside of it. None of this is being recounted to suggest we need to think of art in terms of good and bad – it is to call

attention to the fact that art's ability to meet aesthetic preferences and popular appeals cannot account for art as we know it. Art is much larger and more varied than that.

5. The cumulative nature of art: The cumulative nature of art is analogous to the cumulative nature of knowledge because they *are*, at heart, analogous. Regardless of how advanced our mathematics may become, that will not make obsolete the elementary textbooks explaining addition, subtraction, division, Pythagorean geometry, etc. This is because, regardless of how much humans as a species might advance in their mathematical knowledge, each individual human being, to reach whatever stage of knowledge they are at, has had to recapitulate portions of the history of that gain in knowledge. Just as historically cultures were counting before adding and subtracting, and adding and subtracting before the technique of multiplication and division could be developed and integrated into the cultural skill-set, so too each child learns to count before adding and subtracting, and adds and subtracts before learning to divide and multiply. Similarly, a child, regardless of the complexity of their environment, will first be attracted to bright primary colors, basic shapes, faces, story-book adventures, hide-and-seek, lullabies and sing-songy tunes. If the data on goggled-kittens has any relevance to human children, however, the environmental presence of more complex and varied art, music, narrative, etc., over the course of early development would potentially lay the brain circuitry for even more optimal variety in thinking and perceiving. Once a human has advanced beyond the "absorption" stage that ends in late adolescence, advancement in art appreciation

or creation, like advancement in mathematics, physics, etc., is effected by active pursuit and generally appeals to only a fraction of the population.

6. The ambiguous nature of prehistoric art: Earlier, in discussing "How Old is Art?" it was noted the difficulty in making judgments about the function of many ancient artifacts and the tendency in anthropology for "not obviously utilitarian" objects to be classified as art. I suggested that we must retain skepticism about ancient art as with little application of the imagination one can posit plausible utilitarian functions for these presumably non-utilitarian objects. This unresolvable ambiguity poses no threat to Optimal Variety Theory. Even were these objects utilitarian, they would have introduced novelty into the environment, would have modified the environment that would in turn have potentially modified the minds (via brain development) of the hominids that inhabited it. The thesis is not that utilitarian artifacts do not affect change in mind via contribution to optimal variety. After all, it could be argued that architecture – generations of humans being raised in habitats with flat walls and corners – may have primed the human mind for the breakthrough in understanding of perspective of the Renaissance more so than did any art that preceded it, for example. Rather, the thesis is that art is unique in that, due to being uncoupled from necessity, it can multiply many-fold such gains to mind accorded by optimal variety. As discussed concerning the ancient technology of controlling fire, learned practical behavior can in turn shape the genotype – and can have far-reaching, unpredictable consequences.

7. The more controversial works of art: If art is, by its very nature, expansive, and if individuals tend to reach a stage of art appreciation by recapitulating portions of the history of art to the stage of appreciation they are currently at, two things can be expected: 1. Art is continually going to violate the limits of any current extensional definition of art or any intensional definition that has been derived from analysis of static traits of existing and past art, and 2. Any art which is on the furthermost limits of expansion will be within the capacity of only a small minority of the population to appreciate, as individuals would be at different stages of appreciation and only specialists tend to devote the time to purposely extend their recapitulation of art history to its limits. We should expect to always see another art revolution; we should expect there to always be controversial works; we should expect to always see avant-garde art that is derided, dismissed or denied being art by a portion of the population. Similarly, we should also expect there to be always popular art that is derided, dismissed or denied being art by a minority of the population more sophisticated in their art appreciation.

One caveat: even if art behaviors tend to have fitness value due to providing variety, it does not follow that any specific current art behavior has fitness value. Also, there may be a limit of optimal variety that, once reached, provides diminishing returns – art behaviors beyond that point may be only sustaining gains that earlier could be made with less. There may also be a limit beyond which the behaviors required to further increase optimal variety might prove to have negative fitness value. I don't believe there is any way of knowing, except perhaps in retrospect (and even then with difficulty), what might hold true about these potential limits.

8.4 CRITICISMS

Let us consider some potential criticisms of an evolved behavior, optimal variety theory of art.

8.4.1 The variety of art pales in comparison to the variety of the world.

The argument would go like this: Why would humans need art to complexify their environment? Our environment and that of our ancestors is/was already incredibly complex – does the variety of art compare to the variety of leaves on a tree (each one is different), the variety of plants, insects, animals, cloud patterns, etc., always about us and our ancestors? In reply it may be said, firstly, that novelty is subjective. We do not tend to see all of the different leaves on a single tree as variety – with see each leaf as more of the same, not significantly different from the others. That is how our brains tend to work – we are wired to recognize patterns and dismiss what our brains determine to be insignificant differences, for otherwise the acts of cognition and reasoning would become intractable. A patient of Luria tested to have a near-perfect memory but it proved to be a handicap as the patient remembered each perspective and expression experienced of someone's face (for example) as so distinct from other perspectives and expressions of the same person's face that the patient had difficulty recognizing them as being that of the same person (Luria 64). Pattern recognition occurs within a window of optimal complexity – too simple and it is dismissed as trivial, too complex and it becomes noise. So too with the significance we place upon features of our environment – too common and it becomes background, too novel and it might even go unrecognized. Art, instinctively being created by humans for humans, falls within the limits of significance – it otherwise wouldn't be intrinsically pleasurable to its creator. And regardless of how complex the environment might be, art would add additional complexity – the inherited drive is a drive for a differential gain.

8.4.2 If art is all about novelty, why isn't novelty sufficient?

Novelty is easy – it can be accomplished by anything that generates randomness: words pulled from a hat, music composed by rolling dice, novels written by flipping coins to choose plot turns, haphazardly splashing paint or taking random photos – Why don't these seem to appeal to us in the same way works of art do? Reply: earlier we referenced optimal variety as seen with mutation of genes; if the frequency of mutations is too low, the species may not have the necessary variety to adapt to change in the environment; if the frequency of mutations is too high, any fitness gains resulting from mutation could in following generations be quickly lost due to other, conflicting or retrograde mutations. Shannon was referenced earlier by Ashby to say that reliable messages can be transmitted over an unreliable channel – this can be accomplished by adding redundancy to the message. We might consider some gene processes and art behaviors to be of similar types in that I am suggesting both are developed mechanisms/strategies for harnessing bounded randomness in a way that increases the fitness of the organism. We might think of optimal variety in genes or in art as that which maximizes variety within the limits of maintaining sufficient redundancy. Randomness without bounds does not meet these criteria. Art, instinctively being created by humans for humans, appears to do so.

8.4.3 If art is about the introduction of novelty into the environment, what distinguishes art from all other human activity that also introduces novelty into the environment?

Reply: Yes, any human activity that makes changes in the environment has the potential of introducing significant novelty into that environment in such a way that it might increase the perceptual and conceptual range of the brains of those immersed in that environment. This however, would be incidental to the purpose for which that (non-art) activity was engaged in. If the straight horizontal and vertical lines of architecture primed the brain so as to eventually allow for a more accurate, nuanced understanding of perspective, that is accidental – the buildings were built as they were to provide durable shelter within limits placed by the constraints of knowledge, materials and design. Art behaviors, however, deliberately introduce novelty into the environment unrestrained by utility in that their ultimate utility is found in the effect that novelty itself can have on the human brain.

8.4.4 What about the difference between art and craft? Fine art, ornament, decor and commercial illustration? Surely you aren't saying these are all the same?

Yes, that is what is being claimed: in that all of these are equally art, they are all the same. Where they are different is that they contribute discernable optimal variety to different people in different positions of art appreciation. (I say positions, not stages, because there is no hierarchy or set developmental path of art and its appreciation; for whatever set of accumulated art experience a person has, there will be art that will suffice to add additional, optimal variety to that set. From every point there is potential for expansion.) This is perhaps a good place to resolve a question raised earlier in the thesis: should we be considering art as a classification term for entities or a term for a property of entities? In line with this theory, art is undeniably a property – not of entities but of the human environment. Art can be accomplished with the creation of entities or with the ornament of non-art entities – all are behaviors adjusting properties of the environment. Art behaviors might involve direct involvement of the creation of art or might (more commonly) involve accumulating art created by others – again, all are behaviors adjusting properties of the environment and are equally accomplished by fine art, ornament, décor, craft, etc.

8.4.5 Why aren't our pets smarter?

Humans have had domesticated animals for tens of thousands of years and many domesticated animals are born and grow to maturity in the same environment as humans. If art has such an effect on the conceptual and perceptual development of humans, why does it not also on domesticated animals? Reply: firstly, we do not know how growing up in the human environment might be making a difference in the neurocognitive development of domestic animals compared to their development were they in the wild. Elements other than the presence of art are significantly different between domesticate and wild lifestyles; studies would need to specifically target discovering the developmental difference made by environmental perceptual and conceptual complexity to answer this. Note as well that art is intra-species specific – what might have developmental effect on humans might be filtered out as insignificant by other species. If we extrapolate from the studies of goggled kittens and environmentally-enriched rats, we could expect that the art that suffuses the human environment might be having some effect on our domesticated animals, but you can read a kitten as many bedtime stories as you want and the kitty is not going to learn to read.

8.4.6 This theory doesn't account for much that we know of art.

Denis Dutton, in <u>*The Art Instinct*</u>*, defines art using "a set of cluster criteria" (Dutton*

2009, 51); these criteria are: provides direct pleasure, requires skill and virtuosity to create, conforms to recognized styles, expresses novelty and creativity, coexists with social art criticism, involves representation, elicits special focus, expresses individuality, presents intellectual challenge, is situated in socially created art institutions and traditions, provides imaginative experience (Dutton 2009, 52-59). But optimal variety accounts for only 1/12 of this list. Reply: the Optimal Variety theory actually accounts for more than just the “novelty and creativity” item on the list – it encompasses, as well, “imaginative experience” (the conceptual and perceptual play of much of the less passive novelty), “intellectual challenge” (which arises only with novelty and certainly isn’t characteristic of a good portion of art), “direct pleasure” (art being of intrinsic value, as many evolved, inherited behavior tendencies often are, regardless of their extrinsic value), and “recognized styles” and “traditions” (the redundancy component of optimal variety). “Involves representation” is true about art except when it isn’t, as is also so with “special focus”. “Expresses individuality” can be said of much of human behavior and “requires skill and virtuosity” can be said of most specialized human behavior. “Institutions” and “criticism” are components of many socially situated human skills (are there any other type?) which are valued and for which there are specialists – and neither of these can be considered universal in regards to art. We should consider, as well, the point made earlier about Duchenne behavior: if a behavior is instinctual and universal but in addition has positive social reinforcement, it can be expected that reinforcement of *simulation* of the behavior and therefore its appearance as a learned behavior may be universal as well. Regardless of what fitness value an art instinct might have, we should expect that there could be learned behaviors that coexist with and simulate the instinctual behaviors. We should therefore not expect all art behavior to be fully in agreement with our understanding of the instinctual behavior.

8.4.7 What would suffice as evidence?

The question of whether or not art behaviors are instinctual and whether, if so, their fitness value lies in providing optimal variety, is ultimately an empirical question. What evidence should we expect to support or falsify the theory? Reply: I can imagine no ethical study that could be done on humans to reach significant conclusions about the effect of art/optimal variety in the environment on development of mind. The great portion of art that exists in any human society tends to be integrated into people's living environment – this could not be selectively removed without radically altering other environmental factors, and certainly not, for any subject, for the period of birth through adolescence suggested to be the significant period of neuronal development. Comparative studies are also problematic. When comparing the lives of two subjects, even if from the same community, it is unclear how to quantify the existing complexity in their environments and the novelty of whatever art exists within it, especially given that novelty is subjective and would have differing value for any particular subject. These problems only escalate in comparing individuals from different communities, different societies, and different cultures. How to eliminate all other factors that might obscure what could very well be a subtle (for the individual, but significant in terms of long term effect on populations) effect of the art? Such a study is so far out of the realm of being realizable that it approaches comedy even to try to envision.

Perhaps, for something that expresses effects in changes in populations over vast periods of time, we should look for evidence of a vaster scale. We have discussed the dynamic, expansive nature of art, which, over the course of art history and combined with invention or refinement of techniques, creates the illusion of advancement or progress in art. If the history of art can be modeled as a succession of periods or movements, should we not expect to see a corresponding change in the human mind? Gablik, in *Progress in Art*, draws comparison between the succession of periods in Western art and the developmental stages of children as presented in the work of Piaget: "The history of art exemplifies fundamental patterned principles of mental growth" (Giblik 147). If there has been an expansion of the conceptual and perceptual range of the human mind over the course of history, we might expect that such development would effect changes in the art and other creations of such minds, as Gablik suggests. The additional question resultant from the Optimal Variety Theory of Art is whether the art itself has been a significant contributing factor in that expansion of mind. If so, how to distinguish art as cause from art as effect when looking at human history on such a scale? Feedback loops, such as provoked by art as we are hypothesizing it, are particularly vulnerable to presenting spiraling chicken and egg conundrums. Of course, it only complicates things that we have no *direct* evidence of increased conceptual and perceptual range in humans over history, and any indirect evidence we might have for expansion of mind generally takes the form of the very artifacts that we are suggesting might be cause (or effect or both) of it.

CHAPTER NINE - DISCUSSION

If the Optimal Variety Theory of Art is true and was somehow proven to be true, what might be the practical implications for human art activity? I suspect it should have little effect upon the human production of art. If, as the theory argues, art production is instinctive, then we might expect it will continue as it always has. We might expect some artists to find in the theory a new freedom and justification for divergence from established trends and forms; regardless, each artist is limited in their art production by the limits of their perceptual and conceptual range at the time of its creation, though *any* art output (good, bad, conservative, revolutionary) has the potential of being effective should it find its suitable audience. One might expect some artists to misinterpret the theory as being prescriptive instead of descriptive and attempt to deliberately manufacture novelty, equating novel art with "good" art; but, as with smiles and laughter, non-Duchenne behavior is rarely valued as highly as Duchenne behavior. Some folks might take comfort and others might take discomfort in the assurance that there is little objective basis for a belief in high and low, good and bad art, as all art has the potential to perform its evolutionary function − different strokes for different folks, something for everybody.

I would suggest, though, that were this theory in fact true, the kind of proof that couldn't be twisted away from simply would not exist, that this theory is in the category of those types of theories for which available evidence cannot be conclusive and about which we must maintain an active inconclusiveness. The lesson available to us from Thompson's experiments with evolved hardware applies equally to Philosophy as it does to Circuit Design – it is worth requoting Thompson at length on this point:

> For a human to design such a system [as the circuit evolved by the evolutionary algorithm] on paper would require the set of coupled differential equations describing the detailed electronic and electromagnetic interactions of every piece of metal, oxide, doped silicon, etc., in the system to be considered at all stages of the design process. Because this is not practical, the structure and dynamical behavior of the system must be constrained to make design tractable... conventional design always requires constraints to be applied to the circuit's spatial structure and/or dynamical behavior. Evolution, working by judging the effects of variations applied to the real physical hardware, does not... (Thompson 403).

To subvert Thompson's insight into Design to apply it to Philosophy:

> Philosophy always requires constraints to be applied in its modeling of the world to make theorizing tractable. The structure and dynamical behavior of the world requires no such restraint.

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