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‘IS HUMOR HELD ON A GENETIC LEASH?’

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INTRODUCTION

Humor is an undeniably social phenomenon. Despite the fact that it is experienced almost exclusively in social situations, there is very little agreement among social scientists about what exactly it is used for. While traditionally humor has been studied in Philosophy as a secondary component of theories regarding ethics or human nature, it forms an unavoidable part of our everyday lives. In order to determine whether or not humor is genetically leashed, I approach humor in two different ways. If, by analyzing both the social and biological functions of humor, it is determined that either is unnecessary for an explanation of humor as a phenomenon, then a theory could potentially be developed as a result, including only those functions that are necessary.

First I establish that humor as a social phenomenon, regardless of its function or use in society, relies on the emergence of the biologically evolved functions of the brain that allow for fast and efficient thinking, problem solving and the manipulation of meaning. What this entails is that humor, which is a cultural phenomenon, is controlled by the development of our genes. Proposed by Lumsden and Wilson, the theory that culture and genes co-evolve claims that the genetic variation in any species has a profound effect on the possible cultural variation that could happen at any given time. All culture (including humor), they say, is held on a 'leash' by genes, and so can only vary in limited ways. I argue, however, that it is unclear to what extent this 'leash' controls the development of humor.

Secondly, by defining humor as a function of an efficient information processing system, such as is exemplified by the human brain, I argue that the genetic 'leash' on culture is not as strong as Lumsden and Wilson claim. Variations in genes, such as Lumsden and Wilson describe, have resulted in the emergence of the information processing system of which humor is a function, but has no influence over how humor manifests. It is then not the case that humor is affected in any meaningful way by our biological evolution. Any system (whether actual or theoretical) that is able to fulfill the conditions necessary to be considered intelligent (by our own standards) would understand humor as we do, as the processes necessary for humor are functions of an intelligent system.

The purpose of this paper is not to provide a definitive theory of humor as a function of sociobiology. What I aim to establish is that any theory that does attempt to explain humor successfully must take into account the biological factors underlying the social functions of humor.

I conclude by stating that what in fact defines humor as a phenomenon is the fact that it is a function that arises out of a system that is able to efficiently and successfully learn and manipulate complex information. This function is what is fundamentally responsible for the manifestation of humor as a social phenomenon, and so is necessary for any explanation of what humor is and how it works.

CHAPTER 1:

HUMOR AS AN EXTENDED SOCIAL PHENOMENON

One of the problems that has consistently plagued the study of humor in the social sciences is the fact that there are so many varying accounts of what humor actually is. What is perhaps least clear about humor is the way we have, through various attempts at explaining it, separated the sociological function of humor and the functional aspects that determine how and when humor occurs. It may be this distinction that has until now meant that a complete description of humor could not been reached.

However, I believe that the distinction is one that should not prove as problematic for an explanation of humor as it currently does, given that there is no real reason to favor any one explanation exclusively. In this chapter I show that, while humor clearly has functional and ethical implications in its capacity as a social phenomenon, all of these implications rely on the mechanisms that allow humor to arise, and so are not social in and of themselves. These mechanisms, having evolved in the human brain through the process of natural selection, are those that allow us to process information efficiently. It is logically possible for the very same implications that arise out of humorous social interactions to occur in isolation in a fast thinking system.

In this chapter I outline a number of attempts to explain what humor is and how it works from a sociological standpoint. Instead of claiming that one is a more believable than the rest, I show that regardless of which of these theories we take to be the most accurate in its description of humor, there is a common feature that is shared by each of them – the biologically evolved mechanisms that allow for the manifestation of humor.

1. Sociological functions of humor

In her paper titled '*The Sociology of Humor'* (2008), Kuipers outlines a number of proposed perspectives on humor that range across a number of disciplines and schools of thought. Within the field of Sociology, she claims, the study of humor has largely been ignored, since its focus had always been on the 'great structural transformations of modern times: modernization, industrialization, urbanization, secularization, etc.' (2008: 365). Since there have been no, or at least very few, purely sociological explorations of humor, she explores theories from a broad range of disciplines that have made light of the social nature of humor and the functions related to it within broader social contexts.

She outlines what she calls the three "classical" approaches to humor, namely the Superiority, Relief and Incongruity theories (which are outlined briefly in an earlier section of this paper). These three, however, are not directly social in nature, and it is only after the beginning of the 20th century that theories of humor linked directly to the social sciences began to emerge (ibid.: 368).

The first of the approaches that she explores is the Functionalist approach (ibid.: 368), which looks at humor in terms of the function that it performs in a society. One particular function that humor seems to perform in society is to organize and stabilize social relationships, allowing one individual to interact with another in a joking manner in order to maintain the order of the relationship (i.e. relieving stress in particular situations where the status of the relationship may be unclear) (Radcliffe-Brown, 1940; cited in Kuipers, 2008: 369).

Another function identified by Kuipers is that of social control. For instance, humor is used as a way to identify and target values and problems within the social order of a society, ridiculing them in order to reinforce those norms and values that are identified as valuable or virtuous. This view of humor relates to Bergson's claim that humor is used as a 'social corrective' (Kuipers, 2008: 269). By laughing at certain behavior and ideas, we ascribe to them the status of being irregular and as a result are largely considered best to avoid. This view relies heavily on the psychological condition known as Gelotophobia, which is the feat of being laughed at or ridiculed (Platt & Forabosco, 2011; Ruch, Beerman & Proyer, 2009). While this condition does limit the general response to humor in those affected by it, it is not clear that humor is always effective as a social corrective. In many situations, humor is also used as a directional communication tool. Kuipers (2008: 369) cites studies conducted by Coser (1960) that indicate directionality in joking during social interactions that reflect hierarchies. For instance, doctors are more likely to get laughs than residents, who get more laughs than nurses. This could be due to the power of humor as a tool for the release of nervous energy, however Coser also maintains that the direction of the joking aids in maintaining and reinforcing the social structure. Doctors are more likely to make jokes about residents and nurses than the reverse. Though this is not necessarily due to perceived superiority as some earlier theories might claim. Using hierarchical humor could reinforce structure while guiding social cohesion. Professionals work better together when there is a clear boundary between rolls, and the use of humor could work as a non-intrusive way of maintaining that (where the assumed alternative would be aggressive posturing and conditioning by those in higher ranks).

The ability of humor to guide and reinforce social cohesion excels in situations where there is less formal structure (Kuipers, 2008: 370), for example the lives of patients spending time in hospital wards. Much like in situations that require stress relief, humor allows individuals in these situations to bridge the gap between their own situations and the situations of others, providing a sense of solidarity and identity, not as a collection of individual patients stuck in a ward together, but a group of patients sharing the same experiences and helping each other cope with difficult situations. In situations where there is a social hierarchy, such as in a professional workplace environment, humor could also aid solidarity between employee and employer by creating a sense of kinship that may be blinded by traditional ideas of the workplace structure (i.e. having a boss that occasionally cracks a joke may allow employees to understand that their superiors are not so different to them that they cannot relate when necessary).

The origin of this functional status that is ascribed to humor can be traced back to one of the original evolutionary uses for smiling. Used as a kind of aggression deflator in primates and other mammals, the act of baring one's teeth in a certain way and later breaking down in fits of laughter (suggesting a willingness to immobilize oneself in the face of potential danger) (Ramachandran, 1998) indicates safety. This notion is mirrored by Coser who claims that

> *"to laugh, or to occasion laughter through humor and wit, is to invite those present to come closer. Laughter and humor are indeed like an invitation, be it an invitation for dinner, or an invitation to start a conversation: it aims at decreasing social distance"* (Coser, 1959: 172; cited in Kuipers, 2008: 370).

However, recent studies suggest that the adherence to either the social cohesion or hierarchical functions of humor depend largely on a number of factors including the type of humor used, the status of the joker in question and the structure and composition of the social group itself (Robinson & Smith-Lovin, 2001).

Robinson and Smith-Lovin and others (Holmes, 2000; Martin, 2006; Palmer, 1994) identify four specific functions of humor as it relates to social relationships. These functions highlight what Coser and others seem to either misidentify or ignore; the fact that the function of every social interaction is not necessarily positive – and even if it is, that does not mean that the results will be consistently positive. Since they do not address the potentially negative effects of humor, regardless of whether or not that negativity forms part of any of the functions, it is impossible to take this view seriously in isolation. Even functions such as those that use humor to maintain social structure will be impacted in some way by the possibly negative effects of using the wrong type of humor in the wrong situation. Even though the negative emotion conjured by some forms of humor (as suggested in a section to follow) is not explicitly malicious in the majority of situations, it is an effect that has meaningful social connotations, and so must be addressed.

It is also not necessarily clear in the above mentioned theory how the roles and cultural norms in our interactions come about. However, regardless of whether or not the theory is able to sufficiently account for humor as a social phenomenon, it is the fundamental premise that is intriguing. Humor as a social phenomenon, if understood in this way, relies on the ability to understand and negotiate social norms, multiple meanings and cultural practices; something that the human brain has adapted to do over the course of our evolution.

2. Humor as symbolic interaction

Another approach to humor that uses social interaction as a central tenet claims that the value of any interaction as humorous or serious is something that is defined contextually, and cannot be defined clearly in terms of content or structure. It is something that is determined through the course of interactions (Coser, 2008: 377-378). The way that the shift between serious and joking interactions happen will largely dictate how successful the act of joking will be. A number of signals, either verbal or reactionary could mark a shift between serious and joking conversation. Coser refers to Goffman (1974) who introduces "framing" as a way to explain the shift. Within humorous 'frames', a lot more leeway is given to speakers and their audiences when it comes to stepping out of bounds or creating harmful interactions. Being within a humorous frame, he notes, "redefines everything someone says: it is not supposed to be taken 'seriously' anymore" (Goffman, 1974).

Apart from being (relatively) easily differentiated from serious interaction – due to cues such as beginning a statement with a laugh, or smiling in response to an initial joke or situational jest that would suggest a shift in seriousness – humor is useful in social interactions as a way of negotiating meanings, discussing taboo subjects and defining social roles in a way that is able to successfully negate as much potential harm as possible. The seeming ambiguity of humor in social situations means that most conversations that take place within a humorous frame allows those involved to speak freely without attracting unwarranted criticism or invoking any personal accountability.

Much like some of the proposed functional uses of humor, those who view it as a tool for symbolic interaction highlight the fact that it is useful for exactly this reason: for defining social norms. It could be debated how socially cohesive it is to exclude certain groups, even through joking, in order to set up a status quo, but the use of humorous frames could potentially be used to set boundaries between certain types of activities in society without directly pointing out and ostracizing individuals who might fall outside of the norm.

The difficulty faced in social settings when attempting to broach sensitive subjects can be greatly diminished by setting conversations up in such a way that humor's ambiguity plays an important role. That is, to bring humor into a situation that is potentially difficult to approach is to allow for all parties involved to maintain distance from the subject in such a way that should they feel that the situation is no longer appropriate, they can negate it.

Anything that is said in jest, no matter the seriousness of the implication, can be ignored if the nature of it is not important. Adults, for instance, often use joking remarks to flirt with potential partners, and should the remark not have the desired effect, the ambiguity involved acts as a buffer and allows participants to test the situation without having to commit to any serious action (Fine, 1983; cited in Kuipers, 2008: 378).

In addition to it being able to create the ambiguity necessary to discuss difficult topics and create new meaning in certain social situations, humor is also effective as a tool for defining boundaries between groups and setting up new criteria for inclusion or exclusion from any said group. Apart from this causing some trouble for our understanding of humor as performing a positive social function (as it tends to aid in dividing society into smaller sub-cultures), use of humor in this way can be interpreted as a result of one of the above mentioned functions of humor – social control. The aspect of control and power relations that is implicit in the use of conversational humor becomes apparent when viewed in relation to the functional view claiming that humor maintains social order. Because joking tends to happen in a top down structure (except perhaps when those in lower positions joke about their superiors in order to create solidarity), the mechanisms involved could be considered as "conversational aggression" (Norrick, 1993; cited in Kuipers, 2008: 379). According to Norrick, humor "disrupts the regular turn-taking pattern of conversation" and "the shift from serious to joking conversation means a drastic shift in the mode of conversation".

This focus on power relations means that gender relations in society are effected tremendously by the occurrence of humor, since the power struggles noted above traditionally have manifested in social relations between men and women, with women being expected to laugh at jokes more often while men are expected to initiate humor more frequently (Kuipers, 2008: 379).

However, the tendency to view humor as symbolic interaction is not unique, since it does rely on many of the same concepts as other approaches to humor. Because many of its examples can be viewed in a number of frameworks, it is not clear whether or not creating a general theory about humor from this approach is possible.

3. Humor as worldview

A particular approach to humor that views it as a phenomenological construction of reality changes the focus that is traditionally seen in studies of humor. Instead of focusing on how humor works, the Phenomenological approach (Kuipers, 2008: 380) looks at how humor manifests and the implications of that manifestation on the way we view the world from a societal perspective. As in the section above, the phenomenological approach to humor views the ability of humor to create and "play with meaning" (Zijderveld, 1982; cited in Kuipers, 2008: 380) is fundamental to our understanding of what it is. What differs, however, is that the understanding of this approach is that humor is not simply a tool that we make use of to make sense of or dictate meaning in the world around us. Instead, it is a standpoint that we take that allows us to view society in such a way as to reveal things about it that we would not otherwise be able to see, since within the frame of reference of any society, what seems natural is unlikely to be questioned in any meaningful way.

Humor enables us, according to Zijderveld (1982), to experiment with society and negotiate meaning. Some theorists (Bakhtin, 1984; Zijderveld, 1982; Habermas, 1992) look at how humor is able to create completely separate worldviews that work alongside our traditional structures. In carnivals ('carnivalesque' in Bakhtin (1984)), traditional societal rules are negated, and the humor and playfulness that is often associated with these institutions is taken as a ‘counterpoint to the process of rationalization’ (Zijderveld, 1982). For Bakhtin, the carnival functions as ‘an alternative sphere of freedom and resistance’.

Kuipers identifies Mulkay’s understanding of humor, in which he claims that:

> *“the rules of logic, the expectations of common sense, the laws of science and the demands of propriety are all potentially in abeyance. Consequently, when recipients are faced with a joke, they do not apply the information-processing procedures appropriate to serious discourse*” (1988; cited in Kuipers, 2008: 381)

What happens when we approach the world in this ‘humorous mode’ (ibid.) is that we allow ourselves to communicate ideas that are seemingly contradictory to the social norm without replacing it. Since we do not make use of the same information-processing methods that place constraints on regular interactions, we are able to make the norms and values that are commonplace within that mode normal in every day society. For instance, when we engage in humorous banter about gender related or sexual humor, we create an implicit understanding that the ridiculousness of the expectations and stereotypes that are commonly associated with gender bias is just that – ridiculous. As a result, any potential discussion that takes place regarding any of these expectations and stereotypes is associated with the humorous ‘mode’, thus neutralizing the seriousness of the subject. In this way, maintaining separate worldviews (i.e. serious and humorous) allows us to draw clear lines between the content of each. We do not, for example, view fire breathers as dangerous or ridiculous when we are within the ‘carnival’ worldview.

4. Historical-Comparative Approach

Another approach to the sociological study of humor that has become more commonplace in recent years is one that takes into account all of the information available to us from previous studies both within sociology and other related fields. While no theory that falls under the historical-comparative approach is taken to be the authoritative measure of humor, most make use of similar variables to determine how humor should be defined. For instance, Apte (1985; cited in Kuipers, 2008) notes that some of the constant features of humor that are instantiated across cultures include topics such as “sexuality, gender relations, bodily functions, stupidity and strangers”. Similar to approaches previously mentioned in this chapter, historical-comparative approaches view humor as a way to create a disconnect between serious and non-serious interactions Kuipers, 2008: 383).

Across different cultures, all of these features generally form part of the phenomenon of humor. Variances occur when humor is localized due to changes in cultural norms and availability of content. However, Zijderveld (1982) claims that it is not the variation between cultural approaches to humor that is important for our understanding. Instead, what is at the heart of humor as a general concept is the fact that, wherever it occurs, it is a result of an adaptation to a certain worldview or rationalization of a situation.

Humor in the early modern period may have may have, for example manifested as basic foolishness in order to counteract the seriousness of the Enlightenment, whereas humor in the 20th and 21st centuries can be characterized as witty and intellectually challenging due to dissatisfaction with modern cultural trends.

Kuipers claims that what is common between all instances of culturally diverse humor is the fact that ‘humor and other phenomena manifest the same trend’ (2008: 383). We can compare how humor that manifests in a particular cultural or historical situation and compare it to another phenomenon of the same time or place to see how and why it has manifested in that particular way.

Comparing ethnic humor from around the world at different points in history, Davies (1990) notes that “although ethnic humor is probably universal, who is targeted, and how, varies significantly “(Kuipers, 2008: 383). Kuipers also points out that what is evident from Davies’ approach is that certain types of jokes are told in certain situations, regardless of who or what the subject is. For instance, jokes about stupidity or “backwards” people are told about certain versions of one’s own group; jokes about ‘stingy’ people are told groups that have been historically successful in different parts of the world (for instance, Jews, Scots or the Dutch – a group who take up the ‘stingy’ mantle in Belgium) (2008: 384).

A running theme that comes across from Davies’ research is the fact that humor in broad societal contexts and the way we view the implications thereof has more to do with the relations between the groups involved than it does the humor itself. Used as a method of generalization and buffering between social groups or classes, humor tends to be, at least according to some historical-comparative approaches, something akin to the functionalist approaches. These approaches tend to view humor as something that maintains social order or develops social cohesion, depending on context.

5. Negative Humor

A critique that is often laid against many sociological studies of humor is that they fail to address the negativity that could be interpreted in humorous interactions. Apart from the Superiority theory, which states that humor is used to celebrate victory of one kind or another over others. It is supposedly a “putdown or an act of social exclusion” (Billig, 2005; cited in Kuipers, 2008: 287). What is often found to be the case, even though humor is not necessarily intrinsically harmful or malicious, is humor being used in a negative manner towards people or things that we have negative feelings towards – either to act as a social corrective or a control system that allows the ‘superior’ joker to control the opinions of his or her audience towards the subject at hand.

Most humor theorists agree, however, that coming to terms with the potentially harmful fallout of some darker or offensive types of humor is not as simple as determining whether or not the person initiating is simply joking or has some ulterior motive. More often than not, what must be taken into consideration is the context within which the joke or mindset towards other groups or individuals occurs. In the same way that historical-comparative theories claim that jokes told about individuals and groups that are considered as apart or representing minority views, it may be the case that what is viewed by many superiority theorists as negative, abrasive and harmful humor directed maliciously at one group is simply an attempt to "play with aggression" (Davies, 1990; cited in Kuipers, 2008). Along the same vein, Oring claims that "Joke cycles are not really about particular groups who are ostensibly their targets. These groups serve merely as signifiers that hold together a discourse on certain ideas and values that are of current concern…These attributions, while not entirely arbitrary, are, for the most part not seriously entertained." (2003: 65)

The idea, however, that the use of humor to 'target' and thereby exclude some individuals and groups fails to take into account the possibility that the mindset from which humorous jabs are made could be one of reflection. As in the approaches detailed above, it is likely the case that (in most cases) when we make jokes targeting one group or another for being inferior, or pointing out the fact that women are meant to be physically weaker than men, we do so in a manner that lets our audience know that we are aware of the stereotype we are committing to. If this is the case, humor could easily act as a tool for highlighting those stereotypes that, while difficult to deal with in serious conversation, are fundamentally ridiculous. They are taken as such in humorous interactions, allowing us to negate the negative implications and correct our expectations of those groups in light of the understanding that those ridiculous implications being disregarded as serious.

6. Common Features

These five descriptions of humor describe how and why we use humor in social situations from a sociological standpoint. However, they do not do much in the way of explaining the mechanical functions of humor ('function' in this context refers to the causes, triggers and psychological effects, as opposed to the social function, which refers to the external effects of using humor).

In order for us to consider any account of humor to be complete, it must explain both the sociological and psychological aspects. The latter, which provides insight into what it is that makes a joke or humorous interaction ‘seem’ funny (as opposed to offensive or confusing), can be explained as thoroughly as presently possible by appealing to the structure of our cognitive abilities. As explained in a previous chapter, the information processing power that has developed in the human brain over our brief history as a species makes it possible for us to solve difficult cognitive problems efficiently. One of the byproducts of the process of evolution that lead to this trait is the understanding and use of humor, which is one of a number of reward systems in place that promotes problem solving in certain situations. Simply put, when we are able to identify and resolve the incongruence involved in situations that we are faced with that do not put us in any immediate danger, we are rewarded with a flood of dopamine, the chemical that controls feelings associated with pleasure and reward, among others.

In other words, when we see or hear something that does not agree with our expectations of what is supposed to occur at a certain time, our brains must work to solve the problem. Once the problem is solved and we are able to understand what was strange about the situation, we are able to reflect on how ridiculous our initial expectations were, given the new information. This process often occurs so fast that our laughter or smiling seems like an instantaneous response to the situation, but this is largely a result of the efficiency of the information processing that we have developed over thousands of years of evolution.

As argued in the section above, the reason that offensive or negative humor is not considered by most humor researchers is because the content is for the most part, inconsequential. It is rather the identification and solution of incongruities that makes us react to it as though it is funny.

One feature of the cognitive processing system is thus shared by every one of the above mentioned sociological theories; namely, efficient resolution of conflicting information. No matter which social functions we attribute to humor, none are possible without a brain that is able to sort through information efficiently enough to solve complex problems. Due to the dependence on this cognitive function, we could argue that the social features detailed in the section above are not exclusively social functions, but only function in social situations because human life is an inherently social experience. In isolation, all of the above mentioned functions (i.e. problem solving and interpreting multiple meanings) still occur within the cognitive information processing systems in the brain.

This chapter shows that there is a feature common to every seriously considered sociological account of humor. That common feature, the ability to understand and process information from the environment efficiently, is one that has arisen by way of biological evolution. The mechanisms that have led to the development of this feature, while clearly biological, are still unclear. The following chapter looks to determine what these mechanisms are and how they allow humor to arise.

CHAPTER 2:

THE SOCIOBIOLOGICAL ORIGINS OF HUMOR

In order to understand how biological evolution gave rise to the ability to use humor through the development of an intelligent mind, we must first understand how humor manifests itself as a biological trait. This chapter looks at humor from an evolutionary standpoint, considering that it may have evolved in two ways: first by coopting mechanisms that allow us to communicate emotion in different ways, and perhaps more fundamentally, as a result of genetic adaptation that results in certain physical and cognitive traits occurring. The potential changes in these traits is restricted by the variation in genes. I argue that this theory of gene-culture coevolution should be considered as a relatively accurate account of the biological factors involved in the development of humor, even if its effect on humor is, for the most part, limited.

1. Humor as evolved emotion

Regarding the evolutionary origins of humor, there are conflicting theories that try to account for the processes involved from different perspectives. It is widely accepted that humor (or at the very least, laughter) evolved as an adaptation of an already existent mechanism. At some point in our evolutionary, a mechanism would have existed that allowed us to exhibit aggressive or defensive behavior towards potential threats in the wild; the same mechanism that is common throughout the animal kingdom. The conflicting theories on the process of evolution do not necessarily deny that this is the mechanism from which humor evolved, but there is no real consensus on what the purpose of the adaptation was that allowed us to develop humor in its current form (Gervais & Wilson, 2005: 396-397).

Since there is no real firsthand evidence of early humor in humans that is unique to our species, the best way to study its origins is indirectly by looking at how it manifests itself in our closest relatives. Since the same basic behaviors are apparent in most primates (as well as in other species), it is safe to assume that the mechanism is a common adaptation that was picked up before our species' diverged from a common ancestor.

The laughter that our species shares with bonobos, chimpanzees, gorillas and orangutans manifests itself as the "open-mouth play face". According to Keltner and

Bonanno, this facial expression involves ‘a widely opened mouth and quick, vocalized, staccato breathing’ (1997: 687). The reason we have for believing that this behavior resulted from the same mechanism is not simply that we seem similar to other primates in this regard. In fact, human babies and toddlers exhibit the exact same behavior as other primates do.

Various accounts of how laughter and the ability to perceive basic humor manifest in humans of different ages show that laughter commonly occurs for the first time between the ages of one and two months (Sroufe & Wunsch, 1972, cited in Keltner & Bonanno, 1997: 688), and is commonly associated by activities such as tickling, play fighting and the introduction of novel stimuli. Laughter occurs in these situations only in situations where the individual exhibiting the behavior feels unthreatened. For example, if a baby is exposed to play fighting, tickling or novel sensory information in a way that it does not feel safe (likely in the presence of a parent or in an area that it associates with safety), it will likely have a more negative reaction. These activities only induce laughter when they are viewed as mock aggressive, which is signaled most commonly by the use of laughter and smiling by those initiating the laughter inducing behavior. As children get older, their playing becomes more imaginative, often evolving into playful chasing and manipulation of thought processes and their interactions with objects and other people (Morreall, 2009: 41-42).

This ability to use cognitive skills in order to associate different, often inappropriate or uncommon meanings to objects and words is what is commonly viewed as the difference between simple reactive laughing and the use of human specific humor (Morreall, 2009: 43).

Paul McGhee (1979, cited in Morreall, 2009: 42-43) suggests that there are four distinct stages to differentiate in the development of humor. The first, 'Incongruous Actions towards Objects' typically develops during the child's second year. It involves the manipulation of already existing mental images in the child's mind, and the use of those manipulated images in a way that is abnormal or inappropriate, given the purpose of that specific image-object relationship (Piaget, 1991, cited in Morreall, 2009: 42). For instance, a child using a stick as a gun in a playful instance of war with his or her friends shows how the mental image associated with one object can be used, in a purposefully humorous way, in conjunction with a different object. This stage of development marks the beginning of the development of humor because objects used in this way are used specifically for the purpose of being humorous or to create a sense of enjoyment and not simply as a reaction to external stimuli.

The second stage of development begins shortly after the first. According to Paul McGhee, this stage is known as the Incongruous 'Labeling of Objects and Events' stage (1979, cited in Morreall, 2009: 42-43). During this stage, children learn to use and manipulate their newly developed understanding of language use. Once they have gained the necessary skills to understand how and why certain words are appropriate in certain situations, they then develop the ability to purposefully identify the incorrect objects and events in order to show that they understand that there is some level of incongruity happening in the interaction.

This stage allows for the development of the third stage, which McGhee implies is somewhat related, as it relies on many of the same principles and the understanding of the use and meaning of language. The third stage, 'Conceptual Incongruity' allows the child to manipulate and violate concepts and to misuse the standard features in a way that the find humorous. This can only happen, supposedly once the child has learned the associations that go along with conceptual language, instead of simple acts of naming objects. The concept ‘dog’, for instance, once understood, encompasses an entire species of animals, and not just the specific family pet that the child has encountered for his entire life. Once the child is able to understand that there are many instances of animals that behave and sound the same way as others, they can manipulate that to humorously include animals and objects that do not fit the standard description. Young children often find it humorous if a parent or sibling makes animal noises that they already understand do not fit the common features of people.

The fourth stage allows children to understand and manipulate multiple meanings of words and phrases. This includes creating humorous riddles and sentences that play on words or phrases that sound similar to each other, but with different and often opposing meanings or connotations. A typical joke of this kind, which can usually be heard being swapped by children to their peers would take the form of a riddle, such as:

> “Why didn’t the skeleton go to the dance?”
>
> “Because he had no body to go with”

Once in this stage, children’s sense of humor typically begins to develop into the kind of humor we normally find happening during interactions between adults. As we become more aware of the complexities behind the incongruities and the ways in which they can be successfully manipulated in order to create humor, storytelling, style, tempo and social interaction become more important. During this stage, and well into adult life, humans gain the ability to use cognitive skills in a disengaged way, applying their skills and knowledge about the world in order to have fun rather than for any specific practical reason.

It is important to note that the way children develop humor does not necessarily dictate how the first instances of humor came about in our early ancestors. While children react to incongruities in their environments with humor, they only do so in situations in which they feel safe (such as during interactions with close relatives and inanimate objects). Early instances of humor would presumably not have come about in this manner, because, as Morreall (2009: 43-44) states, “life in the Pleistocene era was more dangerous than the lives of babies today”.

According to Ramachandran (1998), the purpose of the first signals of humor (i.e. vocalized laughing and the physiological symptoms associated with it) was a social one. He suspects that laughter was used as a way to announce to a social group that a discovered anomaly or incongruity in the world is either non-threatening, or trivial (1998: 206). All three of the major theories of humor can be seen in situations where this kind of false alarm is set off, leading to humor. Ramachandran provides an illustration of how we sometimes laugh because of a situation that is seemingly dangerous at first, yet turns out to cause humorous effects.

Consider for instance, a situation wherein an individual, inexperienced in flying, begins to panic at the appearance of minor turbulence. Everyone in the cabin of the plane who has had experience with this kind of disturbance before will look at someone experiencing it for the first time and think it a ridiculous reaction to such an insignificant event (or they might pay no attention to it, depending on how they tend to react to these kinds of disturbances). The individual reacting to the turbulence will at first hold a firm belief that they are in danger, and will panic for fear of their life. However, they will quickly realize (or at least they should, provided the flight is not in an real danger) that their reaction in response to the potential threat was either completely inappropriate or exaggerated.

If we take Ramachandran's account of the development of humor to be accurate, then we can assume that the individual will laugh when he comes to this realization as a signal to the rest of the passengers that he has become aware of the harmless nature of the situation. At the same time, however, the realization and subsequent laughter allows the individual to get rid of the stress that has been built up by the initial danger. It also gives other individuals in the social group to laugh at the inability of the first to successfully handle a seemingly dangerous situation. Ramachandran suggests that for this reason, his False Alarm theory can also account for slapstick comedy. We laugh at the misfortune of others not because we are entertained by harm that is inflicted upon them, but as a signal to others in the vicinity that there is nothing to worry about. As Ramachandran states:

> "If a man's head hit the pavement and his skull split open, you would not laugh as you saw blood spill out…But if he got up casually…and continued walking, you would probably burst out laughing, thereby letting others standing nearby know that they need not rush to his aid." (1998: 206).

It is important to note, however, that the mechanisms underlying the use of humor are not necessarily ones that have been selected for humor by natural selection. As with many other evolved mechanisms and features of many animals (including humans), those that allow for the use of humor and laughter may very well have evolved for a completely different purpose, but were co-opted and used for laughter. Both Ramachandran (1998) and Morreall (2009) suggest that the facial expression we commonly associate with smiling and laughter first evolved from the expression of aggression in lower primates (which typically involves retracting the corners of the lips to expose the teeth and gums). Early in the evolutionary process, it was used as a defensive mechanism, and as species like ours and our close relatives became more social, it turned into a signal of submission, and later, as the expression changed and became more relaxed and resulted in a less threatening demeanor, became a signal for play and kinship.

The question then needs to be asked: Is the way we use and understand humor something that is based on our biological evolution, or is it something that has been learned, having conveniently co-opted the mechanisms for defense? Ramachandran (1998) states that the neurological system that allows laughter and humor to happen forms part of the limbic system, which is the part of the brain that allows for orientation in relation to threats and to the exterior world (1998: 207). What is unclear however, and still being contested by experts in different fields, is whether or not this co-opting is part of the process of natural selection, or whether it is something that is simply a by-product.

2. <u>Do genes dictate our ability to understand and use humor?</u>

Sociobiologists will claim that what has become a clearly refined sense of humor in humans stems from our evolutionary origins. While traditionally biologists would claim that the relationship between genes and culture is something that appeared and reached its peak at a certain point, having not changed much since then. They view the relation in terms of what is known as the 'promethean-gene hypothesis' (Lumsden and Wilson, 2005: 1). This hypothesis claims that the culture that makes humans unique as a species came about as a product of the existence of a handful of so-called 'Promethean' genes. Once the ability to form cultural practices and to maintain them has been created, evolution by culture becomes possible. The two worlds, genetic and cultural, supposedly part ways and work on influencing different aspects of human life.

On the other hand, sociobiology views the evolution of genes by natural selection and the evolution of culture as interacting at a fundamental level. It views the evolution of the human species as comparable to the evolution of other related primate species, with each one adapting in its own way to its environmental pressures.

Lumsden and Wilson (2005) however, believe that taking such a simplistic view of all species, especially Homo sapiens is incorrect, as it assumes that there is some kind of direct link between behavior and specific genes. Instead, they propose what they call 'Epigenetic Rules'. In favor of these proposed rules, they explain that "behavior is not explicit in the genes, and mind cannot be treated as a mere replica of behavioral traits" (2005: 2). The epigenetic rules (which will be explained more thoroughly in the next chapter) make use of information that is gained from the environment by way of cultural and non-cultural (individual learning) information to varying degrees depending on a number of factors that could be present at any given moment. Lumsden and Wilson claim that this approach (as opposed to claiming that behavior comes directly from genetics alone) is more appropriate for human behavior than for other animals such as primates and any other lower animals because of the vast number of complex cultures (most of which can be viewed as distinct from the next to varying degrees) that have been created by humans over the ages. Such a degree of variation in behavior could arguably not have been achieved if there was only one possible outcome for any single type of genetic composition.

Defining culture as "the sum total of mental constructs and behaviors, including the construction and employment of artifacts transmitted from one generation to the next by social learning" allows Lumsden and Wilson to provide a broad overview of all aspects of human life that could be interpreted as cultural, not simply focusing on language and other forms of symbolic communication that seems to make our species unique. What in fact makes Homo sapiens unique, according to Lumsden and Wilson, is the fact that we have the ability to teach our young and other members of society by way of reification. As far as we know, we are the only species to have developed this tool (2005: 4-5). While we are not the only species to teach our young, the magnitude of our ability to teach and learn in different ways and for different purposes makes us unique in this sense. 'Reification' according to Lumsden and Wilson is a cognitive process that can be defined by the following distinction:

> "The operations of the human mind incorporate (1) the production of concepts, and (2) the continuously shifting reclassification of the world. Insects, cold-blooded vertebrates and other relatively small-brained animals filter out most signals at the level of peripheral sensory cells and lower associative centers and then respond principally to a very restricted set of "signal stimuli" among the signals remaining. The human mind, in contrast, absorbs vastly greater numbers of chaotically timed stimuli, most of which lack immediate relevance, and constructs an internal reality from them" (2005: 5).

According to Lumsden and Wilson, it is the development of this process that has allowed our species to advance in the way we have - by way of genetic and cultural co-evolution. One important question that must be answered if this theory is to be considered with any real weight is how exactly the two evolutionary processes actually interact. What they propose is a unit called a 'culturgen' (Lumsden and Wilson, 2005: 7). The culturgen is typically viewed as a cognitive artifact much in the way a physical object is considered an artifact by archaeology (though it is not suggested that the culturgen is an actual physical phenomena). The use of the term is similar to the use of the meme by Richard Dawkins

(1976), and can be understood to be the same phenomena, though it is proposed for a different purpose, hence the distinction.

The culturgens, which are transmissible behaviors, mentifacts and artifacts (2005: 7) and are processed by cognition through a sequence of epigenetic rules. The epigenetic rules act as barriers that guide the cognitive process towards certain developmental and behavioral choices. They affect the probability of applying one culturgen over another. By applying the epigenetic rules to the information obtained through the culturgens, the process of natural selection is able to dictate which of the culturgens is used, and whether or not one is used more often than others, or even chosen at all.

Lumsden and Wilson propose a thought experiment to illustrate why they take the interaction between genetic and cultural evolution to be one that is co-operative. If an individual is confronted with a specific set of culturgens (which presumably cover all possible options for a common range of behaviors or choices, i.e., an assortment of food items or a choice between different tools), there are three possible outcomes.

The first outcome would occur if the development of the individual were contained in such a way that the same culturgen were selected each time, by each individual in a society. This kind of transmission is purely genetic (2005: 9). This is the transmission type that occurs in species without high levels of enculturation. Any choices made are either genetically hard-wired (instinctual), or if they are learned at all, the learning is directed so strictly by their genetic makeup that there would be no alternative but to learn that specific behavior." (2005: 9-10).

Lumsden and Wilson allude to the way certain birds learn only one song, and while it is clearly learned behavior, it is the only song they are able to learn, because their physiological and genetic predispositions restrict them from learning any other. Because of this restriction, there is no possible variation in the outcome of the learning process (except, perhaps, certain special cases of variation that occur via mutation in genes).

The second possible outcome is one that is on the other end of the spectrum. Imagine a species that has evolved a set of epigenetic rules that remove all bias from the species selection process. For example, a species that is able to visually comprehend every possible color frequency, and so has the option to select from any one of them (as opposed to most actual species that have certain upper and lower limits on possible perceived frequencies). This is referred to as purely cultural transmission (2005: 10) and is commonly associated with how human culture is perceived to evolve.

However, Lumsden and Wilson assert that both of the above mentioned types of transmission are unsuitable for any species that is supposed to be capable of cultural evolution (referring to humans and any possible species that may evolve the ability to form any significant culture). Pure genetic transmission is ill-suited for use as an explanation of human evolution because there are clearly instances of human learning and decision making that vary from person to person. The likelihood of there being a direct link between genes and the resulting decision is slim. On the other hand, pure cultural transmission is ill-suited as an explanation because:

> (a) our epigenetic rules are affected by our sensory limitations. It would be impossible (or at the very least extremely unlikely) for any species to be equally as likely to choose from a culturgen that lies outside of its upper and lower limits as it would be to choose from the number of culturgens it has available to it within the perceived parameters (if we take senses like sight and hearing to be standards examples of potential culturgens). So, equal probability for all culturgens would be impossible to achieve,

(b) any species that evolves with a reliance on culture would not be likely to have all possible culturgens available for selection, even if there were no possible upper or lower limits on their perception. This is because any culturally complex species is highly unlikely to begin its evolution (at least after the first generation) from a point of completely undifferentiated behavioral development,

and (c), if it were possible to start each generation with uniform probability on all culturgen choices, the process would be highly unstable, and eventually a bias towards certain culturgens would manifest due to the likelihood of certain choices better aiding genetic survival.

Because the epigenetic rules are what dictate the upper and lower limits of possible culturgen choice, a species' genetic predispositions supposedly hold a metaphorical leash over what kinds of cultural decisions can be made by any one member of the species, and by extension, by the species as a whole. These predispositions differ from the hardwired genetic encoding that result in definitive and replicable action in every member of a species (i.e. instinctual action).

The "leash" is limited in its control of the culturgen choice because there would be too great a metabolic and processing drain on the individual to warrant having complete control over all outcomes. As a result, there is a sort of "lengthening of the leash" (Lumsden and Wilson, 2005: 13). The resulting leash, which has less constraints on it than the leash between genes and instinctual behavior in non-cultured animals, allows for not only (relatively) free choice of culturgens from any given set, but it also allows for the creation of completely novel culturgen. These novel culturgens are potentially selected by the species in question according to their potential to assimilate under existing epigenetic rules.

In order to determine whether or not the above argument is able to provide a successful account of gene-culture coevolution in the human species, Lumsden and Wilson (2005: 16) suggest a set of four pieces of evidence that must be shown to correlate in order for the conclusion to hold.

The first piece of evidence that must be found is the existence of the so-called 'non-uniform epigenetic rules'. The unique process of selection of culturgens relies fully on the existence of these rules, which provide the framework for the types of cultural selections that can possibly be made by the species in question, as well as the upper and lower limits on those possible choices (where upper and lower limits are necessary or unavoidable). The authors spend two chapters describing what they believe to be the epigenetic rules associated with human culturgen selection. Among them are sensory experiences such as taste and smell, colour classification, hearing, all considered primary epigenetic rules - which are named as such because they are the automatic processes that result from sensory experiences and the filtering of information (Lumsden and Wilson (2005: 36). Secondary epigenetic rules include those rules that involve evaluation of information given to the senses by making use of processes such as memory recall, emotional response and decision making that leads the individual to predispositions regarding one culturgen over another during any given situation (2005: 36). For the purpose of this project, I will take the evidence for the existence of these epigenetic rules to be sufficient, as there is relatively firm consensus on the subject from experts in different fields (though with different technical terms being used for different purposes in separate fields).

The second piece of required evidence, according to Lumsden and Wilson, is that "genetic variance in epigenetic rules must exist within human populations" (2005: 16). They state that although the study of epigenetic rules is still at an early stage, various studies have shown that there is evidence of genetic variation in epigenetic rules among humans who have similar genetic backgrounds (such as fraternal and identical twins). Even though these studies were not necessarily conducted for the specific task of determining what the extent and cause of the variation could be (especially not in terms of how it relates to gene-culture theory) (Lumsden and Wilson, 2005: 16), their results show good evidence for the existence of variance in epigenetic rules.

The third required piece of evidence involves verifying whether or not there is a link between cultural practice and genetic fitness, specifically within the human population (the species with the most evolved sense of cultural practice). Lumsden and Wilson suggest that the evidence necessary for this condition has already been provided in depth in a host of other fields of study, some of which even hint at the very fine differences between selecting one culturgen over another. Evidence for this can be seen in the way tattooing and body modification (including circumcision) affects various factors that play a role in genetic fitness (such as mortality, birth rate and sex ratio. There is also evidence for various other cultural practices that can be called upon to account for changes in genetic fitness of any specific cultural group. For example, there is no evidence that rational consideration was taken when certain Mediterranean societies formed their beliefs about the Fava bean, a food item that is known to have a negative effect on genetic fitness for those in the area affected by the G6PD gene (which has a high frequency in Mediterranean populations) (Katz, 1980, cited in Lumsden and Wilson, 2005: 17-18).

Lastly, in order for the gene-culture coevolution theory to be accepted, there needs to be evidence for mechanisms that are able to explain the connection between genes and cognitive development. Because of the immense complexity of the cognitive capacities of Homo sapiens, there hasn't necessarily been any direct evidence linking these two aspects at a species level. However, in many other species there is evidence for a link between sensory reception and behavior.

According to Lumsden and Wilson (2005: 18), certain mutations in the genes related to color vision and sensitivity to certain chemicals and input signals can be seen in a variety of species, and even more complex epigenetic rules can be affected. Minor changes in genes controlling for detection of odorants can affect experience of different scents, causing changes in perception of those scents and thus the cultural choices made in relation to them.

There are also a number of neurotransmitters that have significant effects on mood, concentration, sleeping habits and sociability. These genetic mutations have been known to affect behavior and the ability to choose between culturgens with even the slightest variation in the gene in an individual. Common examples of this kind are schizophrenia, which has the ability to alter epigenetic rules that are affect by decision making skills and socialization (those belonging to the secondary epigenetic rules class).

What Lumsden and Wilson are suggesting by presenting this evidence is that any changes to the genetic makeup of an individual (or an entire species over a long period of time) will alter the route of cognitive development in a number of ways, which will affect the development of epigenetic rules (which then in turn affect the ability and likelihood of selecting certain culturgens over others). Thus, the "genetic leash" on culture is one that changes in length and effectiveness over time.

3. Objections to Gene-Culture Coevolution

Some criticisms that have been made against Sociobiology as a whole, and more particularly against Wilson's gene-culture coevolution theory make various claims against the validity of many aspects of the study. Some of these criticisms make the claim that sociobiology is better defined as a pseudo-science than an actual scientific field. Michael Ruse, in his book "Sociobiology: Sense or Nonsense" (1985), evaluates a number of the critiques against the field and provides his thoughts on whether or not they are warranted, making use of a number of tools that allow him to evaluate them both from a philosophical and biological standpoint. It should be noted that most (if not all) of these objections have been made specifically against Wilson's coevolution theory in one form or another over the course of its existence.

a. The Problem of Reification

The first problem discussed by Ruse is what he calls the 'problem of reification'. The problem stems from the idea that traditional biologists do not accept the idea that there are direct links between individual genes and physical manifestations of characteristics. Ultimately, a sociobiologist arguing for certain behavior stemming from a genetic standpoint, they falsely assume that that there is in fact a way to identify certain genes that correspond with certain kinds of behavior (Ruse, 1985: 102).

Ruse claims that there are two points to be made that show this objection to sociobiology and its practices as unwarranted. The first is that even though it is unclear that there exist specific genes that code directly for certain kinds of behavior, there is no reason to believe that direct encoding is the only kind worth considering. Even so, because there are a number of traits that can in fact be linked directly to genes (such as eye colors, skin color, hairy type, and other features), there is no reason to be completely closed to the idea of isolating certain features, even if they are behavioral instead of physical, to be potentially linked to a gene. (Ruse, 1985: 102-103). The second point he makes is that one of the major critics of sociobiology and Wilson's work in particular, Lewontin, accepts the extension in his own work, in which he produces a list of traits in fruit flies that are in fact controlled by genes. Ruse also notes that other critics have formed a seeming double standard on this point (that certain kinds of behavior can be controlled or affected by genes), as it is commonly accepted in genetic research that there is in fact a genetic basis for schizophrenia (Ruse, 1985: 103).

Ruse suggests that there is then no a priori reason for not allowing the same kind of treatment of behavior in genetics. It may turn out that certain kinds of behavior are more complicated than assumed, and that their link to genes can only be successfully drawn by assuming an interaction between multiple genes to create the appropriate behavior. However, he states that this is a problem for the field of genetics itself, and not an exclusively sociobiological issue.

b. <u>Incoherence of sociobiological kin selection theory</u>

The second point of criticism made against sociobiology (and because of its reliance on the fundamentals of the field, against Wilson's coevolution theory) is that the assumption made by Sociobiologists who claim that individuals involved in the process of kin selection are in some way involved in distinguishing their kin from other members of their species (Ruse, 1985: 104). According to Sahlins, who is one of the major proponents of this line of criticism:

> "Hunters and gatherers generally do not have counting systems beyond one, two and three. I refrain from common on the even greater problem of how animals are supposed to figure out how r [ego, first cousins] = 1/8. The failure of Sociobiologists to address this problem introduces a considerable mysticism in their theory." (Sahlins, 1976: 44-45; cited in Ruse, 1985: 104).

The claim here is that even as the most cognitively complex species around, early human hunter gatherers, with no concept of advanced statistical mathematics, would have no way, and presumably no need, for distinguishing reliably between their kin and other members of their group.

Ruse claims that Sahlins' criticism of kin selection seems to misunderstand the purpose of postulating the mechanisms that lead to the selection itself. For example, his claim that postulating a mechanism that allows for calculation or detection of kin within a group without knowledge of what that mechanism actually is amounts to mysticism is unwarranted for two reasons:

(a) Postulating a genetic mechanism that is not immediately evident is not an exclusive practice of sociobiology. Most genetic theories begin with such postulation, and it is this practice that actually leads to the discovery of the mechanisms in the first place. So, according to Ruse (1985: 105), the fact that Sociobiologists do not know the exact nature of the mechanism they are talking about means that there is a problem to be solved, implying progress.

(b) Simply because the Sociobiologists do not explicitly know the nature of the mechanisms they are dealing with doesn't mean that there is consensus among them that it doesn't need to be found or tested. Various studies in sociobiology have been dedicated to the ways in which organisms gather this kind of information, and Wilson (1975; cited in Ruse, 1985: 105) has spent a lot of time trying to solve the problems associated with the communication between lower organisms and how they use chemical signals to identify other members of their groups.

The point being made by Ruse in response to this criticism is that even though there are problems with theories in sociobiology, the problems they face are no different at their root than those faced by other scientific disciplines. So long as Sociobiologists use scientific methodology, there is no reason to hold them to a different standard than we hold any other scientist.

c. <u>Sociobiology as unfalsifiable</u>

Another challenge that has been leveled against Sociobiologists is that the field as a whole is unfalsifiable. Sahlins and others argue that for anything to be taken as legitimate science, it must be open to testing and possible falsification. Their claim is that sociobiology fails to do this, and so is not worthy of being called real science. According to Popper, this claim is not as threatening against Sociobiologists as it may seem, as he believes that the accusations are made with misinterpreted meanings of certain important concepts in mind (one of them being the idea of falsifiability.

As Ruse points out, however, even though the idea of falsifiability is an important feature of what we consider to be legitimate science, its application is not as simple as it is in theory. Karl Popper, the philosopher whose addition of falsifiability in his Philosophy of Science popularized the concept, also noted that there is no simple way to claim that a theory is pseudoscientific if it proves to be unfalsifiable at first glance. Even if a theory is tested and is shown to have false consequences, there are a number of things that scientists can and will do in order to avoid having to admit that their theories are objectively false. Pierre Duhem (1914; cited in Ruse, 1985: 112) suggests an explanation of how scientists are able to avoid having to falsify their theories. Ruse explains what has come to be referred to as the Duhem-Quine Thesis in the following way:

> "Hypotheses are rarely tested in isolation - within any interesting scientific theory there are usually a group of associated hypotheses - and so, if one is really keen to hold on to one particular scientific hypothesis, one can always (or nearly always) game an unsuccessful prediction on one of the associated hypotheses." (1985: 112).

While it is not necessarily common practice to deny falsification of every scientific theory, many major theories have been resistant to falsification after initial fault. The point being made by Ruse is that the only way to properly falsify any scientific theory (including those stemming from sociobiological research - such as Wilson's gene-culture coevolution theory) is to look at the whole picture, not just focus on a single case that may point to false data.

d. <u>Troubled terminology</u>

What might remain unclear about the claims made by Wilson in the gene-culture coevolution theory relates to the use of the ‘leash’ metaphor. The idea of a genetic leash on culture is one that, I believe, succeeds in providing an explanation of the way in which cultural and genetic evolution have remained entwined. However, there is a seemingly negative connotation that any reader might hold – since leashing commonly refers to deterministic control of an object organism. It is entirely possible that the idea of genes having deterministic control over our cultural and behavioral evolution might make anyone uneasy. However, I believe that this is because of a general misunderstanding of how the ‘leash’ in the theory actually operates.

Genes ‘holding culture on a leash’ refers to the inextricable link between processes involved in the two forms of human evolution. Since our genes form the basis of our appearance, instincts, abilities, intellectual abilities and adaptability (which we can assume to be aspects of the physiological condition of our species), then the evolution of culture must inevitably happen in relation to these aspects to varying degrees.

Cultural evolution is free to move in any direction it chooses (not literally, of course), but will ultimately tend towards a certain point of equilibrium that would promote (via natural selection) the survival of the physiological genes that form the basis of our existence. By extension, those culturgens (the metaphorical gene-like unit of cultural selection) that promote survivability will replicate and form the basis of our cultural lives until such a time that learning and adaptation takes place, at which point the ‘leash’ will again find a point of equilibrium around which it centers to promote survival. While the use of deterministic (metaphoric) terminology might play a role in our willingness to accept a theory as accurate, I do not believe that it should be a determining factor. An understanding of the underlying assumptions made by the gene-culture coevolution theory portray it as a relatively acceptable theory.

Having already established that humor has a biological basis, this chapter provides an explanation, via the gene-culture coevolution theory proposed by Lumsden and Wilson, of how biological evolution works to control our cultural evolution in general, and humor as a result. Criticism of the theory has traditionally not held up in any meaningful way, and I propose that this is because it is somewhat misunderstood due to its tricky use of the 'controlling leash' metaphor. In the following chapter, the mechanisms behind the gene-culture coevolution theory are explained, and the extent of their effect is evaluated.

CHAPTER 3:

EPIGENETIC RULES AND THEIR INFLUENCE ON THE DEVELOPMENT OF CULTURE

In this chapter I look at the mechanisms that are fundamental to Lumsden and Wilson's gene-culture coevolution theory. These mechanisms, termed 'epigenetic rules' dictate the extent to which cultural evolution is able to create variation, given that the genes that hold the information relevant to their development create upper and lower limits. By discussing the two variations of epigenetic rules (primary and secondary), I argue that the extent of influence these rules have over the development of culture (which includes the manifestation of humor) is limited, especially in the case of the secondary rules. By showing the limitation in this way, this chapter leaves open the possibility of including the gene-culture coevolution theory in any definitive theory on humor, so long as the inherent limitations are acknowledged.

According to Lumsden and Wilson, epigenetic rules are "the genetically determined procedures that direct the assembly of the mind, including the screening of stimuli by peripheral sensory filters" (2005: 7). It is these rules that shape the way the genes interact with the environment to direct learning and place restraints on development in order to promote the survival of an organism in a particular environment.

A distinction that is made by the authors, and one that I believe to be important for the purpose of this project, is the distinction between primary and secondary epigenetic rules. In this section I deal with each of these sets separately and show how I believe the distinction is problematic when it comes to Lumsden and Wilson's overarching project. The distinction is as follows:

> *"Primary epigenetic rules are the more automatic processes that lead from sensory filtering to perception…The secondary epigenetic rules act on color and all other information displayed in the perceptual fields. They include the evaluation of perception through the processes of memory, emotional response, and decision making through which individuals are predisposed to use certain culturgens in preference to others."* (Lumsden and Wilson, 2005: 36)

What I aim to show in this section, after explaining each of these types of rules and their consequences for the development of culture, is that the distinction matters most when attempting to explain certain aspects of our culture. Humor, in particular, for the sake of this project is an example of a biologically driven cultural practice that would, in theory, fit the explanation provided by the Gene-Culture Coevolution theory. However, the epigenetic rules as they are explained by Lumsden and Wilson has limitations when it comes to certain aspects of culture such as humor. I aim to show that the development of many aspects of culture are not limited by the epigenetic rules, particularly the secondary rules which act on cognition and decision making in later stages of development.

While humor is a genetically guided cultural trait in humans, since it is a function of a brain that has developed as a result of certain genetic traits and epigenetic rules that over time shaped the way we process and respond to information, it is unclear how this theory deals with the content of humor. I will argue that the extent of the influence that epigenetic rules have on humor is limited. These epigenetic rules (where a combination of primary and secondary rules are at work) can account for the fact *that* we are able to use and understand humor, but have little to no control over *how* that humor is used.

In order to show this, I will deal with the two rule sets individually, explaining the types of choices each leads to and how they affect cultural development. The distinction will make it clear, as Lumsden and Wilson claim, that in most cases there is no hard distinction in the way primary and secondary rules interact with our cultural development.

1. <u>Primary Epigenetic Rules</u>

    a) <u>Color Classification</u>

Arguably one of the most fundamental ways in which genetic rules place constraints on cultural development relates to the way the cones in the retina have developed to facilitate our vision based on only four primary colors (2005: 36). Apart from auditory reception, the genetic effect on visual cues is one of the most suitable case studies for genetic influence on culture, as it is the least susceptible to other types of interference. It is a feature that remains stable throughout our entire species. It is a prime example of how strictly the primary epigenetic rules influence cultural development.

Physiologically, the cones in our retina should ideally be able to function across a limited spectrum of waves, ranging from red on one end to violet on the other. However, the genetic rules acting on the development of these senses have divided our experience of colors into two parts. The first component is the classification of colors (red, blue, green, yellow as the four primary colors), and the second is the gradation of color on the surface of objects (i.e. light-darker-darkest) (Lumsden and Wilson, 2005: 43). The former is arguably the more fundamental component, as gradation of shades is done in relation to whichever color is being experienced at any given time. It is also the color classification component that provides insight into what the primary epigenetic rule works in this case.

Research conducted in 1979 clarified the process of color classification by looking at the "response to variation in wavelengths of four-month old infants" (Bornstein 1979; cited in Lumsden and Wilson, 2005: 44-45), which was found to correspond to the categories of color adults naturally seem to group together – blue, green, yellow and red. The fact that these categories of colors occur seemingly automatically shows that the impact of these primary epigenetic rules on cultural development is higher than was previously thought. It had been suggested, according to Whorf (1956; cited in Lumsden and Wilson, 2005: 44) and others, that the distinction between the primary colors and other categories is arbitrary. This evidence, however, shows that there is a link between a naturally occurring divisions between colors and the distinctions we make between them, regardless of culture. If there were no such bias created by the epigenetic rules, we could expect individual cultures to differentiate between colors in significantly varied ways. However, there seems to be a largely clustered account of most colors, with variations in explanations of blues, greens and blacks occurring in cultures closer to the equator, though to an extent that has no real significance to the data overall (Lumsden and Wilson, 2005: 47).

b) Taste and Smell

The epigenetic rules that influence the development of taste and smell, particularly in humans, are the most notably mixed in terms of how primary and secondary rules interact. The interaction between primary and secondary rules manifests fundamentally in that the successful use of these senses require “post-perceptual valuation” (Lumsden and Wilson, 2005: 40). Evidence also suggests that the sense of smell and odor memory in humans is severely limited, especially compared to the same sense in other animals. However, these attributes become more refined and successful if certain conditions are met – presumably conditions that are programmed for by way of epigenetic rules, both primary and secondary. The conditions that allow for the sense of smell and odor memory to be enhanced in humans are: long term familiarity with the odor, an established and commonly used name or term used to refer to the odor, and aided recall (Cain, 1979; cited in Lumsden and Wilson, 2005: 38). This suggests that there is a notable link between the development of language and long term memory and the ability in humans to sense odors.

The effect on the development of culture that is expressed by the limitation of this sense is multi-faceted. There are three stages in the development of dietary preference, according to Lumsden and Wilson (2005: 40) that have come about as a result of the influence of both primary and secondary epigenetic rules.

i. Infants innately prefer sugars (sucrose, fructose, lactose and glucose, in that order) to other odors and flavors. This preference has been attributed to the need for high caloric content indicated by the prevalence of these sugars, the intake of which is necessary to sustain humans (as well as other omnivores and herbivores), especially during developmental phases. Infants are also shown to have a natural aversion to flavors other than sweetness to varying degrees, depending on the levels of nutrients that are lacking at any given time.

ii. There is a tendency in weaning infants, if given the opportunity, to naturally experiment with foods to a degree that is less discriminatory than adults. However, this experimentation does not result in a severely unbalanced diet. According to results published by Davis (1928; cited in Lumsden and Wilson, 2005: 41), after selection by a number of infants, the typical resulting diet consists of ‘milk, cereal, fruit. Vegetables, eggs and other animal products’ (2005: 41) to varying degrees, though not different enough to be relevant. While the study was small and possibly inconclusive due to scale, the results were similar to tests performed on other mammals, most notably rats (Richter and Rice, 1945; cited in Lumsden and Wilson, 2005: 41). These studies showed that rats given the freedom of diet self-selection would “seek foods rich in those components which they lack at the time.”, and that “The rats treat foods deficient in the essential nutrients they most need as though the foods were slow poisons.”

iii. Food habits become more stable and conservative as the toddlers move into adulthood. In most cases, propensity for certain foods remain stable even if many other cultural habits change. Because familiarity and long term memory play a role in odor identification and dietary preferences (especially in adults), localized areas confirming to a specific cultural situation is likely to remain conservative in dietary choices even after change in cultural habits. The variation in diet that can be seen when analyzing different cultures can be attributes to certain types of foods and smells being more prevalent in some areas than in others, and as a result seeming more normal (or safe) than in cultures with different geographic constraints. Studies done regarding the way scents are classified suggest that there may be some similarities between the identification of the four primary colors and the identification of scents (Amoore, 1977). However, unlike color classification, there is more cross influence of primary and secondary rules, and as a result there is more variation in cultural assimilation of certain tastes and smells.

2. Secondary Epigenetic Rules

According to Lumsden and Wilson (2005), secondary epigenetic rules are subject to two interconnected features. The first, penetrance, is “the propensity to use some culturgen…of a given category, regardless of whether the choice is made from among many or few.” (2005: 64). The second is the degree of selectivity among available culturgens. During the early stages of development, the level of penetrance is much lower than in adulthood, which is when high penetrance is met with an equally high degree of selectivity of specific culturgens.

What this suggests is that early learning, while undoubtedly directed by way of genetic influence, is largely still automatic. According to Wolff (1970) and Hess (1973), early learning in humans is considered to be genetically directed, but it does not occur fast enough to be considered imprinting since, for example, it takes considerably longer for human children to become attached to mothers (sometimes up to six months) than it does for other animals (less than a week) (cited in Lumsden and Wilson, 2005: 65).

a. Facial Recognition and Pattern Complexity

The epigenetic rules that allow for the development of more complex decision making and interpersonal interaction are much more complex than those covered in the previous section (naturally, this is because they contain a mixture of primary and secondary rules). Facial recognition, for example, show's genetically guided learning insofar as there is a largely uniform pattern of recognition of facial features in newborn children and infants. The features that are fixated on in the early stages tend to be those associated with regular patterned faces, as opposed to novel or scrambled features while after further development infants are able to make the distinction between 'classes of faces such as those of men versus women' (2005: 72). As children get older, their ability to associate particular facial features with a single individual increases in parallel with the ability to recognize geometric designs. Even though the two are independent features, this parallel may suggest that there is an underlying epigenetic rule directing the ability to recognize these features successfully and to influence decisions based on different features in different contexts.

The reaction to varying degrees of complexity is another feature of early guided learning that suggests the influence of epigenetic rules, as the 'intensification' of stimuli does not increase preference. In fact, moderate levels of complexity have been shown to be the most effective in most areas of cognition and pattern identification. This tendency indicates that there may be some level of influence on choices and arousal in pattern recognition by both short term memory and the primary epigenetic rules that shape the basic sensory variation (Lumsden and Wilson, 2005: 74-75).

b. <u>Nonverbal Communication</u>

Another genetically guided learned behavior that make a good case for the influence of secondary epigenetic rules is Nonverbal Communication. There is relatively little difference in the facial expression shown for most emotions across various cultures. Even though there is uniformity for the most part, every culture around the world has specific nuances that affect the way those expressions are interpreted and expressed in certain situations. The variation that occurs between cultures still does not create so large a gap that there is any noticeable difference. A study conducted by Ekman (1973; cited in Lumsden and Wilson, 2005) showed that due to the relative uniformity between expressions in different cultures, when individuals were shown portraits of members of other cultures portraying certain expressions, they 'interpreted the meanings of these expressions with an accuracy of greater than 80 percent' (2005: 75).

Smiling, for example, is a nonverbal gesture that is found performing the same function in infants of cultures that developed independently, as far apart as South America and Africa. Even though the possible meanings associated with facial expressions can vary in adulthood, the variable gestures are limited in very specific, genetically guided ways (2005: 78). Another example of ritualized body movement that varies culture to culture yet has the same general meaning is a "no" signal. Localized gestures range from the most commonly found horizontal head shaking, to jerking the head backwards while closing the eyes to the wrinkling of noses and pouting of the lips. Even though these gestures seem different at first sight, they are all interpreted as responses to some kind of unpleasant stimulus of some kind. The central point of this example, according to Lumsden and Wilson is that the variation in independent cultural gestures is wide enough to provide culturgen choice, but narrow enough to be stable.

> "*the epigenetic rules vary among the categories of nonverbal signals in narrowness and specificity, but in all cases these qualities are strong enough to restrict substantially the array of nonverbal signals generated during cultural evolution*." (2005: 78-79).

While these examples of primary and secondary epigenetic rules do not encompass the entire scope of the effect on genetically guided learning, they provide enough evidence, according to the authors, to show that these rules have very real effects on the development of culture. There is, however, an argument to be made that the scope of their study and the conclusion that they draw from it is too narrow and takes too much for granted to hold any real weight as a full explanation of the phenomena at hand.

c. Information Processing and objections to the tightness of the leash

It remains to be seen, for example, whether the gene-culture coevolution theory proposed by Lumsden and Wilson is able to prove that the assumptions are committed to hold any weight. Flanagan (1991: 281) identifies four claims that must be accepted if this theory is to be considered successful. He also grants these claims initial success for a number of reasons. For example:

(1) Biased epigenetic rules must be shown to exist.

People who are color blind are affected by the variation in epigenetic rules to the same extent that everyone else is, but are unlikely to make the same aesthetic choices as anyone with perfect color classification. (ibid.)

(2) Epigenetic rules must be shown to have a heritable component.

Linguistic ability, according to Flanagan, is an example of a clearly heritable epigenetic rule. (ibid.)

(3) A link between specific culturgens and genetic fitness must be established.

Certain culturgens have a profound effect on the potential genetic fitness of both the individual and the collective cultural group. Drug addiction, celibacy and contraception as common practice all decrease genetic fitness. (ibid.)

(4) Molecular and cellular mechanisms mist be discovered 'that directly link genes to cognitive development'.

Genetic structure and DNA encoding is linked to cognitive development in a number of ways, such as through neuro-transmitters that have evolved via natural selection, or specific proteins that control information processing in the central nervous system (ibid.).

Because the theory rests on the success of the epigenetic rules as a way of linking genetic and cultural evolution, it is imperative for Lumsden and Wilson that these rules succeed. However, Flanagan points out a few problems with this specific aspect of the theory. These problems largely reflect what I believe to be the crux of my argument against gene-culture coevolution. They will highlight the problematic stance that Lumsden and Wilson take when it comes to the strength of the genetic leash on culture. As the problems are explicated, it becomes evident that many of the culturgens that would fall under the gene-culture coevolution theory's umbrella are much more difficult to ascribe to purely genetic origins than Lumsden and Wilson would claim.

First, he claims that there are more variables to be taken into consideration than simply stating that 'epigenetic rules are genetically determined' (Flanagan, 1991: 283). Because epigenetic rules are phenotypic traits, that is, traits that manifest observably, there is nothing intrinsic about them that could lead us to believe that environmental constraints do not have a direct role in their development. In other words, there is no way of knowing that environmental factors don't play a role in epigenetic rules because they always manifest in some environment or another. The best we could do is pin down how strong the genetic constraint on the rule is as opposed to the environmental alternative.

Secondly, Flanagan states that we can, with reasonable certainty, grant Lumsden and Wilson that there are at least some epigenetic rules that are strongly determined by genetics (such as linguistic ability, memory retention, general intelligence, etc.) (ibid.). However, the theory at hand does not make the distinction between those rules that are tightly and loosely controlled. Flanagan asks us to imagine the following scenario:

> "*Imagine the average…logician. Thanks to a combination of natural ability and lots of education and practice such an individual will become proficient at processing information in novel and highly idiosyncratic ways. [the] logician might become an expert at simultaneously comprehending the meaning of a passage in a philosophy paper and testing for logical soundness and validity."* (ibid.)

He then asks whether or not the abilities learned by the logician are part of the epigenetic rule system. According to him, Lumsden and Wilson will claim that his internalized knowledge is simply a product of the rule system that is already in place (i.e. that the information processing system, the efficiency of which is genetically determined, enabled the logician to acquire this information). They do not, however, consider that the opposite may be true. As with any information processing system (given that our cognitive information processing systems work in much the same way as computers and other purely process based systems), new information, rules and knowledge are not systematically locked out of the system simply because they are external. Any learned rule that enables the system to function better is typically inherited as part of the system that it was acquired by if that system is aware of its function.

Flanagan's point here is that, even if the epigenetic rules have control over some of our decisions and dispositions, as we mature, new information is assimilated by our systems, creating more complex systems than those we started out with. The epigenetic rule systems that acquire new information once we are adults are much different to the systems that are in play in adolescents. The external influence from enculturation, education, habituation, and even raw sense data, fundamentally change the way the information processing system works.

Another issue with Lumsden and Wilson's theory that Flanagan points to is that it relies too heavily on the assumption that genetic influence is strong enough to create distinct variation in culture. Lumsden and Wilson seem to assume, according to Flanagan, that the human tendency to directly imitate other humans is a 'constraint on the epigenetic rule system' (Flanagan, 1991, 284). Whether this is true or not (and I believe Flanagan is correct in his assumption that it should instead be considered as a defining part of the rule system itself), the fact that there is a horizontal element to human behavior, in the form of imitation, suggests that genetic influence is not as strong or as important to cultural adaptation as Lumsden and Wilson think.

One claim that Lumsden and Wilson make that gives their theory value is the fundamental claim regarding the "variation that exists in the epigenetic rules, contributing to at least part of the variance of cognitive and behavioral traits within a population" (Flanagan, 1991: 286). This claim points to the idea that variation in epigenetic rules can be responsible for the wide variation in culture due to selection pressure on individual culturgens based on their ability to aid genetic fitness. However, since there are many culturgens that clearly do not add to genetic fitness in any way, and since there are some (e.g. smoking or contraception) that directly hinder fitness in individuals and populations, it is unclear why some would be selected for in order to promote fitness while others (such as those above) are selected for different reasons.

A more likely explanation that would allow Lumsden and Wilson's main claim to hold true is that what is selected for by epigenetic rules is not individual culturgens, but rather a species-wide information processing system that allows for adaptation in different environments (1991: 286). Flanagan makes the following argument supporting the claim I make in this paper (the claim that most cultural traits rely more heavily on effective and contextually sensitive information-processing systems than genetic origins):

> "*the evolution of a plastic information processing system as opposed to rigidly canalized behaviors is predictable on general evolutionary grounds. Imagine a situation 'in which genes favoring general intelligence are competing with genes favoring some cultural trait that is adaptive in a particular environment. Whenever the environment changes (as it always does) the genes for intellect would gain'." (Gruber, 1982: 12; cited in Flanagan, 1991: 287)*

By distinguishing between the two types of epigenetic rules (Primary and Secondary), Lumsden and Wilson claim that each works in a different way. While primary rules create upper and lower limits on the manifestation of physical traits, secondary rules influence behavioral and cognitive traits. It is the secondary rules that would then ultimately influence cultural evolution to a greater extent than the primary rules.

However, as Flanagan points out, the extent of the influence that the epigenetic rules have over the development of culture, and especially the cognitive features that allow us to process information efficiently enough to make sense of the world around us, is limited. What this means is that the epigenetic rules, having guided cultural evolution to a certain point, do not have any significant influence on the content of that culture, but only dictate *that* we have evolved to be a culturally complex and intelligent species.

Instead of looking to the epigenetic rules to understand how and why humor manifests itself in our species, I believe we should gain a better understanding of the system of information processing that gives us our intelligence and cultural complexity. By doing so we should be able to grasp what humor is and how it evolved in us biologically, given that it is not a fundamentally biological phenomenon.

CHAPTER 4:

HUMOR AS A FUNCTION OF INTELLIGENT SYSTEMS

This chapter outlines the functional approach taken by Hurley, Dennett and Adams, which claims that certain criteria must be in place in any system if it is to be considered intelligent. These features, they argue, are also necessary for the emergence of humor. If, as they claim, humor is a function that arises out of the same system of features that make us intelligent, then any system that has those features present could potentially utilize humor in the same way we do, and the biological aspect of humor can be regarded as secondary.

In their 2011 work, Hurley, Dennett and Adams attempt to answer one of the most central questions in the study of humor: What is the *essence* of humor? (2011: 3). They argue, however, that framing the question in this way will perhaps not afford us the answers we are searching for. What is more likely is rather that the essential features of humor that may be found from a biological standpoint might be shared with other categories or features of human physiology. Perhaps we should instead find those features that are shared and attempt to find out how and why they evolved in a particular way.

Instead, argue Hurley, et. al. (2011: 4), the question should be framed in a way that would allow us to explore the mechanisms that allow us to understand certain situations as humorous when there is a potentially infinite number of interpretations. Their question is replaced with another: “*What makes us feel that some things are funny?”* (2011: 4). What they suggest as an answer to this is a computational or functionalist theory of humor that will allow us to understand the causal processes involved in the cognition of seemingly humorous information.

While it has long been thought that any entity considered to be purely (or at least mostly) computational could not possibly understand or use humor (the authors use as an example Data, a character from the *Star Trek* series (2011: 4)), Hurley, et. al. claim that it would not be possible to create a computational entity with human level intelligence that is unable to use and understand humor. This is because the central features and causal processes that allow for humor in our species are all features that are necessary for a number of other important cognitive features. In order for any entity to be considered intelligent by human standards, these features must be created (2011: 4-5).

What the authors propose is that it is not enough for a computational entity to exhibit the same 'behavioral expressions' as humans do when it comes to humor or other emotions, but for it to be considered truly intelligent, the agent must exhibit those behaviors as a result of being subject to the 'same processing methods and informational contents' (2011: 5) as we are. What matters for these processes, according to Hurley, et. al, is the "information-handling processes and the reasons for their existence, not the existence of proteins or biochemical substances" (2011: 5).

Humor, they argue, is not simply a reflexive response to external stimuli (as is proposed by most theories of humor based on biological origins), but rather that:

> "…*it requires a certain category of information processing involving most of the faculties of thought, including memory recall, Inference, and semantic integration. It follows, then, that our book must sketch a theory of the kind of general intelligence that could support a genuine sense of humor."* (2011: 5).

The processes and features that must be present in any intelligent system, according to Hurley et. al. include fast thinking, the construction of mental spaces, active beliefs, epistemic caution and commitment, and conflict resolution (2011: 116-143).

a) Fast Thinking Systems

In order for a system to be considered intelligent enough to, as Hurley, et. al. claim, 'support genuine sense of humor', it must have sufficient capacity to work through all of the information available to it. Modern computing systems have become so adept at sorting through information that we hardly think of them as having to sift through all of the information available to them in fractions of a second. Even larger systems such as Internet based search engines like Google have a seemingly effortless method of searching through every piece of archived and indexed piece of information available in the world. But how do they do it?

The power of Google's hardware far exceeds any regular computer, because it needs to be able to work through an exponentially bigger set of information, but even with almost infinite resources, the Google search engine would not be able to function efficiently enough to be useful if it were to attempt to search through every piece of information to ensure its accuracy. A number of algorithms and complex machine learning processes aide the Google search engine in selecting appropriate information based on keywords, search history, location and a number of other data sets. This narrowed set of information is searched and indexed to again narrow down the possible results running through one thousand individual computers to reveal accurate search results in an average of 0.2 seconds (Dean, 2010).

This kind of speed matters in computing systems because culturally, we value efficiency in our services. However, achieving the speed needed to search and index information on the

Internet is especially important as a step towards potentially creating an artificially intelligent system capable of humor.

The process of evolution by natural selection that humans have endured since the split from our closest humanoid relatives has left us able to function successfully with a very limited set of information available to us in our everyday encounters. At any given point, having to make a decision will force us to act upon incomplete information, and while we might sometimes stumble through incorrect decisions because of any number of incorrect assumptions or interpretations, for the most part, we have been able to navigate our history with a fair amount of expertise.

Any system that is created with a sense of humor (or at least with the ability to develop one) must incorporate this innate decision making ability, as well as the ability to independently learn contextual information and heuristically navigate the information available by using a number of calculated, informed shortcuts. While there are problems faced by any system that must settle for taking shortcuts, it is a necessary function that must be built into any system that aims to be efficient enough to survive (whether against natural predators or against any competition designed or fulfill similar functions).

In order for a proposed or actual system to function correctly, it must also be adaptable. However, even though the adaptability needed by a system capable of humor could be brought about in a number of ways, the best (and perhaps only) system we know of that is capable of such adaptation is us. While it may seem like hubris on our part to believe that we should model any potential artificially intelligent system on our own abilities, however, we need only identify those processes and abilities that would allow for more efficiency, while leaving less efficient or accurate ones on the cutting room floor.

It is also important to note, as Hurley, et.al do, that we do not necessarily need to create an actual system that functions with artificial intelligence in order to support the claim that artificially intelligent systems have the ability to use and understand humor. Instead, we need only identify those functions in our own thinking processes that allow for understanding of humor and show that those functions could possibly be replicated in a future system (since we do not yet have the technological power necessary to create such a system even if we were to get the design correct).

Fundamentally, it is the ability to make decisions quickly and to process information efficiently and accurately that must be present in any artificially intelligent system if it is to adequately cope with humor. This 'quick-wittedness' as Hurley, et.al call it (2011: 116), allows for a number of other traits that make decision making and information processing more efficient. It is entirely possible for fast thinking systems to make use of entirely different functions to those explained in this section. However, Hurley, et. al (2011) claim that these functions, when present (as they are human mind), allow for functional use of humor. Since these features allow for humor in our own species with relatively few problems, it is safe to assume that mirroring them in any artificial system would result in a somewhat accurate mirroring of the sense of humor that is seemingly unique to us.

b) <u>The Construction of Mental Spaces</u>

One of the most troubling factors that proponents of Artificial Intelligence have to deal with when attempting to create an authentic AI system is what McCarthy and Hayes (1969; cited in Hurley, et. al., 2011: 121) call the '*Frame Problem*'. This problem introduces itself into the picture of AI when we attempt to establish the knowledge base and recall ability of a system. Whether we are talking about the human mind or some computer designed to function intelligently, the information available must be recalled at the right time to deal with the accompanying obstacle or problem that the individual (human or otherwise) intends to overcome. As humans, we have seemingly had this Frame Problem solved for us by the millions of years of natural selection that have shaped the way our brains work. For any other system that needs to be designed, however, there needs to be an understanding of what the problem actually is before it can be solved.

An explanation given by Dennett (1998) using an imagined case study illustrates the difficulty that will likely be faced by hopeful creators of artificially intelligent robots sometime in the future. The scenario starts off with a robot named R1, programmed to be self-sufficient. It learns information from its environment, and is programmed only to fend for itself by making use of any means it has at its disposal. The robots creators set up a scenario where R1 learns that its spare battery is stuck in a locked room with a timed bomb.

Understanding that in order to ensure its own survival, it would need to save the spare battery from being blown up by the bomb. After figuring out that the key it had at its disposal was able to unlock the door to the bomb room, R1 entered to find the spare battery sitting on a cart in the middle of the room. The obvious solution (at least to R1 at the time) was that pulling the cart out of the room would save it from the explosion. Once the cart was withdrawn from the room, the bomb exploded and destroyed the battery anyway. The bomb, it turns out, was also on the cart pulled out of the room. Even though R1 was aware that the bomb was also placed on the cart, it didn't recognize that the implication of that would be the danger of the explosion also exiting the room along with the battery.

As a relatively important flaw in their initial prototype, R1's builders knew that they needed to adjust for these implications in their next build, and they added programming to the next model – named R1D1 – that would allow it to understand and think about the implications of its decisions so that it would not make the same mistake again.

Once the programming on the robot is fixed and the new model is rolled out into the same scenario to see whether or not it is able to cope any better, the creators find that an entirely different problem has arisen. Now having been programmed to think both the intended and unintended implications of its actions, R1D1 is unable to retrieve the cart holding the spare battery before the bomb goes off, even though it has access to the room and is able to differentiate between the battery and the bomb. The 'implications', as the programmers defined in their coding of the robots processing included a number of unwanted and seemingly irrelevant implications too – but they failed to make that clear to R1D1 in the first place. As a result, the robot began by making clear its necessary actions – withdrawing the cart holding the battery from the room. It is at this exact moment that the real implications of the frame problem become clear. When told to think about the implications of its actions, R1D1 does this literally. Removing the cart from the room will cause the wheels on the cart to rotate. Moving the cart at all will change the state of the floor beneath it. Removing the cart will not cause the color of the walls inside the room to change, and moving the cart may or may not have an effect on the state of global warming. Even though none of these implications are at all relevant in the task that the robot was given, it was told implicitly through its coding that it must consider them.

In order to overcome this issue, and to ensure that future models were not rendered paralyzed by overthinking at the first decision that needs to be made, more coding was necessary that would instruct the next model, R2D1 (an ode to the actually intelligent droid in the Star Wars franchise - R2D2), to only consider those implications that are relevant to the situation at hand, while ignoring all implications that are irrelevant or that have only minor impact.

For the next phase of testing, the newest model was given the exact same task – remove the spare battery from the room housing a bomb before the bomb goes off, but do so while considering only those implications of your actions that are relevant to the situation at hand, while ignoring those that are inconsequential.

The result of the test was, as with all those that came before it, a failure. In its consideration of the implications of its actions, R2D1 found itself stuck in a seemingly infinite loop of finding out what the implications are of its action (pulling the cart from the room) and then setting aside those implications as inconsequential. Even when it found relevant implications, it could not be sure if it had exhausted every relevant consequence until it had catalogued the entire range of irrelevant ones. (Thought experiment appearing in Dennett, 1998: 182-183)

Even though we know that (for the most part) we don't encounter these issues as humans, we don't necessarily know exactly how it is that our processing systems are able to overcome their issues. What Hurley, et. al suggest is that we do so by making use of the 'creation of *mental spaces* by way of *spreading activation*' (2011: 121). When we as humans think and make decisions, we are able to not only think of those implications of our actions that are relevant to the situation at hand, but also ignore those that are frivolous without having to go through them in the painstaking way that the R2D1 robot would have to. The key issue we are faced with is how to find the right balance between nimble searches into our available set of information and a thorough exploration of all options that would lead to the most successful outcome.

The proposal of the existence of 'mental spaces' (Fauconnier, 1985; Fauconnier and Turner, 2002: cited in Hurley, et. al, 2011) explains that this balance has been achieved through natural selection. According to Hurley, et al., a mental space is "a region of working memory where activated concepts and percepts are semantically connected into a holistic situational comprehension model" (2011: 122). Unlike other mental structures, mental spaces are not ready-to-use tools that are activated whenever our active memory goes into effect. Instead, these are spaces (functional, theoretical 'places' in the brain – as opposed to actual segments or regions of the brain) that are built on the fly and are constantly changing to adapt to new information.

This allows us to maintain ideas and relationships between concepts that are separate from the others while allowing for combinations between them. We are able to 'maintain separate referents in multiple spaces' (2011: 122). This explains how and why we are able to hold conversations about one thing (going to a restaurant for lunch, for example) without breaking down into having to explain every type of restaurant, décor, management styles, whether or not other people will be there at the same time, or whether or not we would have to pay for the meal. All of these concepts are built into our mental spaces as we start conversations about restaurants so that we do not have to bring them into working memory individually.

So while, in a perfect world, we would be what Hurley el al. refer to as 'unsurprisable agents' (2011: 121), having all of our anticipations about the world be accurately represented in our minds, we have to make due with what we are given. We can predict, relatively accurately, most situations that we are likely to encounter due to the associations made within the mental spaces we create on the fly. When a situation is novel or the information we have at our disposal is inaccurate or incomplete, new spaces are created to house the new information in working memory, and we are able to find associated concepts in our store of knowledge relatively quickly without having to sift through every possible piece of data at our disposal. We have become efficient anticipation generators due to the ability to predict the kinds of information that are likely to appear together while being quick enough to adjust expectations on the fly without expending too much energy.

In order to better understand how these mental spaces operate, Hurley et al. make use of what they call '*just-in-time spreading activation*' (from here on referred to as JITSA). JITSA is a process whereby the above mentioned task of activating and recalling information in various mental spaces is performed as efficiently as possible in order to conserve energy and allow for optimal response time. Hurley et al. state clearly that while the term can be used to refer to a number of individual models used in the cognitive sciences, their use of the term does not prefer any one over the others. They merely intend to show that the JITSA processing method is used in human cognition, and is thus optimal (and perhaps necessary) for humor to occur.

JITSA is explained as:

> "*an economic model of processing…in which computation is not performed until the moment it needs to be, on demand, as it were. This is…not just biologically likely (wherever there is choice, organisms are energy-conservative) but also realistic with respect to how thought works phenomenologically."* (Hurley, et al., 2011: 128)

This is why we are able to recall information at will, even if that information does not fit into the current mental space being used. If our minds had evolved to process information all the time and have it 'running' in the background in order to recall it, we would find ourselves facing a major delay before any bit of information can be relayed. Even though the information available to us is constantly being used, weaving in and out of the mental spaces conjured up in our minds whenever we need, it is not as energy-inefficient as the alternative. The information recall process involved in the JITSA model is available at all times, but only activated when the appropriate mental spaces and concepts are in use. We do not, for example, think of dolphins while discussing martial arts. Not because the information is not available, or must be 'processed', but because the mental spaces relevant to maintain a discussion regarding martial arts do not contain any of the concepts that would lead us to think about dolphins.

The power of the JITSA model allows us to come up with new information almost instantly, since associations between concepts are already established. When new information is needed, it is called up into working memory as though it had been there all along, giving us the illusion of it having been processed beforehand. In fact, the information is simply processed parallel to information relevant to other spaces. This way, the time (and energy) needed to recall the information is reduced dramatically when compared to any linear processing model.

Hurley et al. state that even though there is no evidence that the creation of an AI system capable of JITSA processing is possible, small scale models have successfully been created, and there is reason to believe that future technology and a better understanding of the science behind the models will allow for the systems to be scaled up to a size sufficient to sustain human-like intellect.

The JITSA model contains the foundational speed necessary for an AI entity to portray human-like intelligence, and so it will be needed in order to establish the remaining features necessary to establish an efficient humor-enabled system.

c) Active Beliefs

Another cognitive tool that is necessary to enable the humor mechanism in an intelligent agent is that of belief. A belief, according to Hurley et al., is ‘a commitment to a fact about the world’ (2011: 131). There is a distinction made by the authors between what they call ‘active beliefs’ and beliefs stored in long term memory – which I will refer to as ‘latent beliefs’.

The distinction can be drawn along the following features: active beliefs are those beliefs about the world that at any one moment have a direct effect on our behavior and/or thinking. They are the contents of mental spaces – the beliefs that have been ‘activated’ so to speak, and brought into the forefront of our minds. Latent beliefs, then, are those beliefs and mental contents stored in long term memory, that at any particular moment have the potential for activation, being drawn into the mental spaces currently at work in an instant. These beliefs act as a potential resource of extra information about the world that we do not have access to from the immediate environment.

However, the misconception – as stated by Hurley, et al. (2011:132) that often confuse our thoughts on the working of belief mechanisms is that long term memory acts as a "storehouse of sentence-like things that can be *retrieved* and *moved* to…working memory."

It is important to remember that the framework within which we are exploring these mechanisms is the JITSA spreading activation model. Long term memory, instead of being a warehouse for storage of beliefs is rather one node from which beliefs are activated, and through which they function when brought into the mental spaces. Working memory then, is simply the node or group of nodes that is 'currently working' (2011: 133).

Those beliefs that we think to be housed in long term memory while others are active, are in fact not as dormant as we would lead ourselves to believe. All of our beliefs are, in fact, active at all times, though to various degrees. After all, every belief we hold, no matter how trivial or common, is a belief *about the world that we are committed to*. Whether we believe that there will be a Superbowl this year, or that a cup of coffee will spill due to the force of gravity if we tip it over, we are still committed to that belief and have certain expectations about them being fulfilled in certain situations.

If we weren't committed to all of these beliefs all the time (however long ago we happened to have actively thought about them), we wouldn't have any reaction if they were violated. But even though we don't constantly think about the fact that plants on the sidewalk don't sing to us when we walk by, we would be taken aback if it were ever to happen. What happens when the beliefs in our long term memory are activated, entering into our mental spaces, is that spreading activation will allow the beliefs to activate related concepts until the belief is adequately fulfilled, cutting off the need for endless searching for more information to include. When we activate a belief about how cars are manufactured, the concepts that are brought into the mental spaces do not involve having wild animals working the machines. Even though we do not actively exclude wild animals from those beings that could possibly run the production line, they do not typically share any of the conceptual markers as production warehouses or factory workers.

In order for any AI model to function according to the same JITSA model that has given us an effective grasp on humor, we must be able to teach it how to keep the relations between concepts used in the spreading activation system to only those relevant to the situation being presented. Hurley et al. understand this function to be teachable:

> *"We can think of it as a thrifty triage system, helping not-quite blindly to allocate resources by 'selfishly looking for excuses' to terminate its own activation any time its local hunch is that the current task is unlikely to engage its talents productively and so it should conserve its resources for a better occasion…"* (2011: 134).

If it is in fact teachable, there may be hope yet that intelligence in any system with the same or similar cognitive capabilities to our own might be able to make use of humor.

d) Epistemic Caution and Commitment

While the above mentioned mechanisms are fundamental for humor to develop, it is the way we (or any intelligent agent) react to the information that is available to us. Without any reaction to the information, we are really nothing more than computers, processing the information without any value. What has the biggest effect on the way we react to information that is called up into our working memory is the extent to which we are committed to believing that that information is accurate.

Whenever we are presented with information that we have no real commitment to, a violation of that information (i.e. when we learn that that information is incorrect or inaccurate) would cause no real reaction in us. We would simply have nothing invested in having that information be correct. Information that we have beliefs *about*, however, is the information that leads to reactions related to humor. Any information that we have expectations about (e.g. stepping on the brake pedal in your car will cause your car to slow down) is information that, when active in our mental spaces, has the potential to be the subject of humor. Hurley, et al. make the distinction here between what they call '*uncommitted belief*' and '*committed active belief*' (2011: 136).

Since it is the committed active beliefs that we have strong reactions to (as we hardly ever have any notable reactions to beliefs we are uncommitted to), the process of reaction and subsequent searching for a solution to the problematic information is a useful evolutionary trait that allows us to avoid developing too many incorrect committed beliefs (2011: 137-138). Those things that we commit to our long term memory are not simply saved as carbon copies, but rather are saved as approximations that, when recalled, are recalled along with any extra information or related concepts are we can relate to them. If we find something 'mot quite right' about one of our committed beliefs about the world, the next time we recall the information relevant to them, we will do so with less commitment or adjusted expectations.

Hurley, et al. suggest that this is the original evolutionary purpose of humor. Allowing us to catch erroneous information before committing it too firmly to our long term memory is what humor does to allow survival, while promoting the survival of itself as a genetic trait by its highly pleasurable reward system (2011: 138).

e) Conflict Resolution

In order for any belief to be worthy of our reaction to it, it must first be active in our working memory. If we believe that the house down the street is empty (however committed we are to that fact), but that belief has been committed to long term memory, we will have no reason or means to react to the fact that the house is in fact empty until the information is activated and brought into our working memory. Many of the things we believe as a society are unchallenged simply because we have no cause to activate them into working memory to have them challenged by a new, contradicting belief.

When there is a conflict between two elements of our beliefs, however, there are three possible outcomes: unresolved conflicts, cooperative resolution, and uncooperative resolution. In the first, we retain both beliefs, each with an asterisk that is recalled with it each time in the future, telling us that "something is not right here". Cooperative resolution allows us to retain both beliefs by resolving the seeming contradiction between them. Uncooperative resolution happens when one belief clearly refutes the other, thus destroying it and allowing us to continue with a clear view of what information is correct.

However, not all active beliefs carry the same weight when it comes to commitment. We are more likely to be committed to information obtained by our senses than we are to information that we are recalling information from our childhood, or a secondhand anecdotal story. However, when a situation occurs where we are committed to beliefs from any of these sources equally, the conflict is much more difficult to resolve.

It is only when two beliefs, or two sets of information that carry equal or near equal commitment weight are contested that we can have any humorous response – expressed in the form of an epiphany or realization that our previously held conviction about a certain aspect of the world was mistaken, despite it being so firmly held. Any potentially intelligent agent with the ability to resolve epistemic conflicts between firmly held active beliefs should be capable of humorous response, since humor is a result of the commitment we make to processing information in a certain way.

I have shown in this chapter that the functional model of humor that is put forward by Hurley, Dennett and Adams makes a good argument for the idea that humor is not a fundamentally biological phenomenon. Since it relies, above all else, on the five features of an intelligent system detailed in this chapter, it is reasonable to assume that the biological origin of our cognitive development is only one aspect of what makes humor a unique phenomenon.

CONCLUSION

Sociological approaches to humor have generally failed to come to a consensus on what the social function of humor might be. Some view it as a tool for social control, others as a way to promote social cohesion, or as a form of symbolic interaction that allows us to make sense of novel and difficult information. However, they all have one feature in common, which is the reliance on the biologically evolved ability to process information through efficient cognitive power.

In order to establish how this processing ability evolved, I looked to an influential theory in sociobiology, which claims that biological evolution dictates how all aspects of our culture (including humor) evolve. Through variations in the upper and lower limits of what and how we potentially experience the world, the 'Epigenetic Rules' tighten and relax their control on our physical and cognitive experience over time. The primary and secondary epigenetic rules that claim control over different aspects of our experience have a limited effect on the way culture evolves, however. It is limited to being responsible for the evolution of the cognitive processes that allow humor to occur, but has little to no effect over what the content of those processes might present.

Hurley, Dennett and Adams propose an approach to humor that acknowledges the role played by cognition in its development. The five features that must be present in any system for it to be considered intelligent (i.e. fast thinking, the construction of mental spaces, active beliefs, epistemic caution and commitment, and conflict resolution) are also instrumental in the occurrence of humor.

Regardless of what one takes the social function of humor to be, it relies on a number of biological mechanisms that evolved by way of natural selection. Lumsden and Wilson's gene-culture coevolution theory is flawed in a number of ways. However, what I take to be its biggest flaw is the extent to which it assumes the leash between the two is effective. While humor in our species has clearly evolved as a result of the genetic variation that created our sizeable brains, I argue that it is only the capacity for humor that has evolved in this way, not the content of the humor itself. The functions of the human brain that allow for humor to manifest are the same functions that, developed in an artificial system, give rise to efficient computers and (as yet) limited artificial intelligence. If any system that develops the function to process information as efficiently as our brains is able to understand and use humor, then we could argue that humor is a function of such a system, and not a strictly social phenomenon.

If, as Lumsden and Wilson's gene-culture coevolution theory claims, culture is held on a leash by our genes, there would be a greater correlation between the types of humor and the genetic variation we have experienced. However, the content of jokes (and humorous interactions in general) is limited only by the ways in which we make connections between them in language and the understanding of meaning we develop though our cognitive capacity. Because of this, I find it reasonable to claim that humor is not a unique function of a biologically directed process of evolution, but a function of any system, biological or otherwise, capable of intelligent cognition. As a result, I believe that any theory of humor that fails to account for the important role played by these cognitive processes will fail to show the entire picture. Accounts of humor that hold the biological aspect of its development as the most important factor and that do not acknowledge the limited scope of biological variation in relation to the possibly infinite variation in humorous (and more generally, cultural) interactions limit their explanatory power to include only humor that arises in biologically evolved systems.

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