

Chapter 14: STYLE AND ETHNICITY: THE EVOLUTION OF SYMBOLIC TRAITS

“... what are the advantages which we propose by that great purpose of human life that we call bettering our condition? To be observed, to be attended to, to be taken notice of with complacency and approbation, are all the advantages we can propose to derive from it.”

Adam Smith, 1790

[The hobby of ocean] “sailing is like standing day after day in a cold shower tearing up five-dollar bills.”

Anonymous blue water sailor

In a Luann comic strip Luann is doing her nails. Brad asks “What’s that, another new nail polish?” Luann answers “Yup, after it dries, it still looks wet.” Brad asks “Why do you want it to look wet when it’s dry?” Luann replies testily “I don’t know Brad. I’m just a slave to fashions, I don’t *create* them!”

I. Introduction: Style a Puzzling Problem

Why should we devote any time, attention, or other resources to the seemingly frivolous traits exemplified by fashion? As Adam Smith and Luann tell us, human life is deeply influenced by our quest for attention from others and our use of “style” to attract that attention. We adorn our bodies with gaudy clothes, cosmetics, jewelry, tattoos, and scars. We make and collect art, and decorate even mundane utilitarian objects with logos and bright paint. We speak thousands of languages when any one of them would seem to do perfectly well. Even when designers like Bauhaus architects forswear style for pure function, no-style itself becomes a stylistic statement. Brad may disparage Luann's nail polish, but wearing old Levis can't escape being a kind of fashion either. Style and our preoccupation with it are an important puzzle from an evolutionary perspective. Sure, boys seem to be attracted by prettily made up girls, but shouldn't evolution have favored males who are attracted by no-nonsense earthmotherly types? What are we to make of the aesthetic analogy between human style and the colorfully variable traits of some animals (e.g. pheasant feathers and tropical fish tails)?

In this chapter we will introduce and apply the evolutionary theory that applies to symbolic cultural variation. The theory is borrowed from the biologists' theory of sexual selection, so the argument here is that the resemblance between the colorful dress of real cardinals and the red feathers of the bird of the same name is more than superficial. Using

the theory, we'll try to answer some of the controversial questions that social scientists have posed about human preoccupation with style and symbolic behavior.

II. Basic Background

A. Style Ubiquitously Important in Modern Humans

It is easy to give anthropological examples of stylistic "excesses." On the Pacific Island of Ponapae, a man's prestige is partially determined by his contribution of very large yams to feasts held by district chiefs. Contributions of ordinary foods like breadfruit, coconut, or standard yams count for little. Rather families compete to grow very large "prize" yams using special varieties and laborious cultivation techniques. These can be really huge, up to 9 feet in length, 3 feet in diameter, and requiring a dozen men to carry. Families expend great effort in producing such yams, according to their ethnographer Bascom (1948). Yet the yield of food per unit effort is much lower than for ordinary yams. Despite the apparently wasteful effort involved, the competition is taken very seriously by Ponapaens. Success in growing prize yams is taken as an index of a man's ability, industry and generosity, and bringing one to a feast is taken as a token of his love and respect for the chief. Chiefs raise the rank of men who contribute large yams consistently.

American life is as full of arbitrary stylistic behavior taken seriously as Ponapaens or any other. Our own behavior seems to us so natural and sensible that we forget its giant yam-like attributes, although those of Ponapaens and other exotic people do seem bizarre and useless. This is simple ethnocentrism. Think of the generational styles in matters such as music, clothing, and recreational drugs. It is interesting that major conflicts between parents and teenagers can erupt over such seemingly trivial matters of style. Most of you have probably experimented with pleasing your parents by imitating their style or displeasing them by flaunting one they don't subscribe to. Think of the way that advertisers try to manipulate our commitments to style to sell their products. Vendors of functionally equivalent or near equivalent products like cars and beer are especially clever in this regard. The author Tom Wolfe is perhaps America's most acute and entertaining commentator on style. He is good on our giant yams.

B. Style's Recent Origin

Human preoccupation with style is an evolutionarily recent phenomenon. It is associated with the so-called Upper Paleolithic Transition (UPT), which occurred in Europe about 35,000 years Before Present (BP) (Stringer and Gamble, 1993; Klein, 1989: Ch. 7; Marshak, 1976). The European UPT is well excavated and understood descriptively, and is marked by the simultaneous appearance of (a) Anatomically Modern Humans (replacing

Neanderthals), (b) artistic artifacts like statuettes and beads, (c) stylistic (apparently non-functional) variation in otherwise utilitarian artifacts like projectile points, (d) local variation in styles on a quite small scale, and (e) debatably, fully functional speech (Lieberman, 1984). (The more fragmentary evidence so far recovered elsewhere suggests more complex patterns.) Thus, for most of human history, we got along without style. It is notable that the Upper Paleolithic Transition is associated in Europe with a big jump in population densities.

C. Controversy Over Possible Functions

Function:

Evolutionary biologists define function in terms of what natural selection favors. Adaptations *function* to promote the survival and reproduction of individuals in conventional evolutionary arguments. Social scientists have traditionally defined function similarly with regard to cultural traits, although they have usually been group functionalists. Non-functional behavior will be produced by processes such as random error or drift if they are strong enough overwhelm natural selection and similar function-generating processes.

Debates over the function of style or the lack thereof have a long history. The post UPT population increase suggests that style may have functions despite its seeming costly frivolity. Biologists and social scientists have conducted rather parallel discussions. Darwin started the ball rolling. He proposed that many colorful stylistic traits, both organic and cultural, are the result of mate choice sexual selection, usually female choice of males. He suggested a non-functional or even anti-functional mechanism by which female choice and similar processes could arbitrarily amplify peacock tails and human decoration to wasteful extremes in defiance of ordinary natural selection.

Be careful of definitions here. We can define “function” any way we want; some evolutionary biologists include sexual selection in their definition, some don’t. Thus, we can speak of peacock tails functioning to attract females, although we speak of them as dysfunctional from the point of view of survival. The important point, beyond mere matters of definitional taste, is that sexual and (ordinary) natural selection can conflict. Sexual selection became Darwin’s theoretical alternative to natural selection to explain traits that were

apparently dramatically afunctional from the point of view of ordinary natural selection.

Culturally, people are able to chose whom to imitate, a process that is quite analogous to choosing whom to mate with, and if Darwin's anti-functional mechanism will work for culture, something like it might work for culture. We argue in this chapter that the anti-functional ideas of certain social scientists make sense in terms of a sexual-selection like mechanism, indirect bias.

Others have objected vehemently to such notions, and have proposed various ordinary functional hypotheses to account for style. For example, style can identify which species or cultural group you belong to for purposes of mating or other kinds of social interaction, something which may be highly functional. We will discuss a variety of these hypotheses below.

*There are also some very interesting hypotheses that blend the functional and afunctional hypotheses. The best known of these goes under the term the “handicap principle.” Perhaps carrying a conspicuous, costly, burden around is a *signal* to potential mates or imitators that your genes or culture are unusually good. Those gaudy tail feathers, costly clothes, or expensive, rarely four-wheeling, four-wheel-drive vehicles are saying loudly that you can not only survive and prosper, but survive and prosper in spite of wastefully spending resources on feathers, clothes, or cars.*

*There are two types of style (Wiessner, 1989): (1) People use stylistic variation *assertively* to express their individuality, as in the case of personal adornment or competitive displays of prestige items and (2) People use style *emblematically* to signal membership in a group, such as an ethnic group. Of course, the same system of style, such as car ownership, can have variation at the individual and group level. At one level businessmen and college professors use cars emblematically to signal what subculture they belong to (big American sedans versus “sensible” but classy foreign cars). At another level, the details of manufacturer, model, color, and so forth reflect individual taste. Quite different functions (or non-functions) might apply at the two levels.*

The evolutionary questions turn on the issue of honest versus dishonest signals, and on the total effort devoted to competitive advertizing versus “real” quality. The theory imagines that animals (and people) advertize. The ultimate sales pitch is for your genes or your culture. Are the population level consequences of advertizing the accumulation of dishonest signals “designed” to mislead imitators and mates? Does advertizing lead to a wasteful arms race, even when signals are basically honest? Or do strictly utilitarian uses of advertizing dominate?

D. Definition of Style as Symbolic Characters

Technically, stylistic traits are usually described as symbolic. A symbol is a type of a sign. A sign is something that stands for something else. According to semioticians, the theorists on the issue, signs come in three flavors: (1) *Icons*: signs that resemble the thing they stand for, for example a map or an anatomical drawing in your biology textbook. (2) *Indices*: signs that are factually related to what they indicate. For example the size of a person's house or the fullness of farmer's storage bin are indices of wealth and farming talent, because without them it is tough to display the index. (3) *Symbols*: signs that indicate what they indicate by conventional agreement. The purest example of symbols are found in language; it doesn't matter what words or grammatical structures are used to represent particular meanings, only that we all agree on which to use for what. Any sign may have some scope for stylistic alternatives that are functionally equivalent, but the scope for stylistic variation is greatest for symbols. An exceedingly rich symbolic repertoire is a human specialty. Primates like monkeys are known to have a few symbolic calls, on the order of one dozen. Humans have active vocabularies of a few thousand words.

III. Evolutionary Forces Acting on Stylistic/Symbolic Traits

A. Ordinary Adaptive Forces

Purely stylistic variation cannot be subject to ordinary natural selection in the usual way. Symbols by definition are equivalent until we decide to invest them with particular meanings. Take linguistic variation. English is not an adaptation to the British Isles, nor is Chinese an adaptation to the Yellow River Plain. If history had made the inhabitants of England Chinese speakers (more plausibly, they might have remained Celtic speakers, or become French speakers), life would go on just fine.

Adaptive forces like natural selection and direct bias can act on symbol systems in three specific ways. *First*, in the case of communication systems like language, the ability to communicate can be selected for its functions, even if the symbolic variation is adaptively neutral. It may be adaptive to communicate food sources, danger, and social information to your fellow humans, whatever language you use. *Second*, selective forces may act to counteract the excesses of the run away process, or to minimize the costs of signaling. Remember Darwin's idea here: The peculiar dynamics of sexual selection may conflict with the effects of natural selection, and in any given case one or the other may be the stronger. Natural selection will fight our tendency to wasteful competitive signalling. *Third*, frequency dependent selection can also act on symbolic variation itself, much like the operation of frequency dependent bias discussed in the next section.

B. Social Choice-Based Forces

Frequency dependent bias and similar effects, such as social ostracizing of people who display “odd” tastes, may be important in the evolution of style for the same reasons that frequency dependent natural selection affects symbol systems. At least when functioning as a straightforward communication system, conformity is important in that we must all use the same symbols for the same meaning. If communication by symbols is to be successful, we must “agree” to use the same symbols for the same meanings. Bias (or selection) will favor the common type and discriminate against rare variants. For example, a rare individual who cries “hell” instead of “help” when in trouble will be less likely to receive aid and is perhaps significantly more likely to die. Knowing this we tend to use the same sounds everyone else does for the same meanings. Note that none of these three processes tend to cause functional convergence and fit to the environment of stylistic variants. We say “cat,” Spanish speakers say “gato,” and both are equally effective for communication. In the case of assertive style, non-conformist forces may be important; for creative artists, it is important to be new, fresh, and unique.

Indirect bias is an important force on symbolic traits and has very interesting properties. Because symbolic characters are used in communication, they are a natural locus for evolutionary forces based on choice of whom to imitate or mate with. People often seem to act like they want to pass on their genes and culture to others. The epigraph from the arch-rationalist utilitarian Adam Smith reflects his acknowledgment that people's fundamental desires are to be imitated and mated. We can easily imagine that people choose mates and cultural teachers with an idea to acquiring good genes and good culture to pass on to genetic and cultural offspring. Ideally, we would be able to survey potential mates and “role models” (let's use “role model” as a shorthand for any type of cultural model we might have the chance to choose rather than be stuck with) and estimate as precisely as possible what their genetic and/or cultural quality is. However, this is not easy to do. On the other hand, in order to attract mates and imitators, individuals are perhaps willing to advertise.

The simple step of trying to choose mates and role models based on limited information that includes advertising leads quickly to complex but fascinating evolutionary dynamics. As a mate or model chooser, honest communication will greatly help our choice. Those who seek mates or “proteges” may be quite willing to give signs of their cultural or genetic quality. These signs may or may not be honest. That is, mate or protege seekers with less than ideal genes or culture may well benefit from false advertising.

It matters what other people think. Once a system of communicating mate or model quality becomes widespread, it matters not only what you or I as potential mate or role

model choosers desire for our own advantage, but also what others are likely to choose. For example, a female choosing a mate may think that a colorful tail (or the habit of smoking) is a stupid display, poorly correlated with genetic fitness (or cultural achievement). However, if she is convinced that most females in the population do think that colorful tails or smoking are associated with success, she may choose a colorful male or a smoker *in order that her sons, inheriting colorful tails or smoking from their fathers, have a better chance of being attractive to their potential mates*. This was Darwin's basic intuition about mate choice. Once an "aesthetic capacity" developed in (usually) females, successful appeals to female taste could counterbalance quite considerable ordinary fitness costs. (Cronin, 1992, gives a good analysis and history of the sexual selection issue, going back to Darwin and Wallace.)

Indirect bias has a lot of similarities to mate choice sexual selection and, general conclusions that apply to one are also likely to apply to the other. Recall, cultural transmission is indirectly biased when people use some traits displayed by potential role models, such as indicators of prestige, such as dialect, to bias the imitation of other traits, such as subsistence technique. In other words, some attributes of a model are used by naive imitators as a basis for choosing to imitate a more general class of traits for the same model. It is useful to distinguish three classes of characters when thinking about this mechanism of cultural evolution: (1) *Indicator traits* are displayed by models and used as a basis for weighting their importance by imitators. For example, suppose that imitators are inclined to admire and then to imitate successful individuals, and that success is estimated using particular indicator traits--number of cows, number of children, or style of dress. (2) *Indirectly biased traits* are acquired as a by-product of choices based on indicator traits. Once a particular model is given a large weight in enculturation, naive individuals might tend to acquire animal husbandry lore, beliefs about appropriate family size, or a set of study habits from this role model. (3) *Preference traits* are the criteria by which naive individuals evaluate indicator traits of potential models. In some cases, a simple more- is-better rule (e.g., the wealthier, or the better student, the better) might be used. Other times, intermediate values of an indicator trait may result in the strongest weight. For example, contemporary middle-class Americans seem to most admire people with intermediate-sized families, not the childless or those with very large families. Later on, we'll look at a case in which people prefer as models someone who is simply like themselves on a stylistic trait--birds of a feather flock together.

Language evolution shows indirect bias in action. Sociolinguists have shown that patterns of the spread of linguistic variants are under the influence of an indirect bias mech-

anism (Labov, 1980). One of Labov's most famous examples is the development of a distinctive phonology (way of pronunciation) on Martha's Vineyard, an island off the coast of Massachusetts. People on the island are mostly involved in the tourist business, but they consider catering to the whims of tourists to be rather low status. Most Islanders admire the independence of the few fishermen left working on Martha's Vineyard. They see them as exemplifying the individualism and independence of Old Yankees. Preferring independence, and treating fishermen's salty talk (including frequent disparaging remarks about tourists) as an indicator of an independent frame of mind, Islanders put fishermen at the top of the local prestige hierarchy. Have done so, they tend to imitate the pronunciation of fishermen, who have thus become the leaders of dialect evolution on Martha's Vineyard. Interestingly, those young individuals whose ambitions will lead them to leave the island are responding to the wider New England prestige system, and conform to mainland rather than Island phonological patterns. The pronunciation traits changing on Martha's Vineyard seem to be indirectly biased (rather than being important indicators) because data suggest that people are not very self-aware concerning these particular small-sale dialect differences.

There is considerable evidence that people use indirect bias in a number of situations similar to the linguistic example to choose whom to imitate:

(1) *Evidence from social learning theory.* Laboratory studies of human imitation have shown that naive individuals often use indicator attributes of role models to bias their attention to models and their acquisition of other behaviors (Rosenthal and Zimmerman, 1978:251-254). For example, Yussen and Levy (1975) exposed preschool children and third graders to warm and neutral adult models. Warm models increased student's attention, reduced their susceptibility to distraction, and enhanced their recall of modeled behaviors.

(2) *Evidence from the diffusion of innovations.* Rogers with Shoemaker (1971:ch 6) review how patterns of information flow during the adoption of innovations are affected by sociological attributes of adopters and models. They discovered that a class of individuals whom they label "opinion leaders" play a disproportionate role in the spread of innovations within a local community. These individuals are usually higher in status than average in the local community, and seem to be picked as role models based on local prestige indicators. If opinion leaders adopt an innovation, it spreads to the rest of the community; if not, few adopt the innovation (more on this topic in Chapter 20).

It is easy to imagine that indirect bias is a functional mechanism for acquiring cultural traits (Flinn and Alexander, 1982). By imitating successful role models, naive individuals can increase the chance that they will acquire the beliefs and values that lead to success. In the case of diffusion of innovations, for example, Rogers suggests that copying

opinion leaders is a sensible way for potential adopters to decide whether to adopt an innovation. Potential adopters of new techniques have a wide range of abilities and resources to devote to judging the utility of new techniques, and it makes sense for adopters with moderate resources to use opinion leaders with more resources as models of what to adopt. On the other hand, a choice of models of very different status is unlikely to be an effective strategy because the circumstances of life of such a model are likely to be too different to provide a good guide for optimal techniques. Thus, rural people use the best farmers in the village rather than rich city based amateur farmers as opinion leaders for farming techniques. Foreign “experts” are also often viewed skeptically by 3rd World aid recipients. In our experience such experts do sometimes show an unfortunate carelessness about local constraints and conditions.

C. The Runaway Process

Indirect bias can also result in maladaptive runaway evolution. As we noted earlier, one of the most interesting questions is what leads to the apparently maladaptive elaboration of stylistic displays. In this section, we briefly describe the structure of a very simple model that we think captures the bare bones of the problem. A detailed description of the model is given in the reading.

We begin by assuming that each individual can be characterized by the values of two cultural traits. The first trait is an *indicator trait* that affects the individual's attractiveness as a model, and the second is a *preference trait* which determines which variant of the indicator trait that the individual finds most attractive. To keep the model simple we do not include any indirectly biased traits other than the preference trait itself. We assume that different variants of the indicator trait are characterized by different genetic fitness. The model also lacks any explicit details about the genetic system. We merely assume that selection on the (cultural) indicator trait favors a variant that is optimal in terms of genetic fitness. The two traits themselves are modeled as quantitative characters. That is, it is assumed that they can be measured as real numbers rather than taking on discrete values. Such a characterization is quite apt for traits like wealth that do vary continuously, but might not be a very good representation of a trait like class that may have only a few discrete variants in some social systems.

We assume that the life cycle of cultural transmission begins with an episode of simple unbiased transmission from parents to children in which children acquire both traits. This is followed by an episode of indirectly biased transmission in which adolescents may modify one or both traits after choosing a number non-parental adults as role models. The extent to which a particular role model influences a particular adolescent is affected by the

preference trait that the adolescent acquired from his or her parents and the adult role model's indicator trait. That is, adolescents use the preferences learned from their parents to select a set of non-parental models based on these models' easily observable characteristics, their indicator traits. For example, children raised in religious households will be more prone to learn from people who are evidently pious than from those that are not. The adolescents then modify their original indicator and preference traits on the basis of the models chosen. This is not an either/or choice, rather the adolescent imitators weight the influence of the models in accord with their preferences and the models' indicator trait values.

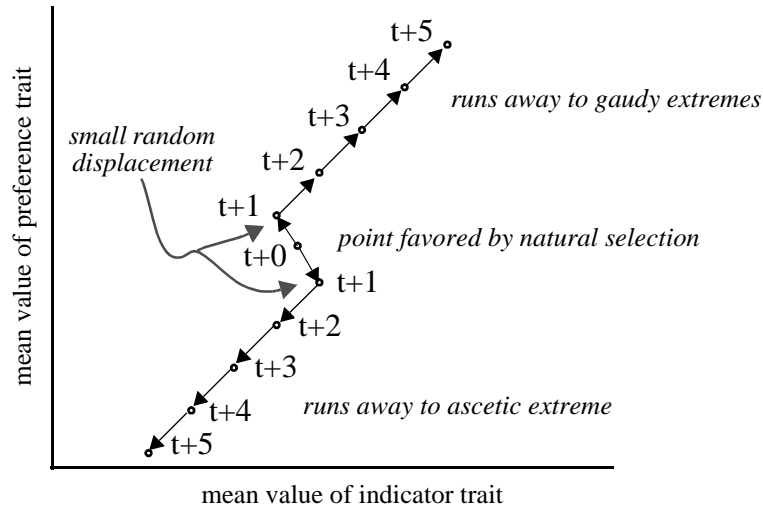
Finally, there is the episode of natural selection favoring the value of the indicator trait that maximizes genetic fitness. Then the next generation begins with an episode of parental transmission to the next generation, completing the life cycle.

Based on these assumptions, one can construct a mathematical model for the distribution of indicator and preference traits in the population (details, again, in the reading). The model suggests that cultural evolution under the influence of indirect bias has two distinct modes:

(1) *Stable fitness maximization, honest advertising.* If the strength of indirect bias acting on the preference trait is weak compared to the combined adaptive forces of selection and direct bias on the indicator trait, then the preference trait will eventually reach a stable equilibrium at the value that maximizes genetic fitness. In other words, both direct and indirect bias will evolve so that naive individuals tend to imitate models with the optimum value of the indicator trait. This occurs when selection is strong enough to ensure that the indicator trait remains a good index of fitness, and individuals are usually able to imitate the indicator trait they prefer.

(2) *A runaway case, costly exaggerated advertising.* If the strength of indirect bias acting on the preference character is strong compared to the combined adaptive forces of selection and direct bias acting on the indicator character, then according to the model, the values of both the indicator trait and the preference trait will run away, becoming indefinitely larger or smaller depending on the initial condition. Clearly, this cannot be literally true; nothing can really grow or shrink without bound. Some process not accounted for in the model will eventually restrain the evolution of the population. The correct qualitative lesson to be drawn is that when the evolution of preference trait is affected by indirect bias, the resulting process may be inherently unstable. Where it exists, such instability is likely to result in preference and indicator traits that are some distance from their genetic fitness optimizing values. Figure 14-1 illustrates the behavior of the model graphically. Thus, when the situation of the runaway obtains, a slave-of-fashion effect can indeed arise. An

Figure 14-1. Cultural evolution can “runaway” due to indirect bias forces. If the strength of bias for the *preference* trait is stronger than the combined strength of selection and bias for the *indicator* trait, the value of the indicator trait in future generations (t+1, etc.) can runaway to increasingly maladaptive values. Here the two extremes might be everyone wears only skimpy, sexy clothing (Madonna’s underwear regardless of the weather) and the other everyone wears completely concealing unisex clothing (regardless of weather).



arbitrary signal of what sort of person is best to imitate will arise, and each of us will be motivated to go along merely because everyone else thinks it is the right indicator. Like peacock feathers, the result is beauty without function.

To see how the runaway process works in a simplified case, let's use another example of language evolution from Labov (1972). In New York City, middle class speakers have historically not pronounced the *r* in many words like *fourth* and *floor*. However, middle class speakers are very sensitive to the status gradations of language, and prefer to speak what they regard as the higher class dialect. It is a fact that higher class speakers in New York tend to use more *r* than middle and lower class New Yorkers. *r* use is a variable that people are more aware of than the dialect variants on Martha's Vineyard we discussed above. By having a preference for upper class dialect, and using *r* use as one of the indicators to select language models, middle class New Yorkers are tending to use more and more *r*. This should all have come to a halt when middle class and upper class speech contained the same amount of *r*. It hasn't because of a curious mechanism Labov calls “hypercorrection.”

Although Middle class speakers have enough awareness of *r* to use it as an indicator, they do not actually have very good control over how much *r* to use. It is interesting how

imperfectly we are aware of our speech, even in the case of a fairly conspicuous and publicly stigmatized bit of behavior like dropping *r*. The most “advanced” middle class speakers tend to use even *more r* than upper class people, the phenomenon of hypercorrection. Presumably, most middle class people don't actually have upper class language models, merely slightly higher status middle class people. No matter how much *r* middle class people use, they “hear” the higher status people, whose dialect they prefer, using more. Everyone up and down the status hierarchy uses more *r* in the next generation, and so more *r* is genuinely spoken. The class-based correlation between preference for *r* and amount used remains. The next generation repeats the whole indirect bias/hypercorrection process, and *r* use increases again.

In these kinds of situations, even the upper class tends to follow along, pushed by the middle class, so the system doesn't simply overshoot a little bit and then stop or come back down to upper class norms. (Middle class perceptions acting as preferences are more important here than what the upper class actually does; there are too few of them to matter much.) There is every indication that this system will run off to complete use of *r*. Perhaps New Yorkers will start to roll their *r* like Spanish speakers! Interestingly, in England, the middle class perceives *r*-less speech to be higher status, and English speech is running in the opposite direction to that in New York.

The linguistic example is simpler than most presumed cases of the run away process because there are no strong adaptive forces acting to restrain the purely symbolic dialect indicator, and because the psychology of hypercorrection “artificially” maintains both a correlation between preference and indicator and creates a mean preference that remains higher than indicator until the dialect change goes to completion.

Even in language, where the range of selectively neutral variation is so enormous, the run away process presses the envelope. Some languages favor rather difficult tongue maneuvers to speak some words. For example the Amerindian language family Salishan is characterized by very complex strings of consonants in words. It is conceivable that Salishian languages are complexified to the point of real difficulty by exaggeration for stylistic effect. English has two painfully exaggerated features. One is its huge vocabulary. It is said that the retention of many French derived synonyms for Old English words was originally a result of lawyers retaining more synonyms to generate ever more complex legalese. The second is spelling. English is one of the few languages without regularized spelling rules. We seem to resist regular spelling because mastering spelling is considered a mark of intelligence. Objectively, a spelling bee would seem to be a form of child abuse, yet the national winners of such irrational contests are juvenile celebrities!

Pure run away models are controversial. The controversy among theorists (see Pomiankowski, 1988) is over whether when more realism is added, cases like the Ponapaens prestige system based on giant yams can respond the way r when the added realism of selection against the wasteful growing of costly items for display is introduced, and when there is no hypercorrection effect to produce a displacement and maintain a correlation. When an element of natural selection or direct bias is added, the correlation between the preference and the indicator tends to collapse in some models.

The handicap hypothesis proposes that the exaggeration effect is ruled by real adaptive advantages. Zahavi (1977) has argued that males can signal their overall fitness by managing a serious handicap successfully. The gaudy tail feathers of a male peacock are essentially saying to females “look, my genes must be good, or I wouldn't be able to obtain food and avoid predators carrying around all these lovely (OK, useless too) feathers. If you mate with me rather than drab old Joe over there, your offspring will benefit from my excellent genes.” The complex social life of humans is likely to involve signaling all sorts of things, and it is easy to imagine that Zahavi's hypothesis extends to cultural traits.

If the ongoing theoretical debate settles in favor of the run away process, then we would interpret Ponapaen giant yams (and American giant cars) as a situation that started out as an adaptive case of indirect bias that got away. Those who grew larger-than-average yams (or drove slightly better cars) were perhaps once better farmers (businessmen). However, once the size of yams had been elevated to the status of an important indicator trait, the run away process might take over. Soon people began to grow special giant yams just to attract the attention of people who were trying to use yam size as a way to learn to be better farmers. Then the role model choosers stopped caring if large yams were really an index of farming skill or not, because once “everyone knows” that yam size is an index of people's general skill and wisdom, and that prize yams earn the respect of authorities, the actual correlation of the skill of growing yams with any non-socially defined skill or quality is beside the point. The slave- of-fashion mechanism is off and running!

If the handicap hypothesis wins, we will have to give an honest signal interpretation to the same cases of exaggeration. At the beginning of the evolutionary process, it may be easy to fake a handicap, say by having some colorful feathers but hiding them except when displaying to females. In such a case, there is no serious handicap due to the anti-camouflage of bright feathers. The handicap has to be exaggerated enough so that it is an unfakable honest signal. A male pheasant or peacock must really expose himself to being seen by predators and get away in spite of it. Any Ponapaen could fake being a good farmer by devoting some extra attention to a little patch of regular yams. Like any reasonably success-

ful businessman can buy a nice model Toyota, Chevy or Ford. But when it is a flat out competition to consistently grow really huge ones, you call forth maximum the horticultural effort and wizardry you possess, and the size of your yam is likely to reflect real your skill. However, such extreme devotion of time and talents to this one task may mean that the actual food production of the best farmer is only a little better than that of low-skill individuals who stick to real business. Like businesses along a suburban strip, everyone would be better off if they could agree to display only a small, cheap, but honest advertisement. But cheap, honest, signs are easily subverted by aggressive, unscrupulous advertisers, and a sort of arms race follows. The competition-driven exaggeration to prevent fakers from taking advantage only stops when each bird, farmer or business dissipates vast resources displaying a sign whose size and expense are pretty well correlated with the size, skill and health of the business/bird/farmer, because everybody who could afford a more elaborate signal would be driven to do so.

The difference between the pure run away and the handicap hypothesis is that in the case of the handicap, the exaggerated display is maintained because elaborate displayers still have the best genes/culture from the ordinary fitness point of view. Unlike the pure run away hypothesis, it is not *just* a matter of everybody else's attention to style that motivates you to pay attention to Lexus drivers in preference to drivers of ordinary Toyotas. Style will be correlated with better ordinary adaptive traits; Lexus drivers will really tend to be better business people. We imitate them because we think they have better business skills, as well as because we know no one will ever imitate us unless we can display an unfakable signal of being good at business. A Lexus is hard to fake as a signal because it is costly. Only good business people can afford them.

It is not clear that the handicap hypothesis is much less pathological than the pure run away hypothesis. In the extreme case, practically all of an individual's advantages due to having superior genes or culture may be cannibalized to support the costly signal. If I try to reserve any of my cultural superiority to actually try to live longer or teach better, a rival with slightly less advantage, but slightly more willingness to display a more severe handicap, will attract more imitators. Every ounce of a superior Ponapean farmer's extra skill may be poured into his giant, useless yams.

On the other hand, the famous evolutionary biologist W. D. Hamilton and his student Marlene Zuk (Hamilton and Zuk, 1982) have proposed that unfakable signals are usually not much more expensive than is required by observers to make an accurate assessment. They think that the brightness and sheen of feathers and the red, blood suffused comb of a rooster are a bird's medical report to potential mates. If a chicken carries a large load of

blood parasites, like malaria, it will be anemic and its comb more dull than a health bird that is resistant to malaria. If it is infested with lice, its feathers will be chewed up and dull. On this hypothesis, honest signaling is possible with a minimum of costly, competitive, exaggeration required to generate unfakability. A Hamilton-Zuk signal is unfakable because it gives pretty direct visibility to the underlying biology. Attempts to evaluate the two hypotheses by biologists have been controversial so far. As far as cultural signals are concerned, the work has hardly started. A Lexus seems pretty expensive relative to its transportation function to us, but perhaps you can think of a way to support Hamilton/Zuk for such cultural traits.

The exaggeration effect in the run away and handicap situations is most extreme in the case where individuals contribute no real resources to their offspring (or imitators). Thus, male characters are most exaggerated in polygynous species like the chicken-like birds, where males play no role in rearing the young and spend all their effort trying to attract as many matings as possible. In many songbirds, where males and females both sit on nests and feed young, males and females differ little in coloration, etc. Likewise, in cultural prestige systems, the most extreme display behavior seems to occur in roles that are active in horizontal and oblique transmission. Media stars, who have a lot of money and the ability to reach the masses, often spend massively on display. Rich businesspeople who plan on leaving the family fortune to the kids seldom bother with really extreme showiness. If Dad is really willing to contribute directly to his family, it is important to Mom and the kids that he doesn't spend it all on fast cars and fancy whiskey.

In human cultures, roles effective in horizontal and oblique cultural transmission with little contribution of resources to imitators are very common. Casual friendships are a common example. There is ample scope for both men and women to behave like the polygynous males of classical female choice sexual selection. Our devotion to symbol systems that have apparently been exaggerated is not so hard to understand!

You are busy acquiring an expensive signal of your cultural worth to display to potential employers, your college diploma. There are two schools of opinion about what diplomas are all about, and they convey two extremes of the quality signaling idea well. The most common, championed by most professors, university administrators, etc., is that your diploma is an accurate index of what you know and how well you know it. Your diploma, transcripts, etc. are relative cheap and unfakable signs of your real skills. Many of these real skills you acquired in classes like this, and such skills justify the high cost of a University degree. Employers, mates, and friends value the diploma itself for its signalling your possession of the skills, but the sheepskin itself is a nearly costless way of advertising your tal-

ents. This is like Hamilton's and Zuk's hypothesis.

A cogent minority hypothesis is championed by cynical (or realist) economists. They argue your diploma is little more than a signal that you have the mental stamina and tolerance of boredom to do the typical white collar job well. You haven't changed since high school really (the specific skills we teach you are irrelevant), but you will have, if you graduate, hard- to-fake proof of those valuable stamina and boredom tolerance qualities you have already had as a high school graduate. Your high school classmates that didn't go on to college may also have these talents, but they can't prove it to an employer, as you will be able to when you graduate. On this hypothesis, the escalation of educational requirements for jobs in the 20th Century doesn't mainly have to do with greater skills but is rather due to ever more costly competitive displays of handicaps. As wealth has gone up, every family can afford to keep kids in high school, and a high school diploma becomes an easily faked signal. Extra time and other resources now have to be wasted to acquire the harder-to-fake college diploma if you aspire to a middling or higher place in the job market. You would be better off, and prospective employers would be indifferent, if there was a cheaper, unfakable signal, than college, but there isn't. An expensive signal is required, and we have an ideology about education that legitimizes a college education as the handicap of choice. Employers in another society might find evidence that you routinely turned up for several hours of silent meditation every day for several years just as useful!

IV. Application of Evolutionary Theory to Social Science Debates

The issue of whether symbolic traits are functional in some way or another, or whether they represent a major challenge to functional interpretations has been one of the major debates in the social sciences. Anthropologist Marshall Sahlins (1976) decried the endless, sterile "cyclical and repetitive" debate caused by feuds between functionalist and anti-functionalists. One of our major claims for ecological and evolutionary theory is that it gives us a better tool than social scientists have had in the past to understand the issues involved in such debates, and to get science moving forward again.

In this section we compare four classic social science hypotheses about stylistic/symbolic variation. The first looks for hidden, but quite ordinary, adaptive messages behind apparently maladaptive signals. The second invokes highly functional explanations for this variation, analogous to Hamilton/Zuk in the biological case. The third, a favorite of many cultural anthropologists, depends upon hypotheses like run away, or at least the high-cost version of the handicap hypothesis. The fourth has little parallel in biology; imagining that the group-level variation generated by symbolic evolution produces group selection for co-

operation, much like conformity.

A. Cryptic Functionalism

Marvin Harris (1974), from an ultra-functional school of anthropologists, looks for ordinary functional explanations of symbolic traits. For example, he explains religious dietary prohibitions against pork in the Middle East as resulting from pigs competing too much with humans for food in a rather dry environment. He explains the Hindu prohibition against cow slaughter as stemming from a need to protect cows from over slaughter in a system where their traction, milk and dung are valuable commodities.

Harris is a bit loose as to how all these hidden functional traits (adaptations) come about. He is also rather unsystematic and suspiciously imaginative in the way he discovers these hidden functions. For example, he invokes group and individual level adaptations seemingly as suits his fancy.

It is quite plausible that many indicator traits are highly correlated with genetic fitness or other conventional standards of functionality. We can help him out. Recall the fitness maximizing case of the indirect bias process. Often indicator characters may themselves be adaptive, as well as being signs correlated with an adaptive complex of indirectly biased traits. The most adaptive sign to use as an indicator trait is one that is causally related to fitness, so we should not be surprised that indicator characters are often directly adaptive.

Harris' hypothesis is well to keep in mind because ethnocentrism may lead us to mistake anything exotic that others do as an arbitrary maladaptive symbol. It is plausible that real adaptations often serve as indicator characters and get woven into belief systems. Style may often substance or be awfully closely correlated with substance.

B. Communication Function Hypothesis

Symbolic traits have basic communication functions. A. Cohen (1974), and many others, argue that symbols are functional in the sense that they are useful in communication. Communication may be at the level of individuals exchanging various kinds of information, as in the basic use of language, or it may be more group oriented communication, as in using clothing style to signal what ethnic group or class you belong to. On this hypothesis, stylistic variation does not do anything at all mysterious. It just symbolizes some underlying meaning people want to communicate, just as a word does. Symbolic behaviors may be rather elaborate and costly, but not really any more than is required to serve their rather complex communication function. The symbol experts (priests, spin doctors, and the like) do acquire a certain amount of power that they abuse, but that is no different in kind

from the tendency of other specialists in complex societies to act in their own interest. *Given that communication is useful in lots of ordinary adaptive contexts, this hypothesis is undoubtedly often part of the answer.*

Communication functions do not conflict with free variation. According to this hypothesis, the symbolic system is free to vary and change, because, as we argued when introducing the evolutionary theory of symbols, the communication function is served equally well by any sign we care to attach to a particular meaning. As long as language or other symbol systems change slowly enough that we mainly understand what others are trying to say, they are free to change any which way without disturbing function. The evolution of ordinary adaptations (what we talk about) is in the medium run almost completely divorced from the evolution of language and other symbolic communication systems (how we talk about what we talk about).

Insofar as symbol systems like language respond to assertive uses of style by individuals, a great deal of stylistic variation will be created by the almost unrestrained freedom of the run away as we saw in the examples like New York r. Groups will almost automatically tend to accumulate stylistic differences because of the very weak functional constraints on what symbol we use to communicate what meaning. This variation may be simply functionally irrelevant, neither of much use nor much harm. We could all speak the same language, but it doesn't really cost much if people in distant communities speak differently. This hypothesis has a close resemblance to Hamilton and Zuk's explanation of "exaggerated" traits in birds. There may be adaptive functions for group marking styles. This "tower of babel" effect of the indirect bias force acting on symbolic indicators may have indirect functional implications by creating stylistic markers of groups. There may even be an advantage to speaking differently from your neighbors. It is widely believed by functionalist anthropologists (Cohen is a good example again in this context) that stylistic markers of group membership are an essential part group level functioning of political systems. Complex societies involves lost of coordination between specialists, and it may be quite important for you to signal your group membership to others so that they can appropriately adjust their own behavior. When this is true, markers of group membership can arise by cultural evolution without the need to necessarily to invoke group advantage.

Boyd and Richerson (1987) studied how ethnic markers, or similar markers of ecologically distinctive groups, might arise using a theoretical model. This is a very simple example of how functional signals of group membership can arise due to individual level advantages.

Here is how it works:

Suppose there is an ecologically heterogeneous area in which [say] raising more cows and fewer crops is an advantage in one region, and more farming-fewer cows is an advantage in another. There is a certain amount of cultural contact across the boundary, so that people living in one area are exposed through trade, intermarriage, and the like to people living in the other. Such contacts will tend to result in a flow of ideas from one region to another. Selection or adaptive biases will tend to cause populations to adapt to the local environment, but, if information is costly and selection and/or biases imperfect, the flow of ideas across the boundary will prevent populations from perfecting local adaptations. Unless something intervenes, the degree to which human populations can develop highly specific adaptations to local conditions will be reduced by the flow of maladaptive ideas from neighboring communities.

This is a quite general problem of evolution in heterogeneous environments. In the case of genetic evolution, we often find species replacing one another at ecological boundaries, and the reproductive isolation between related species is thought to be important in allowing expansion into a new habitat. A small population at the species' margin facing a new environment can't adapt to it because gene flow from the large populations adapted to the species' old environment dilutes the gene pool of the small population trying to adapt to the peripheral environment. If a new species arises, reproductively isolated from the old species, it can proceed to adapt to the new environment free from the disrupting effects of migrants bringing genes from the old environment.

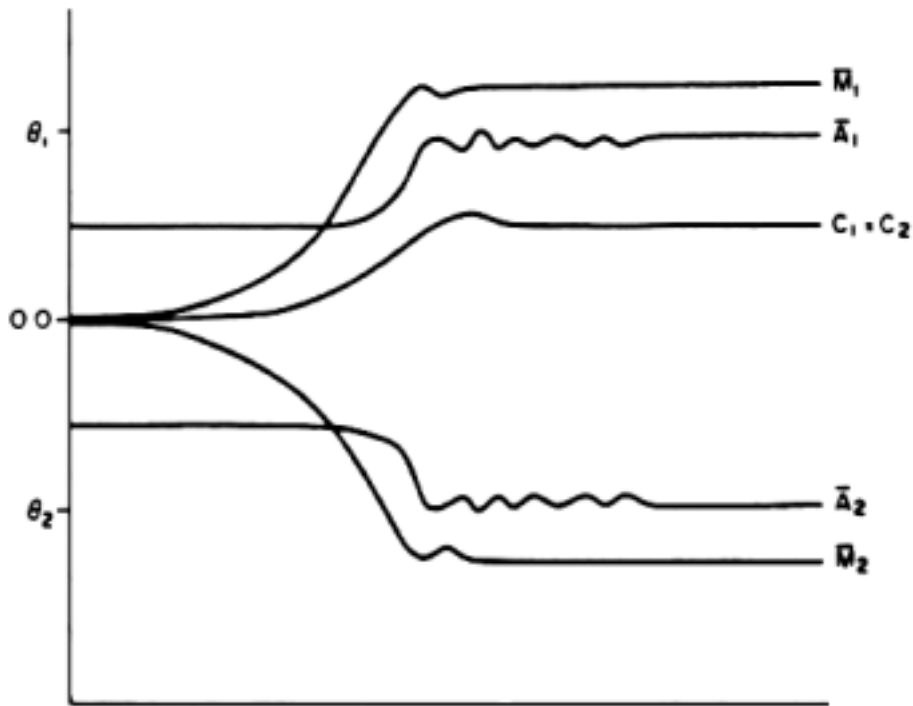
Humans can play a cultural variant of the speciation trick which is actually more efficient. Suppose each of our two model populations is characterized by a variable quantitative marker trait (M_1 and M_2) the two model environments respectively, an adaptive character (A_1 and A_2), and a correlation or covariance (C_1 , C_2) between the adaptive and marker character. For example, we might imagine again a drier environment in which the best adapted subsistence technique might be to raise more cattle and fewer crops next to a wetter one where more crops and fewer cattle is favored. The marker character could be anything conspicuous and stylistic, such as style of hat or amount of pronunciation of r . Correlation or covariance will arise if there is a patterned association of style and adaptive behavior, for example if cattle raisers tend to wear bigger, floppier hats than farmers.

Now, suppose that people acquire their hat style or dialect when they are young from their parents, and later adopt their subsistence strategy as young adults. As young adults, they are exposed to oblique influences, including people raised in the other environment, and who possibly carrying locally mistaken ideas about the appropriate mix of cows and crops. As young adults they use two decision making strategies to select their subsistence strategy. They prefer people similar to themselves on the marker character, a kind of indirect bias. They also put some weight on the economic success of the people they propose to imitate (this could be an adaptive direct bias, an indirect bias effect on an accurate index of fitness, or even just natural selection for economic success).

The theoretical question is whether a correlation between the linguistic symbolic trait and the adaptive trait can arise. If so, then using the ethnocentric preference for imitating people with a like dialect will help protect individuals

from the change of imitating the wrong sort of subsistence trait to culture flow from a second population. A typical result of the model is plotted in figure 14-2. θ_1 and θ_2 symbolize the optimum value of the subsistence strategy, and the X axis is time in generations. Note that the populations start out identical for the marker trait. Until a fair amount of difference in the marker traits arises and until the correlation between adaptive and marker traits becomes substantial, the adaptations to each environment are distinctly suboptimal. (The marker trait divergence doesn't get any help from a run away effect in this particular model.) However, eventually, the symbolic difference becomes quite marked, and a good signal of having the right adaptive strategy, and both populations can perfect their adaptations. Once both populations reach the optimum adaptive mix of cows and crops, the evolution of marker characters and the covariation stops..

Figure14-2. "Representative trajectory of the mean value of the adaptive character, the marker character, and the covariance between the two characters in the two habitats (Boyd & Richerson 1987:74)."



This model suggests that the "pseudo-speciation" effect of partial cultural isolation of human groups by stylistic differences and ethnocentric imitation preferences can indeed be useful. This mechanism is potentially much more flexible than a true speciation barrier, because the choice based on success can over-ride the mechanism if an innovation that is an advantage in both environments occurs. Note that it is driven by the advantage each individual gets from imitating someone like themselves in a situation where like individuals

also have a tendency to have the right subsistence behavior.

UC Davis archaeologist Robert Bettinger (1991) argues that the ethnic boundaries function of style is the best current explanation of the Upper Paleolithic Transition. Recall the discussion on page 14-3 about the correlation between stylistic variation, local adaptation, and increased population density at the Upper Paleolithic Transition. The dramatic expansion of the human species' geographical range, variety of subsistence forms, and numbers that occurred at the UPT is quite plausibly due to the development of modern hominids' enthusiasm for style!

It is interesting that complex, state level societies are built up out of socially differentiated and stylistically marked subgroups. The social raw material of complex societies includes ethnic units, but also castes, classes, interest groups, political parties, occupational and professional associations, government, business and voluntary organizations, religions, etc. These all tend to have stylistic markers. Perhaps the resemblance between complex social communities composed of cultural pseudospecies and complex biotic communities composed of many species is not entirely superficial (we return to this question in Chapters 27 and 28).

We suppose that most thoughtful observers agree that the adaptive advantages of communication in one form or another are part of the answer to the style puzzle. Especially if it is useful to symbolically communicate about social structure like ethnic group membership, it is easy to understand how a fairly elaborate ability to freely develop new styles to fit new social needs is adaptive, even though the symbolic variation itself is not directly adaptive to local conditions in the sense we're used to from thinking about ordinary selection.

C. Antifunctionalist Hypothesis

Marshall Sahlins (1976) and like-minded social scientists claim that the use of symbols in language, ritual, etc. is important and cannot be explained by any form of adaptive theory, cultural or genetic. His argument is that symbols are arbitrary and cannot be very strongly influenced by selection, direct bias, etc. Humans are free to invent whatever symbolic culture they want. Cultural models of the world are symbolic and imposed on nature, not derived from it. In other words, humans first use symbolic processes to define the world, then live in the world they have invented. This is a major challenge to any form of functionalist theory; adaptation to environment is rather meaningless if we've largely invented the "environment" in the first place! It is a view with a very wide following among "post-modernist" social scientists.

Sahlins calls the process he imagines drives antifunctional behavior “cultural reason.” He is quite foggy about what cultural reason is exactly, but many of his examples are fairly compelling. Why are Americans fond of beef, but not of horsemeat and dogmeat? Many people whose cuisine we otherwise admire, that of the French and the Chinese for example, find one or the other quite toothsome! If it is adaptive for the French to eat horse, shouldn't it be the same for us?

The run away process can create maladaptive variation in defiance of adaptation in the ordinary sense. We have a candidate mechanism for Sahlins. Elaborate symbolic systems, including complex ideologies and world views could be built up by the run away process. There is a kind of aesthetic rather than functional principle involved. The run away process is very sensitive to initial conditions. Different societies are very likely to run in different directions, hence American beefsteak, French sauteed horse, and Filipino grilled puppy. Looked at this way, there is a perfectly respectable evolutionary mechanism for anti-functionalists in the social sciences to appeal to.

This hypothesis has been neglected in the social sciences both by ardent adaptationists, and by critics of Darwinian theory. Both camps find it convenient to oversimplify Darwinism to score debating points. The idea that a process like indirect bias can generate functional behavior most of the time, but also sometimes lead to the run away extremes, does not correspond to the typological, dichotomized thinking prevalent among social scientists.

The costly handicap idea makes it even more difficult to make a rigid distinction between functional and afunctional explanations. You should be able to construct this argument for yourself based on the discussion of Zahavi's ideas in the last section.

D. Group-Level Functions for Symbolic Systems

R. Rappaport (1979), and many other social scientists have long espoused the hypothesis that religion and prestige systems are group-functional (the results of group selection in our terms). Religions and political ideologies often include strong norms favoring altruism (e.g. the “golden rule”). Rappaport is especially interested in explaining the subset of symbolic characters that are taken by people to be sacred and holy. These religious aspects of symbolism often invoke the deepest possible commitments from believers. He argues that hiding group functions behind the mysterious veil of the sacred and holy serves to protect them from the selfish calculation of individuals. We would make selfish choices in games like we studied in the last chapter, but religious beliefs “trick” us with promises of rewards in heaven for good behavior and threats of the everlasting fires of hell if we are bad. The tricks are often benign, since commitment to sacred principles allows us to coop-

erate to keep the peace, avoid destructive overexploitation of the environment, and the like. Thus, Rappaport's symbolic group functionalism stresses social organizational functions, moral norms and the like, while Harris' cryptic functional arguments usually stress direct technological and subsistence functions. As with Sahlins and Harris, the examples are more convincing than the explanation of them.

Why might norms for group altruism, like the golden rule, be routinely bound up in highly symbolic religious ideologies and ritual practices? Why not just be nice to everybody without the mumbo-jumbo? One possibility is this: Recall that the run away and handicap exaggeration processes are highly sensitive to initial conditions. In general each society will run away in a different direction. This is a powerful means of generating random variation at the level of groups. The variation can be quite costly in terms of individual fitness. Selection might act on this variation, but the adaptive wisdom of group altruism might remain cloaked in myths and rituals that were part of the runaway process. This has the added advantage from the point of view of group selection that individuals are mystified; it may be more difficult for selfish genetic rules that underlie guided variation and direct bias to undo such symbolically embedded group functions because the group-functional rules are themselves so confounded and entangled with non-rational symbolic elements. Groups with the most complex, goofy mumbo jumbo may actually have an adaptive advantage!

The following scenario illustrates how this process functions embedded in irrational symbol systems might arise. Among a collection of pioneering Pastoral societies out on the steppe, some men's prestige systems might have developed around themes of conspicuous displays of wealth, others around elaborate religious ritual, and still others around many other things. Only a few might initially have been elaborated in the direction of a deeply felt commitment to aggressive masculine bravado. From the point of view of the run away or handicap display hypothesis, all of these may be essentially equivalent. Depending upon accidents of history, some male prestige systems got started in one direction, others in other directions. However, they would have had very different effects on group success. Given steppe pastoral life-styles where long-distance attacks are feasible, and plundering others' animals is a viable economic strategy, societies with the aggressive bravado system may be richly rewarded at the expense of wealth accumulators and the mystically virtuous.

In other circumstances, the reckless bravado system can be suicidal, say where a strong state maintains effective law and order. In environments where strong states are possible, prestige based on wealth accumulation is likely to build richer societies that can afford the armies and organization to suppress tribes with an excess of bravado but limited

sophistication. The arbitrariness of evolution due to signalling may in such cases act like group level mutation that produces variation for group selection to work upon. Like the conformity effect we met in the last chapter, whole groups will be committed to one or another variant to symbolize prestige, and a few “deviant” migrants will be discriminated against.

This mechanism would seem to underpin Rappaport's hypothesis. It seems plausible enough. It is indeed striking that social arrangements and customs are usually “sanctified”-embedded in a ritual system like a religion. This hypothesis will account for that. It might also account for the replacement of non-esthetic, but apparently otherwise quite brainy Neanderthals by modern humans. Our groups might have simply been larger and more cooperative, and able to use collective action (e.g. warfare) to out compete them. It also accounts for the crudity and imperfections of group level adaptations. Only those variants that the run away or handicap process happens to exaggerate are available for group selection, and there is no obvious way for group selection to fine tune where these out-of-control processes go. A few pearls of organizational wisdom, the odd norms of altruism sanctified by religion, and so forth, are bound up in a lot of mumbo-jumbo of dubious utility.

VI. Conclusion

A certain amount of evidence seems to support the existence of cultural evolutionary processes that lead to traits that are not adaptive in the genetic sense. The run away process can generate behavior that is not adaptive in any usual sense of the word. The handicap principle can result in competitive displays of cultural or genetic quality that waste resources. Spectacular examples, like the Jonestown tragedy in 1978 and the similar Waco tragedy in 1993, remind us that human groups are prone to collective insanity. Whatever theory we ultimately adopt has got to account for such things.

The costly information hypothesis suggests that culture even so is an adaptive system, because the costs in genetic fitness of giving up indirect bias would be even more costly than tolerating giant yams and giant cars (on average at least). The capacity to use indirect bias, style and symbols is probably adaptive, even if many of the specific results are of dubious value. We have seen that there are several functional hypotheses involving stylistic traits and indirect bias to compete with the run away idea to explain particular apparently exaggerated traits. The handicap proposal is hard to classify, with its mixture of function and costly exaggeration.

We really do not understand very well why people do all of the wonderful and bizarre things that they do. The real point is not to make too many claims for any one hypothesis.

People are harder to understand than ordinary organisms because they are more complicated from an evolutionary point of view due to having a second system of inheritance, culture, to keep track of. The most efficient scientific progress will come, we think, if we can line up all the logically consistent hypotheses in a row, so we can start shooting at them. That is why I took us out of our way to consider some pretty extreme examples of apparently maladaptive behaviors. Even if they are turn out to be wrong, we ought to give them their best shot to explain the data. This is part of the Darwinian strategy; Darwin wrote almost as long a book about his mechanism of maladaptation, sexual selection, as he wrote about natural selection!

Note that, like natural selection, one evolutionary process, indirect bias, can lead to a multitude of outcomes depending upon the details of the particular case. To the extent that our evolutionary models are apt, they are a powerful tool for investigating the behavioral diversity that we see. The models point to critical things that need to be measured if we are to decide between particular hypotheses in particular situations. For example, is the psychology of indirect bias really ever such as to allow preferences to evolve faster than indicators, and hence set up the run away case?

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