The Evolution of Ethnocentric Behavior

by

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Abstract

Ethnocentrism is a nearly universal syndrome of attitudes and behaviors. Behaviors associated with ethnocentrism include cooperation with members of the in-group, but not out-groups. We show that ethnocentric behavior can emerge from a simple evolutionary model of local competition between individuals. Our agent-based model treats interactions as one-move Prisoner's Dilemmas, and the inheritance of strategies as genetic, cultural, or (most plausibly) both. Results from the model demonstrate that ethnocentric behavior can evolve even when direct reciprocity is impossible, opportunities for "cheating" exist, and agents have minimal cognitive ability. When cooperating is relatively costly, ethnocentric behavior can even be necessary to sustain cooperation.

Ethnocentrism

Ethnocentrism is a nearly universal syndrome of attitudes and behaviors. The attitudes include seeing one's own group (the in-group) as virtuous and superior and an out-group as contemptible and inferior. The attitudes also include seeing ones own standards of value as universal. The behaviors associated with ethnocentrism are cooperative relations with the in-group and absence of cooperative relations with the out-group (LeVine and Campbell, 1972). Membership in an ethnic group is typically

evaluated in terms of one or more observable characteristics (such as language, accent, physical features, or religion) that are regarded as indicating common descent (Sumner 1906, Hirshfeld 1996, Kurzban, Tooby, and Cosmides 2001). Ethnocentrism has been implicated not only in ethnic conflict (Chirot and Seligman 2001, Brewer 1979b) and war (van der Dennen 1995), but also consumer choice (Klein and Ettenson 1999) and voting (Kinder, 1998). In short, ethnocentrism can be in-group favoritism or out-group hostility. This article offers a model to account for the evolution of ethnocentric behavior. Ethnocentric behavior is defined here as cooperation with members of one's own group, and noncooperation toward members of other groups. We show that ethnocentric behavior can emerge from a simple evolutionary model of local competition between individuals, without any explicit difference between the evolutionary process for dealing with members of ones own group and the evolutionary process for dealing with members of other groups.

What is Known and Theorized

In its broadest context, in-group favoritism can be considered a form of contingent cooperation. Viewed this way, in-group favoritism is a candidate to join the list of possible explanations for cooperation among egoists. The present state of knowledge identifies nine mechanisms that can, under different circumstances, support cooperation among egoists. Although a full literature review of each of these mechanisms would require thousands of citations, a few characteristic works suffice to suggest the nature of these mechanisms.

1. Central authority, typically a state or empire (Hobbes, 1651; Tilly, 1992).

2. Inclusive fitness based on kinship (Hamilton, 1964; Dawkins, 1989).

3. Barter and markets (Smith, 1776; Samuelson, 1947).

4. Principal-agent mechanisms, including employment (Spence and Zeckhauser, 1971).

5. Reciprocity based on continuing interaction (Trivers, 1971; Axelrod, 1984).

6. Decentralized enforcement, including norms (Axelrod, 1986; Hechter and Opp, 2001), informal institutions (Ostrom, 1998), trust (Hardin, 2002), and the more inclusive mechanism of social capital (Coleman, 1990; Putnam, 2000).

7. Group selection (Sober and Wilson, 1998).

8. Docility (Simon, 1990).

9. Reputation (Nowak and Sigmund, 1998).

This article will investigate another mechanism that can support at least a limited amount of cooperation among egoists, namely in-group favoritism. The essential idea is that if one can distinguish how similar another is to oneself, a potential strategy would be to cooperate with others who are similar, but cooperate *only* with them.

The empirical literature on in-group favoritism, out-group hostility and related phenomena is very large and contains important contributions from virtually all of the social sciences. This empirical literature is frequently supplemented by informal theory to account for the pattern of the findings. Classic works on in-group/out-group relations are Simmel (1908/1955), Sumner (1906), Sherif and Sherif (1953). Good reviews of this literature include Brewer and Brown (1998) and Fiske (1998).

Ethnocentrism is a special, but almost universal (LeVine and Campbell 1972) example of in-group favoritism and out-group hostility. Ethnocentrism is a form of in-

group favoritism and out-group hostility in which membership is typically evaluated in terms of one or more observable characteristics (such as language, accent, physical features, or religion) that are regarded as indicating common descent (Weber cited in Guibernau and Rex, 1997). A controversial thesis even says that the "clash of civilizations" is the greatest threat to world peace (Huntington, 1996; see also Russett, Oneal and Cox, 2000). Representative studies of ethnocentrism and ethnic conflict include Barth (1969), LeVine and Campbell (1972), Banton (1983), Horowitz (1985), Roosens (1989), Posen (1993), Hutchinson and Smith (1996), Guibernau and Rex (1997), Brubaker and Laitin (1998), Chirot and Seligman (2001), and Reynal-Querol (2002).

A great deal of laboratory and field work has been done on in-group/out-group processes. For the purposes of this article, the most important and empirically well-validated findings are the following:

1. When individuals see themselves as members of an in-group they are more likely to contribute to collective welfare even at the cost of individual advantage (Brewer and Kramer, 1986; Kramer and Brewer, 1984). Indeed, group affiliation is central to identity formation (Howard, 2000) and identity politics (Laitin, 1998; Monroe, Hankin, and Van Vechten, 2000).

2. The most trivial and arbitrary distinction is enough to trigger behavior favoring the in-group, even when self-interest and reciprocity do not apply (Ferguson and Kelly, 1964; Tajfel, 1970; Tajfel et al., 1971). Categorization and stereotyping on the basis of group labels can be rapid and automatic, even preconscious (Dovidio and Gaertner, 1993; Lamont and Molnar, 2002), although their overt manifestations may be changeable (Kurzban, Tooby, and Cosmides, 2001).

3. Both in-group favoritism and out-group hostility tend to be stronger in competitive situations or in the presence of external threats (Sherif 1961, 1996; Brown, 1988). However, in-group favoritism is likely to evolve only when affiliation with the in-group generates valuable resources or scarce social goods (Sanders 2002), or allows more effective response to external threats (Rabbie et al 1974).

4. Categorization of people into groups tends to be based on factors that are perceived to be similar within groups, and different between groups (Oakes, Haslam and Turner, 1994). The factors on which groups are differentiated may often be related to the differential value of group memberships for social and economic interests (Brewer 1979a, Barth 1969).

5. People validate their membership in an ethnic group by pointing to some set of attributes, usually overt cultural traits, that members believe they share in common (Bentley, 1987). Some authors argue that the importance of markers that are both easily visible and difficult to imitate may mean that physical/biological characteristics are preferred to cultural traits as a basis for group differentiation (see van den Berghe, 1996).

6. Group membership boundaries become increasingly salient the closer the spatial contact between groups (Taijfel, 1982)

7. In-group favoritism and out-group hostility (xenophobia) are somewhat different processes and appear to be empirically uncorrelated (see Cashdan, 2001; Brewer, 1979a; Turner 1978; Struch and Schwartz, 1989; Mummendey et al., 1992; Hewstone, Rubin and Willis, 2002). Out-group hostility need not result from in-group favoritism (van den Berghe, 1999), and in-group favoritism is not a necessary concomitant of out-group hostility (Rabbie 1982, 1992; Ray and Love-joy 1986; Struch and Schwartz 1989).

Patriotism, for example, is empirically distinguishable from nationalistic belligerence (Feshbach, 1994; Kosterman and Feshbach, 1984).

In designing a formal model of ethnocentrism, we take special note of this last finding. Our model will focus on in-group favoritism, as opposed to out-group hostility. Following Cashdan (2001), we define ethnocentrism in the model as the behavior of providing active (and individually costly) assistance to in-group members, but not out-group members.

Notable examples of existing formal theories of in-group/out-group behavior include the following. Carley (1991) models how groups change as new members enter or new ideas are discovered. Fearon and Laitin (1996) explore the suppression of conflict between groups through the punishment of in-group deviants. An early model by Schelling (1978) studied the dynamics of segregation. Axtell, Epstein and Young (1999) model bargaining between emergent social classes. Nettle and Dunbar (1997) simulate the evolution of reciprocal cooperation based on social markers, limited mobility, and memory, using the !Kung San hunter-gatherers of Botswana as an archetype. Shaw and Wong (1987) develop an evolutionary model of ethnic conflict and warfare based on nepotistic altruism and utility-maximizing rational actors. Riolo, Cohen, and Axelrod (2001) have developed an agent-based model in which cooperation can be sustained, by *assuming* in-group favoritism based on similarity of attributes, even when the interactions are one-shot Prisoner's Dilemmas.

The model presented in this article is distinctive in treating discrimination as just one of a range of possible outcomes, and in requiring only minimal cognitive complexity in individuals. Our model thereby allows, for the first time, a proof of the principle that

in-group favoritism can emerge and be maintained under quite minimal conditions, including the absence of reciprocity and reputation.

Agent-Based Modeling

The most suitable methodology for investigating the theoretical foundations of in-group favoritism and out-group hostility is agent-based modeling. The emergence of such behavior involves a population of diverse individuals whose interactions have non-linear effects. Heterogeneity and non-linearity are usually extremely hard to analyze using deductive methods. The simulation methodology of agent-based modeling, on the other hand, allows a thorough analysis of the implications of a specific set of assumptions about agents and their interactions, even if the agents are diverse and their interactions are contingent on previous outcomes. Models of social behavior using this methodology include Epstein and Axtell (1996), Nettle and Dunbar (1997), Axelrod (1997), and Read (2002). For reviews, see Johnson (1999) and Macy and Willer (2002).

A particular risk of misinterpretation, however, derives from the evolutionary mechanism employed by many such agent-based models. In evolutionary models, individual characteristics for group membership and behavioral strategies are passed between generations, with more successful behaviors becoming more prevalent over time. However, no specific mechanism for such transmission is necessarily implied. A large literature in sociobiology asserts that the evolution of behaviors may have a biological basis, or be explicitly genetic (see, for example, Lopreato 1984, Irwin 1987, Shaw and Wong 1987, Butovskaya and Falger 1999). We are making no such claim in this model. The mechanism for the evolution of ethnocentrism in our model is abstract,

and ethnocentrism could be passed from parent to offspring by culture, genetics, or some combination of both[1]. Simple abstract models can not, of course, be fully accurate representations of complex social and political phenomena. We have chosen simplicity here for the sake of insight, rather than completeness for the sake of accuracy. Ethnocentrism may have a more complex cognitive basis—but our model shows that it needn't.

The Model

Our model differs from previous models of the evolution of contingent cooperative behavior by not requiring memory of previous interactions (Axelrod and Hamilton 1981, Axelrod 1984), communication of reputations (Nowak and Sigmund 1998), conformity (Boyd and Richerson 1985, Simon 1990), favoritism toward similar others (Riolo, Cohen, and Axelrod 2001), greater ability to distinguish among members of own group than another group (Fearon and Laitin 1996), or leadership (Roosens 1989). These mechanisms may each play an important role in ethnocentrism, but the present model demonstrates that none are necessary for ethnocentric behavior to have evolved or be sustained.

The model makes three assumptions. First, each interaction is a Prisoner's Dilemma of a single move, thereby eliminating the possibility of direct reciprocity.

[1] Our evolutionary mechanism for the transmission of ethnocentrism is, in fact, very similar to mechanisms used in anthropological models (e.g. Nettle and Dunbar 1997) to simulate the spread of languages and strategic behaviors. A comparable mechanism is used to study a wide range of social and economic behaviors in Epstein and Axtell (1996).

Second, interaction is local, and so is the competition for scarce resources including space for offspring. Third, the traits for group membership and behavioral strategy are typically passed on to offspring, by means of genetics, culture, or (most plausibly) both.

The model is very simple. An individual agent has three traits. The first trait is a tag that specifies its group membership as one of four colors.[2] The second and third traits specify the agent's strategy. The second trait specifies whether the agent cooperates or defects when meeting someone of its own color. The third trait specifies whether the agent cooperates or defects when meeting an agent of a *different* color. In this model, an ethnocentric strategy is one that cooperates with an agent of ones own color, and defects with others. Thus only one of the four possible strategies is ethnocentric. The other strategies are cooperate with everyone, defect with everyone, and cooperate only with agents of a different color. Since the tags and strategies are not linked, the model allows for the possibility of "cheaters" who can be free riders in the group whose tag they carry.

The simulation begins with an empty space of 50x50 sites. The space has wrap around borders so that each site has exactly four neighboring sites. Each time period consists of four stages: immigration, interaction, reproduction, and death.

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[2] Formally, a tag is a characteristic of an agent that can be observed by another agent when they interact, and that tends to be passed on to offspring (Holland, 1995, Riolo, Cohen and Axelrod, 2001). In an interaction, an agent can assess how similar the other agent is based on a comparison of their tags. The agent can then condition its response based on the degree of similarity. In the case of people, tags can typically include multiple traits such as skin color, language, and religion. These characteristics qualify as tags because they are readily observable in an interaction, difficult for an individual to change, and are more or less accurately passed on to offspring.

1. An immigrant with random traits enters at a random empty site.

2. Each agent receives a initial value of 12% as its Potential To Reproduce (PTR). Each pair of adjacent agents interacts in a one-move Prisoner's Dilemma in which each chooses whether or not to help the other. Giving help has a cost, namely a decrease in the agent's PTR by 1%. Receiving help has a benefit, namely an increase in the agent's PTR by 3%.

3. Each agent is chosen in a random order[3] and given a chance to reproduce with probability equal to its PTR. Reproduction is asexual and consists of creating an offspring in an adjacent empty site, if there is one. An offspring receives the traits of its parent, with a mutation rate of 0.5% per trait.

4. Each agent has a 10% chance of dying, making room for future offspring.

Results

The simulation results show that the ethnocentric strategy becomes common even though there is no explicit bias for it in the model. In the final 100 periods of ten 2000 period runs, 76% of the agents have the ethnocentric strategy, compared to 25% by chance. See Table 1. In terms of behavior, 88% of the choices are consistent with in-group favoritism. This high rate of in-group favoritism results from 90% of same color interactions being cooperative, and 84% of the different color interactions being non-cooperative. These results establish the principle that in-group favoritism can emerge and be maintained under quite minimal conditions. To be specific, the model shows that in-

[3] Asynchronous updating is used because it is more realistic and avoids artifacts associated with synchronous updating. See Huberman and Glance (1993).

group favoritism can overcome egoism and dominate a population even in the absence of reciprocity and reputation, and even when "cheaters" (mimics) need to be suppressed. Since the model can generate in-group favoritism, it can be an effective tool for investigating the full range of conditions under which in-group favoritism can emerge and be maintained.

The simulations of the model demonstrate how the ethnocentric strategy becomes so common. In the early periods of a run, the scattered immigrants create regions of similar agents. An immigrant who cooperates with its own type is likely to have a faster growing region than one who does not. Thus both the ethnocentric and the fully cooperating strategies are well represented in the early periods of a run. Soon the dynamics are governed by what happens when regions with different traits grow enough to become adjacent to each other. See Fig. 1.

Examining the dynamics of the model reveals *how* the results were actually generated. In this case, the issue is how the ethnocentric strategy becomes so common. For example, an important issue is how "cheaters" were managed (e.g., a blue agent who receives help from blue ethnocentrics, but provides help to no one at all). This kind of issue is best analyzed by looking closely at what happens in a typical run over time. In the early periods of a run, the scattered immigrants create regions of similar agents (Fig. 1a). Once the space is almost full, the dynamics are governed by what happens when regions with different attributes grow enough to become adjacent to each other. These dynamics can be analyzed in terms of regions of contiguous agents having the same color and strategy (Fig. 1b). The most important aspect of regional dynamics is that an ethnocentric region will tend to expand at the expense of a region of a different color

using any one of the other three strategies. For example, when a red ethnocentric agent interacts with a neighboring blue egoist, both defect. The red ethnocentric, however, will do better overall because it gets help from other agents in its own region, while the blue egoist gets no help from other agents in *its* own region (Fig. 2). The result is that an ethnocentric region will tend to expand at the expense of an adjacent region of egoists of a different color. In fact, the cheaters of a given color are suppressed by the ethnocentrics of the other colors.

Not only does ethnocentric behavior evolve in this model, but its emergence is robust under a wide range of parameters. When any of the following parameters are either halved or doubled, at least two-thirds of strategies are ethnocentric and at least two-thirds of the actual choices are ethnocentric: cost of helping, lattice width, number of groups, immigration rate, mutation rate, or duration of the run (Table 1). To confirm that in-group favoritism can not only be sustained, but can emerge "from scratch", a variant of the model was run in which the simulation begins with the space completely full of agents, *none* of whom have the ethnocentric strategy. The outcome was virtually the same. The results are also not very sensitive to the possibility that an agent will occasionally misperceive whether or not the other agent in the interaction has the same color. Even when agents make this mistake 10% of the time, over two-thirds of the strategies are ethnocentric and over two-thirds of the choices are consistent with in-group favoritism. This resistance of in-group favoritism to noise is quite a contrast to studies of reciprocity in the iterated Prisoner's Dilemma. The Tit for Tat strategy, for example, requires the addition of generosity or contrition to be effective in the face of even rare misperceptions (Molander, 1985; Wu and Axelrod, 1995).

Ethnocentric strategies and behavior evolve in the context of local reproduction and local interaction. Although an ethnocentric strategy calls for cooperation with only one-quarter of all agent types, the amount of cooperative behavior is actually much higher. Since interactions are local, interactions are disproportionally with others of one's own color. For example, in the standard case, the coherence of regions results in 79% of interactions occurring with ones own color. As a result, in the population as a whole, 74% of the actual choices made are cooperative. Thus ethnocentric behavior evolving from local reproduction and local interaction can support cooperation, even when the interactions are one-move Prisoner's Dilemma games.

Without local reproduction and interaction, cooperation based on ethnocentric behavior does not emerge. If offspring are placed at randomly chosen empty sites, spatially distinct regions do not form, and proximity is no longer correlated with similarity. Without local reproduction, egoists dominate ethnocentrics, resulting in only 5% cooperation in the population as a whole, compared to 74% cooperation with local interaction (Table 2 line a vs. line b). Similarly, local interaction is necessary for the evolution of cooperation based on ethnocentric behavior. If every agent chooses one other at random without regard to proximity, the level of cooperation falls to 22% (Table 2 line c)[4].

A remarkable result is that the ability to distinguish between the in-group and the out-groups can actually promote cooperation. Consider the case in which the standard cost of helping is doubled to 2%, while the benefit of receiving help is kept at 3%. When

[4] With distant reproduction or distant interaction, the rate of ethnocentric behavior is high only because the modal outcome is mutual defection between agents of different colors.

four colors can be distinguished, this demanding condition achieves cooperation in 56% of all interactions (Table 2 line d). However, when every agent appears to have the same color, cooperation falls to 14% (line e). So when the cost of giving help increases, losing the ability to distinguish between the four colors causes the collapse of cooperation.[5] Put another way, the ability to distinguish between in-group and out-group members can be essential for the maintenance of cooperation in a population. In fact, the ability to distinguish between groups can be regarded as the basis for social capital within a group (Coleman, 1990 and Putnam, 2000).

Conclusion

Anthropologists, sociologists and others have long been aware that competition with outgroups helps promote harmony of ingroups, but this effect has always seemed to require substantial cognitive ability (Sumner 1906, Sherif and Sherif 1953, Simmel 1955). The present model demonstrates that with local reproduction and local

[5] The value of being able to distinguish tags can be understood in terms of inclusive fitness theory that takes into account the degree of relatedness between two agents (Hamilton, 1964; Lacy and Sherman, 1983; Riolo, Cohen and Axelrod, 2001). While proximity alone is a signal of relatedness, being able to distinguish among tags allows a still better signal of relatedness, even for sessile invertebrates (Grosberg and Quinn, 1989; Grafen, 1990). Previous studies have shown that the evolution of cooperation is fostered when proximity is a signal for relatedness (Getty, 1987; Pollack, 1989; Nowak and May, 1992; Nakamura, Matsuda and Iwasa, 1997; Epstein, 1998). Our model shows that sometimes when the cost of helping is high enough, proximity alone may not be enough to sustain cooperation, but the addition of observable tags *can* be enough to sustain cooperation based on in-group favoritism.

interactions, outgroups can promote harmony of ingroups even with agents of minimal cognitive ability. When interacting, an agent only needs to able to make its choice be contingent on whether the other agent has the same or a different observable tag. When a region of ethnocentric agents is adjacent to a region of egoists with a different tag, there is no cooperation across the boundary. However, an ethnocentric agent that interacts with an egoist across the boundary gets help from others within its region, but the adjacent egoist with a different tag does not get help from others within *its* own region. In this way, ethnocentric strategies and behavior can emerge and be maintained. When agents with similar traits form coherent regions, cooperation on the basis of ethnocentric behavior emerges and is sustained, even with substantial opportunity for cheating. Ironically, the ability to discriminate can support the evolution of cooperation based on ethnocentric behavior.

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Table 1. Ethnocentric strategies and behavior emerge even when the parameters of the standard case are halved or doubled. The standard parameters are: 1% as the cost of giving help, 4 colors of tags, 0.5% mutation rate per trait, 1 immigrant per time period, 50 x 50 lattice size, and 2000 periods per run. Each case is replicated 10 times. Data are averaged over the last 100 periods. The range shown is plus or minus the standard error.

	%Ethnocentric strategy	% Ethnocentric behavior	% Cooperative behavior
Standard Case	**76.3 ± 0.9**	**88.5 ± 0.5**	**74.2 ± 0.5**
cost: 0.5	76.0 ± 1.4	90.3 ± 0.4	77.8 ± 0.7
cost: 2	61.8 ± 2.1	73.8 ± 1.3	56.1 ± 1.2
colors: 2	69.4 ± 1.3	86.0 ± 0.5	78.1 ± 0.5
colors: 8	79.1 ± 0.9	89.2 ± 0.4	71.7 ± 0.5
Mutation rate: 0.25%	82.8 ± 1.3	92.2 ± 0.5	79.8 ± 0.5
Mutation rate: 1%	67.1 ± 0.9	83.2 ± 0.6	69.0 ± 0.6
immigration rate: 0.5	77.5 ± 0.5	89.5 ± 0.4	75.5 ± 0.7
immigration rate: 2	74.4 ± 0.8	86.3 ± 0.4	71.4 ± 0.9
lattice size: 25 x 25	70.5 ± 2.2	83.8 ± 1.5	69.9 ± 1.2
lattice size: 100 x 100	78.2 ± 0.8	89.9 ± 0.4	76.0 ± 0.3
run length: 500	73.9 ± 1.0	87.2 ± 0.8	73.4 ± 1.0
run length: 2000	77.3 ± 1.0	88.8 ± 0.4	74.4 ± 0.5

Table 2. Cooperation based on ethnocentric behavior requires local reproduction (lines a vs. b) and local interaction (lines a vs. c), because without these features, the population is dominated by egoists who defect with everyone. The ability to distinguish color among agents can also be essential. With a doubled cost of giving help (line d), cooperation can still be maintained. In this setting, the ability to distinguish color types is essential for the maintenance of cooperation based on ethnocentric behavior. Without this ability, the population is dominated by egoists and cooperation collapses (lines d vs. e). See Table 1 for parameters of the standard case.

	% Ethnocentric strategy	% Ethnocentric behavior	% Cooperative behavior
a. Standard Case	**76.3 ± 0.9**	**88.5 ± 0.5**	**74.2 ± 0.5**
b. Offspring at random location	9.2 ± 0.5	72.5 ± 0.9	4.7 ± 0.3
c. Interaction with random location	25.3 ± 1.9	68.1 ± 1.0	21.5 ± 0.6
d. cost: 2	61.8 ± 2.1	73.8 ± 1.3	56.1 ± 1.2
e. cost: 2 and 1 color	14.0 ± 1.2	14.0 ± 1.2	14.0 ± 1.2

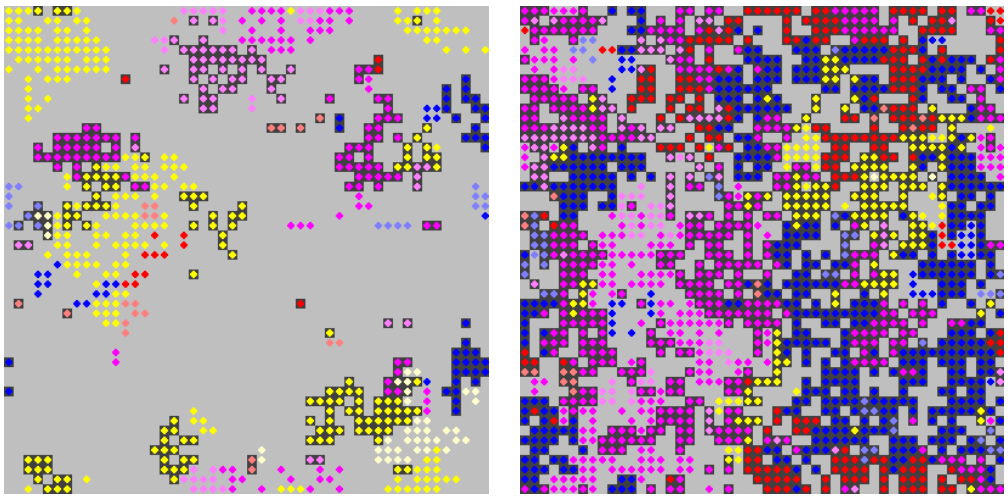

Figure 1. A typical run of the model after 100 periods (a) and 2000 periods (b). The shading of the foreground of a cell indicates the agent's strategy toward others of its own color, with a dark dot indicating cooperation. The shading of the background of a cell indicates the agent's strategy toward agents of other colors, with black indicating defection. Thus agents using the ethnocentric strategy have a dark dot on a black background, and egoist agents have a light dot on a black background. A movie of this run is available on the web in Quicktime format at: www.umich.edu/~axe/EXP104.mov

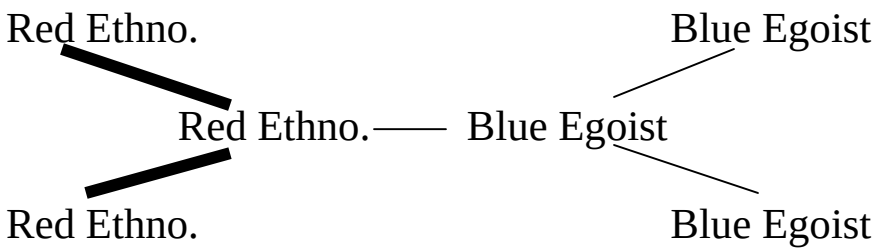

Fig. 2. An ethnocentric region dominates a region of egoists of a different color. This schematic diagram represents what can happen at the boundary of a region of red ethnocentric agents (on the left) and a region of blue egoists who cooperate with no one (on the right). When a red ethnocentric agent interacts with a blue egoist, neither cooperates so neither does well, as signified by the thin line between them. When this red ethnocentric agent interacts with one of its red ethnocentric neighbors, both cooperate and both do well, as signified by the thick line between them. The blue egoist does not do as well when it interacts with blue egoists from its own region because egoists do not cooperate with each other. Overall then, the red ethnocentric does better than the adjacent blue egoist does. Since doing better translates into a greater potential to reproduce, the red ethnocentric region will tend to grow at the expense of the blue egoist region.