The Bifurcation of the !Kung

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(Received September 18, 1996; accepted September 30, 1996)

Dedicated to David Loye on his 70th Birthday.

While the emergence of a planetary society unrolls, a backlash of neonationalism is raising global alarm. Here we combine earlier works on international synergy and social fractals into a model for the new world disorder, and apply it to the transformation of the !Kung as an example.

KEYWORDS: !Kung, synergy, neonationalism

1. INTRODUCTION

In 1941, Ruth Benedict introduced a new concept of social synergy. It measures the degree of convergence between individual and group goals. After studying many societies, she observed that groups enjoying high synergy tend to be peaceful, while those of low synergy tend to violence.

In 1989, we proposed a dynamical model for group behavior based on a field of preference cones, the synergy field, inspired by Roy Radner's microeconomic models. Individual choices made randomly within these preference cones determine the group dynamic, which decomposes the state space of the group into disjoint basins of attraction. Understanding this model may be useful in analyzing international events. A small change in exogenous parameters may cause a large change in the dynamics of the synergy field, and thus a bifurcation in the group behavior, such as a switch from peace to war.

It is a pleasure to thank Ron Swenson for bringing the transformation of the !Kung to my attention, Raoul Kneucker for introducing

World Futures, 1997, Vol. 49, pp. 103–111
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me to Laurens van der Post, Phil Grant for sharing his own work with me, and the Rudolph Steiner Schule of Wien-Mauer, especially Elisabeth Gergely, for the hospitality which made this writing possible.

2. THE TRANSFORMATION OF THE !KUNG

The rapid disappearance of societies like the Maya is an outstanding mystery of anthropology. The study of cultural disappearances now (or recently) in progress is one approach to the solution of this mystery. The transformation of the Kalahari !Kung (also known as the African Bushmen) has been presented in this context (Yellen, 1990).

2.1. Background

The !Kung, until recently, lived by hunting and gathering. They were one of the last surviving epipaleolithic societies. Originally the aborigines of southern Africa, their territory was gradually reduced to the Kalahari Desert of Botswana, Namibia, and Angola. In the early 1970s they abruptly abandoned their traditional ways and adopted the iron age culture of their Bantu neighbors, with domesticated crops and animals. This catastrophic bifurcation took place under the gaze of academic anthropologists, and has been extensively documented. What particularly interests us here is the rapidity of the transformation, and the associated reduction of social synergy which may be seen in the ethnography. Indeed we may regard this event as a model *synergy catastrophe*.

2.2. Before 1970

The chief characteristics of late stone age culture are stone tools, hunting and gathering, and a nomadic lifestyle. Besides these characteristics, the !Kung enjoyed a state of high synergy. This was manifest in the sharing of food and lodging in camps, and in the

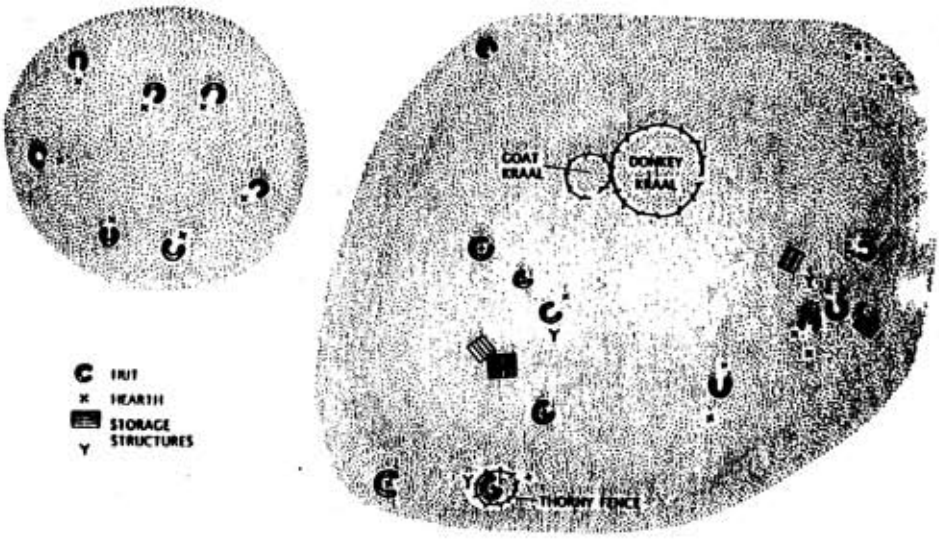

Figure 1 Camp plans of the !Kung, stone age (left) and iron age (right) (From Yellen, p. 104).

layout of the camps. As shown in Figure 1, the camp plan of the paleolithic !Kung was a close-drawn circle of huts with entryways facing inward, and the hearths outside the entryways. These hearths were nuclei of open and intimate social activity and economic exchange for the entire group.

2.3. After 1975

Within a few years, the Kalahari !Kung adopted the iron age culture of the encroaching Bantu immigrants. New tools and small farms replaced nomadic hunting and gathering to a large extent. The camps became permanent settlements. The plan of the camps changed to a looser circle, with the entryways facing outwards, as shown in Figure 2. The hearths were moved into the entryways. Openness and sharing gave way to privacy and hoarding. The distance between huts increased. (Compare Poston, 1975) Storage in locked trunks and sheds became common.

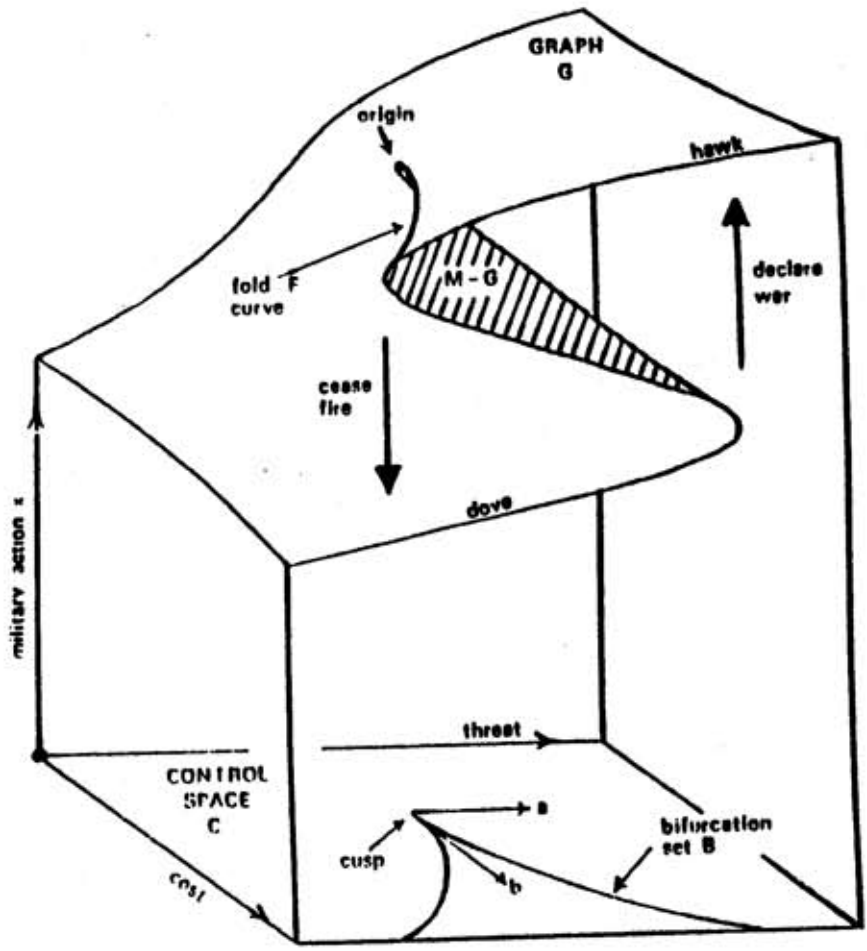

Figure 2 Arms race, one nation (From Zeeman, p. 330).

3. A MICRODYNAMIC MODEL

Previously, we had constructed a model for the dynamics of a social group in which individuals make decisions chosen from a cone of possible choices which seem rationally acceptable according to local (individual) criteria. (Abraham, 1985) In this kind of model, synergy appears as a measure of the intersection of individual preference cones and group preference cones. We may call this a *microdynamic model*, in that the choices of each individual are represented in the model, as in microeconomics.

3.1. Microdynamic Bifurcations

If the cones, and thus the dynamics of the group, are changed by a continuous parameter, derived changes are to be expected in the long-term behavior of the model. That is, the map of attractors and basins of the system will be changed by the parameter. Occasionally, particularly abrupt changes may occur, typical of bifurcations familiar from the simpler models of dynamical systems theory. In addition, we may expect unfamiliar bifurcations, special to this category of model, in which choices are made at random within a preference cone, rather than being prescribed by a vector.

3.2. Synergy Bifurcations

One such bifurcation we might observe is the *synergy bifurcation*, in which the intersections of preference cones abruptly increase or decrease. We might propose this as an (abstract) model for the transformation of the Kalahari !Kung in the 1970s. Like microeconomic models of this type, the dimension is very large, and simulation is not practical. We now seek a simpler model.

4. MACRODYNAMIC MODELS FOR A SYNERGY CATASTROPHE

Consideration of the aggregate behavior of the tribe leads to a simpler, low-dimensional, model. We first follow the example of Zeeman's cusp-catastrophic model for the arms race, shown in Figure 2. (Zeeman, 1977)

4.1. Single-Cusp Models

For the state variable, in place of the accumulation of arms as in Zeeman's model, we pose the accumulation of goods: domesticated animals, fields, tools, etc. For the control variables, in place of the fear and cost of a war, we take synergy and willingness to trade with

other social groups. Assuming then, as in the Zeeman model, a gradient dynamical scheme with a cusp catastrophe, we obtain the model shown in Figure 3. Within this model we have shown a curve of gradual decrease in social synergy, resulting in a catastrophic increase in hoarding.

While this is a close analog of the Zeeman model, a simple modification will provide another model which more closely fits the !Kung data. We now rearrange the model of Figure 3, by exchanging two axes, into a cusp model in which a gradual increase in stored goods results in a catastrophic drop in social synergy, as shown in Figure 4.

We now go on to consider the interaction of the !Kung and the Bantu, by combining two single cusp models, as in the Kushelman double-cusp model for an arms race.

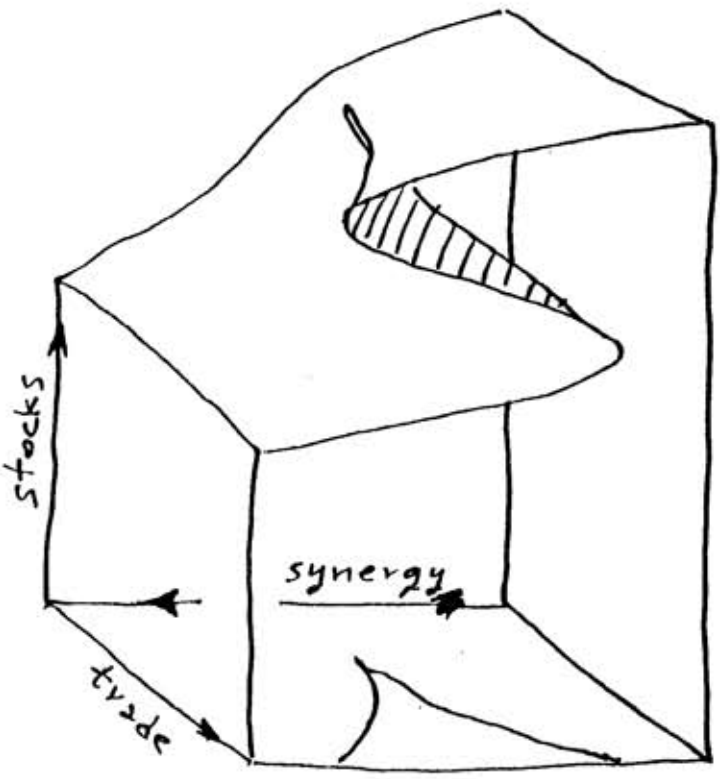

Figure 3 Goods catastrophe for one tribe.

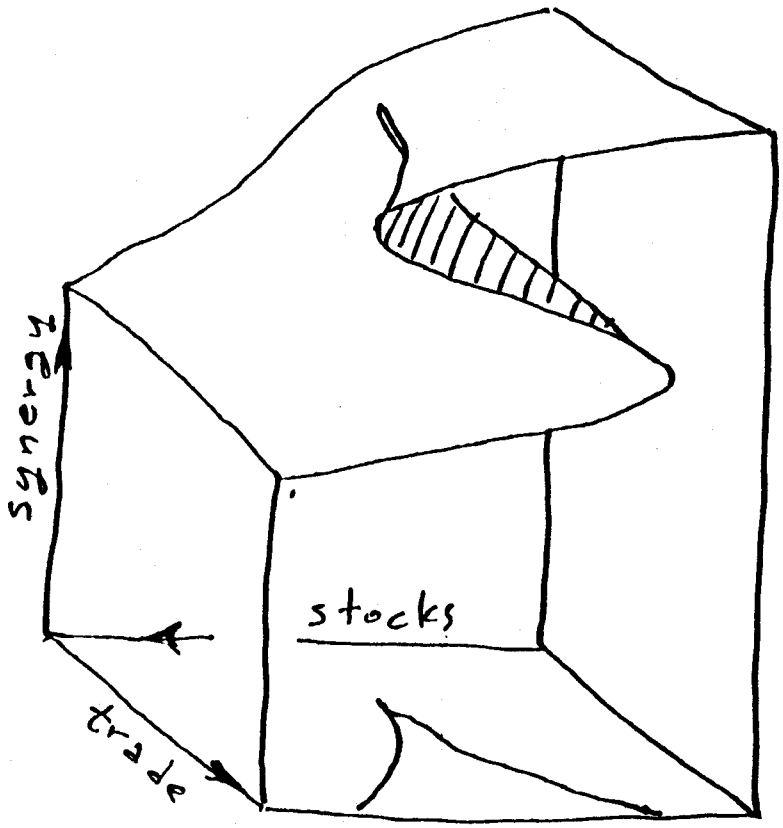

Figure 4 Synergy catastrophe for one tribe.

4.2. A Double-Cusp Model

We consider two similar models for the synergy of a tribe, as in Figure 4. We connect them in a complex dynamical scheme by determining the trade-willingness parameter of each as an increasing sigmoid function of the synergy of the other. The wealth of each remains (for the moment) an uncoupled control parameter. Of course, there are many other possibilities for this mutual coupling. But with this agreement, we have a complex scheme with a two dimensional state space (Bantu synergy, !Kung synergy) and a two-dimensional control space (Bantu wealth, !Kung wealth). As established by Kushelman, this model admits periodic attractors in a large region of the control space. The response diagram of Kushelman is shown in Figure 5.

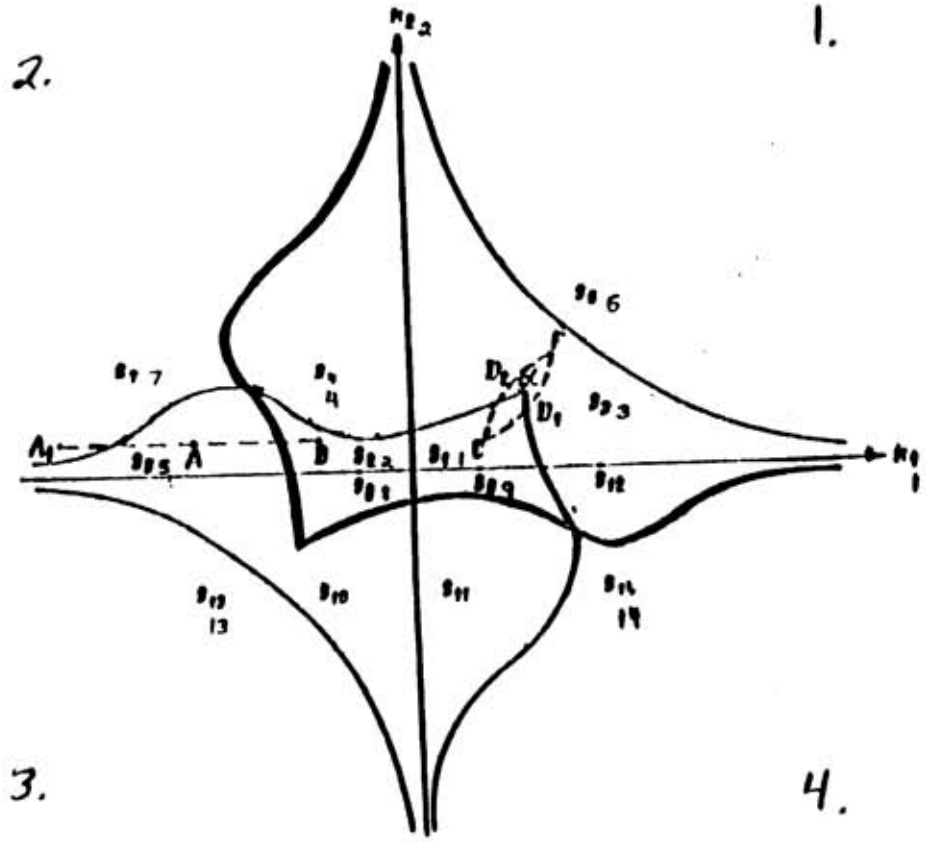

Figure 5 Control space of the double cusp model: the Kushelman response diagram.

These control parameters could be further reduced by the introduction of a macroeconomic model, presumably of the North-South type. (See Chichilnisky, 1993) For example, a cone field for intertribal trading could be introduced on the control plane. In any case, we obtain a reasonable and simple model for the !Kung catastrophe.

5. CONCLUSION

Complex dynamical systems theory has been used to construct a simple dynamical model for the social transformation of the Kalahari !Kung. It consists of a two-dimensional social state space attached to each point of a two-dimensional economic model for the

intertribal economic activity between the !Kung and the Bantu. The social state space is defined in terms of Ruth Benedict's concept of social synergy. The dynamics of the economic activity between the two tribes may be an economic equilibrium, a dynamical, or a preference-cone system. The overall gain from this modeling exercise may be understood as a cognitive strategy, in which anthropological and economic variables are mutually coupled. Intuition based on this exercise may be applied to other examples of social catastrophe, such as our own (Grant, 1995).

When a bifurcation occurs and there are competing attractors (are we moving towards a violent or a nonviolent planetary society?) a dynamical model (or even just dynamical literacy) may make a desirable outcome more likely. When the basin boundaries are fractal, we may have an opportunity to obtain a large change in the outcome through a small intervention. (Abraham, 1993) This is similar to the butterfly effect of chaotic attractors, but applies to bifurcation and basin boundary, rather than to trajectories on an attractor.

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