Cooperation, Competition, and the Challenge of Post Conflict Reconstruction

Professor Alexander E.R. Woodcock, Ph.D.

Chief Scientist and Vice President
BAE SYSTEMS, Fairfax, Virginia, U.S.A.
e-mail: woodcock@syncorp.com

Alexander (Ted) Woodcock is Chief Scientist and Vice President at BAE SYSTEMS (formerly Synectics Corporation), Fairfax, Virginia. He is a Member of the Royal Swedish Academy of War Sciences. He is also Guest Professor at the National Defence College, Stockholm, Sweden, Distinguished Visiting Professor at the School of Public Policy, George Mason University, Fairfax, Virginia, and a Visiting Professor at the Royal Military College of Science, Shrivenham, England. He is actively involved in the development and implementation of societal dynamics models of military, political, economic, and other processes for the modeling and analysis of low intensity conflict, peace and humanitarian operations, and related areas. He has published several textbooks, including The Military Landscape: Mathematical Models of Combat for which he was the co-author, and is the senior editor for several international conference proceedings. He has a Ph.D. in Biology and an M.Sc. in Biophysics from the University of East Anglia in England, and a B.Sc. (with honours) in Physics from Exeter University in England. He is a Full Member of Sigma Xi.

ABSTRACT

The ability to undertake post conflict reconstruction in countries of interest will be determined by the willingness of individuals and organizations to work together under conditions of societal destruction caused by competition and conflict (Figure 1). Models based on catastrophe theory provide a basis for understanding societal behavior needed to chart a course for societal reconstruction and sustained growth. It is expected that further development of these models could provide a basis for assessing the likely outcome of actual post conflict reconstruction activities funded by international sources. A series of "thought experiments" are undertaken and used to identify cooperation, competition, conflict, and conciliation as determinants of overall behavior. Catastrophe theory is used to provide a synthetic modeling environment that incorporates these properties into a common framework for the modeling and analysis of societal behavior. Each of these properties is represented as a control factor associated with synthetic modeling entities called catastrophe landscapes.

Catastrophe landscapes represent the complete ensemble of all stationary state conditions drawn on a grid system representing the key influences at work in a particular system. Catastrophes with an even number of controls can model societies that are inherently stable, those with an odd number can model inherently unstable societies. Thus cooperation in he absence of any other influence is inherently destabilizing. Competition, a second factor, serves to stabilize the situation, while the emergence of conflict as a third factor is a

destabilizing influence. Conciliation, which involves non-bellicose conflict resolution mechanisms is a fourth factor that provides stability.

The ability of catastrophe theory-based models to describe the inherent stabilizing and destabilizing effects of key societal influences can provide interesting insights into the nature of actual political systems. The catastrophe theory-based approach implies that societies involving the action of an odd number of key societal influences are inherently unstable while societies with an even number of influences are inherently stable. The consequences of such an observation are explored in a number of actual political situations. The catastrophe theory- based approach to modeling the stability and instability of political structures described earlier in this paper can illustrate the phenomenon of failing and failed political states and the emergence of new state-like entities. Failing states are characterized by a failure of the government structures to provide security, protection, and an environment that supports the growth of a wide range of societal processes and the catastrophe theory-based modeling framework is used to examine the causes and effects of such failure.

COOPERATION, COMPETITION, AND THE CHALLENGE OF POST CONFLICT RECONSTRUCTION

The Challenge Of Post Conflict Reconstrucion

Simple Thought Experiments Can Illustrate Patterns of Human Behavior

The Societal Reconstruction Landscape

- Cooperation Involves Sharing and Collaboration
- Competition Involves Exclusion and Marginalization
- Conflict is a Destabilizing Influence
- Conciliation Involves Laws, Customs, and Non-bellicose Conflict Resolution Mechanisms

Two Dimensional Societies Are Inherently Stable, Three Dimensional Societies are Unstable

Figure 1: Cooperation, Competition, and the Challenge of Post Conflict Reconstruction.

THE CHALLENGE OF POST CONFLICT RECONSTRUCION

The ability to undertake post conflict reconstruction will be determined by the willingness of individuals and organizations to work together under conditions of societal destruction caused by competition and conflict. Charting a course for societal reconstruction and sustained growth will require an understanding of the underlying processes responsible for generating all aspects of societal behavior. Such an understanding would permit the tendency to engage in conflict to be contained and controlled by other influences and provide an environment in which the generation of resources can take place for the benefit of the wider society. This paper identifies cooperation, competition, conflict, and conciliation as fundamental processes determining overall societal behavior and uses entities called catastrophe landscapes to provide maps to chart the causes and effects of societal change.

Post-conflict reconstruction is involved in facilitating the transition from sustainable peace after the cessation of hostilities and enabling long-term peacetime economic and societal development to occur. The transition from peace to conflict is associated with increasing levels of violence and the erosion of existing political, military, economic, and other structures. Chaotic conditions are created where normal societal processes become impossible to maintain. Conflict can eradicate the achievements of many decades of development by wiping out physical assets, disrupting trade links, and destroying human capital. Conflict can also leave a legacy of militarized and divided societies, human displacement, and severely reduced institutional capacities.

The transition from conflict to peace is often associated with insecurity, uncertainty, and cycles of violence. A more fundamental understanding is needed of the nature of violent conflict in situations of interest and of the associated economic and social disintegration so that post conflict reconstruction can be carried out with the greatest effectiveness. Many conflicts involve ethnic and religious factors. However, these factors also have economic, social, and political dimensions, and may involve the competition for scarce resources. The action of external or internal actors can increase the level of conflict.

The production of a self-sustaining socio-economic environment through post conflict reconstruction must involve re-establishing the framework of governance; repairing vital physical infrastructure; supporting land mine action programs; rebuilding and maintaining key social infrastructure and human capital; and providing assistance to those affected by war (The World Bank, 1998). Other activities must involve restoring social capital; normalizing financial borrowing arrangements; creating the conditions for resumption of trade, savings, and domestic and foreign investment; and promoting macroeconomic stabilization.

Economic restructuring faces particular challenges due to the fragile political conditions in conflict and post-conflict societies. Failure to address social needs may create conditions that serve to generate new disparities that can trigger new episodes of conflict. It is evident that economic programs that demand budget cuts and other types of savings can actually work against the peace process. Under such circumstances, new approaches are needed to define the nature and role of economic and development entity intervention in support of the post-conflict reconstruction process.

The World Bank has observed that a balance must be achieved between military and civilian spending and each must be modified to produce a sustainable socio-economic environment. Post conflict reconstruction requires local ownership and investments must be made at local community levels. Furthermore, The Bank has stated that military spending must be reduced and the savings used to support the enhancement of social institutions and

civil society. This would increase stability and reduce the likelihood of further conflict. Furthermore, demilitarization, demobilization, and the re-integration of ex-combatants must be carried out. A strong legitimate government is required to provide guidance and coordination of post conflict reconstruction activities

Conflict dynamics can become so powerful that they are incapable of being modified by normal economic processes and development activities. Under such circumstances, international peace operations involving the use of military forces may be necessary to generate the necessary conditions of societal stability before reconstruction can be contemplated. One critical factor in permitting the processes of post conflict reconstruction to begin is the need to reduce the threat of landmines to a wide spectrum of societal, agricultural, industrial, and other activities. Failure to do so causes continual human suffering and creates new victims, hampers reconstruction, undermines the effect of intervention, and creates additional conflict drivers.

SIMPLE THOUGHT EXPERIMENTS CAN ILLUSTRATE PATTERNS OF HUMAN BEHAVIOR

The complexity of the problems associated with post conflict reconstruction has created the need for a comprehensive understanding of the relationship of conflict to other societal processes. Such an understanding can assist in identifying conditions where post conflict reconstruction could be either beneficial or counter-productive. Development of such an understanding will begin with the description of a series of simple "thought experiments" undertaken to examine the contribution of processes identified as cooperation, competition, conflict, and conciliation to overall societal behavior. It is argued that specific societies can be characterized by particular levels of those processes, and identifying their relative contribution can provide the basis for estimating the likely success of post conflict reconstruction activities in that society.

The willingness to undertake societal reconstruction suggests that competition and conflict might not be the most basic types of human activity. In other words: it is possible to ask the question: Is conflict the primary human characteristic, as Susan Woodcock challenged me, or did the earliest human activities involve collaboration and cooperation to provide security and resources in a hostile environment? Such a finding could have important implications as we face the challenge of the post Cold War era and starvation, disease, environmental disaster, and other threats. With competition as the basic instinct, the human species may be on a path of exclusion and marginalization that may benefit the few at the expense of the many and lead to ultimate catastrophe. If cooperation is the basic instinct, then collaboration and sharing could result in the production and use of resources for the benefit of the many and other actions that could significantly enhance the possibility of creating a sustainable environment.

In order to answer the question "is cooperation or competition the fundamental basis for human behavior?" it is possible to project ourselves back into a distant, pre-historic era, and carry out a form of "thought-experiment." In order to do this, we imagine a form of hunter-gatherer society in which members of biological families perhaps cooperated to find and obtain food and other vital resources. With low population densities there was perhaps little incentive for competition beyond the competition between the dominant member of the

family and those who aspired to the leadership position. In the notional group shown in Figure 2, four individuals are involved in cooperative interactions aimed at generating and using resources to support group survival. The emergence of competition within a family group is illustrated in Figure 3 which shows competition (indicated by the arrows) between one individual, which can be identified as the group leader, and two other group members. If successful, such competition could result either in a possibly new leadership entity that remains contained within the initial group or the division of that group into sub-groups each under the leadership of one of the competitors.

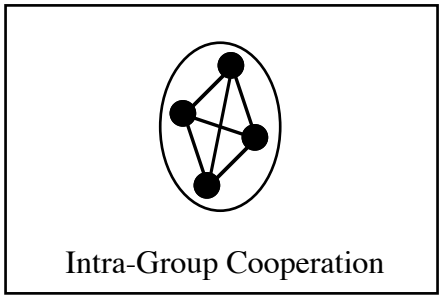


Figure 2: Initial societal interactions may have involved intra-family and/or intra-group cooperation.

Increased population densities and scarcity of resources could trigger two different types of response — a continuation and perhaps an increase in the scope of the collaboration within the biological family into a collaboration between families. This could result in a sharing of resources between members of multi-family groups without creating overwhelming advantages for any one individual or family group. The other response — competition — would lead to conflict and exclusion as one family or group sought to prevent others from obtaining vital resources and other assets. The need to compete would create a need for improved tools. Such tools could be enhanced and turned into weapons and directed against competing groups. Those that had better weapons would be able to defeat competitors with poorer weapons and those who eschewed conflict for collaboration. In the situation illustrated in Figure 4, three groups (labeled (a), (b), and (c)) are involved in inter-group cooperation and some of them are involved in intra-group cooperation and collaboration. A fourth group (labeled (d)) is involved in competitive interactions with the three other groups, who might collaborate for self-protection against that fourth group. Escalation of this inter-group competition can result in conflict involving the use of lethal force.

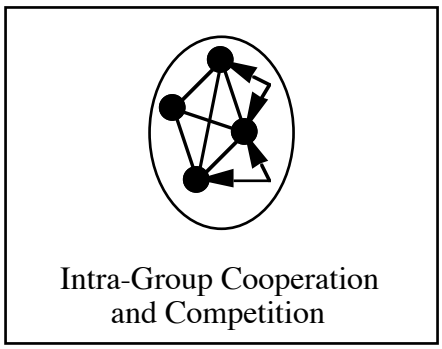
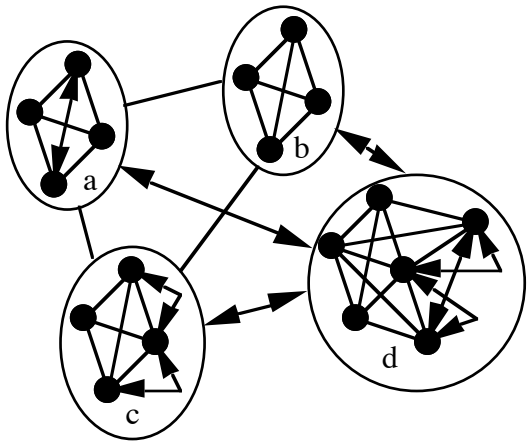


Figure 3: Subsequent societal interactions may have involved intra-family or intra-group cooperation and competition.

In these early acts involving the evolution of competition into conflict, we see perhaps the emergence of the first arms race: The groups with the most effective weapons could obtain resources at the expense of other groups. There are of course limits to any human endeavor. Resources are not boundless and the cost of producing and maintaining advanced weapons systems can prevent investment in other activities that may otherwise insure long-term survival. Something that the Soviet Union has found to its cost! The inability of the Soviet economic system to compete in both military and economic conflicts with the United States led to its ultimate destruction and the start of the post Cold War era.



Intra-Group Cooperation and Competition and
Inter-Group Cooperation and Competition

Figure 4: Further increases in societal complexity may have led to inter-family or inter-group conflict.

There are other factors and influences that can emerge as collaboration turns into competition and conflict drives the need for more powerful and lethal weapons. Carried out unchecked conflict can, and certainly has, created massive devastation and bloodshed. Human society has evolved rules and laws that govern behavior to protect individuals and minorities. Such laws can prevent the use of force for conflict resolution. Perhaps these laws have evolved from the early actions of primitive family groups where dominant individuals might have prevented sub-dominant individuals from attacking each other with lethal force in order to safeguard the longer-term stability of the group. Perhaps there were other origins, but suffice it to say, modern national laws and the emergence of international laws appear to provide mechanisms for insuring stability and maintaining societal survival.

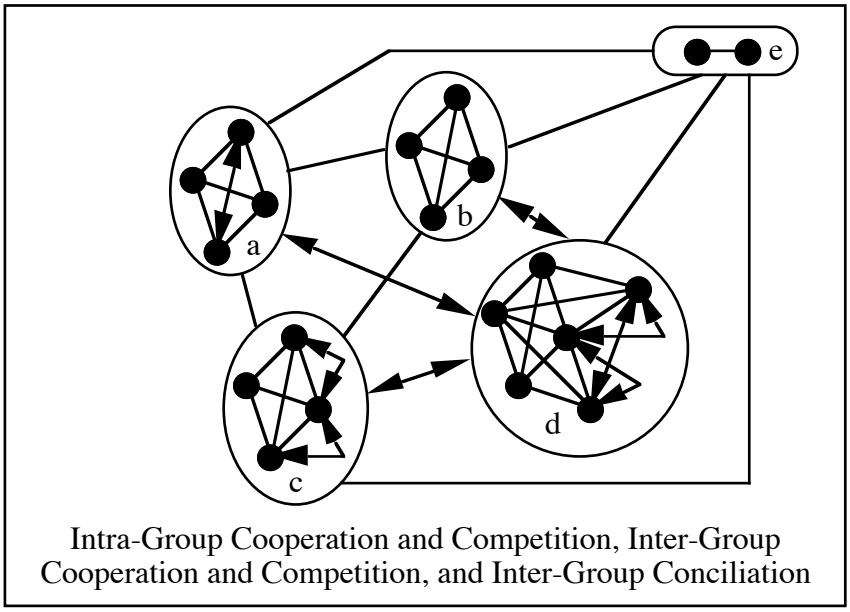


Figure 5: Conciliation may have evolved to reduce the destabilizing effects of inter-family or inter-group conflict.

In the situation involving conciliation shown in Figure 5, an entity (labeled (e)) is assumed to be undertaking conflict resolution and other activities to reduce tension and resolve disputes with the minimal use of overt force. Such entities include local, regional, and national law enforcement and judicial systems and such international entities as the United Nations, the Organization of Security and Cooperation in Europe (OSCE), and the International Court of Justice.

THE SOCIETAL RECONSTRUCTION LANDSCAPE

We have just argued that cooperation, competition, conflict, and conciliation can represent different types of interaction between individuals and groups and that particular levels of such interactions can characterize particular societal conditions. These interactions can be considered as the key societal influences or factors responsible for generating patterns of societal behavior. Having made such an assumption, it is necessary to understand how these influences might work together to determine overall societal behavior. What is needed for this purpose is a synthetic modeling environment that incorporates all the factors into a common framework. Catastrophe theory can provide such a framework, as will now be demonstrated.

KEY SOCIETAL INFLUENCES DETERMINE SOCIETAL BEHAVIOR

Each of the factors described as cooperation, competition, conflict, and conciliation are identified with one of the control factors associated with catastrophe theory-based models. The consequences of the selection of particular types of situation, which will be represented by the selection of particular values for these influences, will be examined. This examination

will involve the construction and analysis of graphs that represent properties described as Resource Distribution Potentials as well as entities called Societal Landscape diagrams.

The process of model-building will be performed in an ordered sequence commencing with an examination of the behavior of primitive types of society whose behavior is determined by the level of cooperation between individuals and groups. This model will be based on an entity called the Fold catastrophe that has one key influence. The Fold catastrophe, as well as an entity known as the Swallowtail catastrophe (which has three key influences) represent processes associated with societies that are inherently unstable. By contrast entities called the Cusp and Butterfly catastrophes (which have two and four key influences, respectively) are inherently stable, and can be used to model inherently stable societies as a consequence (Figure 6). These "structural" properties of the catastrophe theory-based models have significant consequences and can provide important insights on the nature of the processes needed to maintain long-term societal stability. Thus, the model-based analysis provided below will demonstrate the following phenomena:

- *Cooperation:* a society whose activities are based solely on cooperation will be inherently unstable and would disintegrate when the will to cooperate disappears through the death of a respected leader, for example.

- *Cooperation and Competition:* The emergence of a second factor involving competition between entities and individuals has the possibly paradoxical effect of stabilizing an inherently unstable societal environment involving cooperation alone. Such competition can take place either within or between family groups and other entities, and these actions can determine the distribution pattern for resources generated within the overall society.

- *Cooperation, Competition, and Conflict:* Conflict is the third key influence and represents an inherently destabilizing societal factor in the catastrophe models. Two different types of conflict are identified below. One of these, called Acquisitive Conflict involves the capture and utilization of resources by the forces involved in conflict. By contrast, the other type of conflict, called Altruistic Conflict, involves the transfer of resources by the entities involved in such conflict to disadvantaged third party entities. This type of conflict would take place during peace and humanitarian operations supported by military forces, for example.

- *Cooperation, Competition, Conflict, and Conciliation:* Conciliation involves the development and implementation of rules, laws, and other entities aimed at the regulation of societal processes and the settlement of disputed by non-bellicose means. Conciliation represents a fourth key influence and therefore acts to stabilize societal conditions that are destabilized by conflict. Conciliation has emerged as a major factor in national and international relations during the last half of this century, and would appear to be of ever-increasing importance as we enter the highly complex environment of the next century.

LANDSCAPE MODELS CAN REPRESENT DIFFERENT DEGREES OF SOCIETAL COMPLEXITY

There are seven elementary landscapes (or, technically, manifolds) and they are particularly useful for modeling situations where gradually changing forces can produce either gradual or sudden changes in behavior in the same system under different conditions (Woodcock and Poston, 1974, for example). Applications of the catastrophes involve the construction of the simplest possible model (that is a model that uses as few control factors and behavior variables as possible) that can capture the essence of overall system behavior. Once the number of variables at work in a particular system has been identified, catastrophe theory provides an indication of which landscape is appropriate for expressing the causal relationships between these variables.

System behavior can be described in catastrophe theory in terms of entities called potential energy functions. The maximum and minimum values of these functions represent the stationary state-behavior of such systems. Catastrophe theory-based landscapes represent the complete ensemble of all such stationary state conditions drawn on a grid system representing the key influences at work in a particular system (Thom, 1978; Zeeman, 1978; and Poston and Stewart, 1978, for example). In some cases it is appropriate to construct probability distributions that describe the likelihood that a system would exhibit a particular type of behavior.

The catastrophes have names that reflect the shape of their associated landscapes. The Fold catastrophe has one, the Cusp two, the Swallowtail three, and the Butterfly four control dimensions, respectively (Figure 6). As shown below, catastrophes with an even number of controls can model societies that are inherently stable, those with an odd number can model inherently unstable societies (Woodcock, 1998, for example). Each of these catastrophes has a single behavior dimension so that the Fold, Cusp, Swallowtail, and Butterfly catastrophes are essentially two, three, four, and five dimensional objects, respectively. An additional group of elementary catastrophes called umbilics that have two behavior dimensions could be used as the basis of more complex societal models.

Catastrophe Name	Dimensions		
	Control	Behavior	Overall
Fold Catastrophe	1	1	2
Cusp Catastrophe	2	1	3
Swallowtail Catastrophe	3	1	4
Butterfly Catastrophe	4	1	5

Figure 6: Four catastrophes have been used to model societal behavior. Catastrophes with even numbers of control dimensions can model inherently stable societies, those with an odd number of controls can model inherently unstable societies.

COOPERATION INVOLVES SHARING AND COLLABORATION

The Fold, Cusp, Swallowtail, and Butterfly catastrophes can model the behavior of societal systems whose behavior is determined by one, two, three, and four key influences, respectively. These influences can represent the level of cooperation, competition, conflict, and conciliation at work in a societal system composed of interacting family- or group-like entities. The Fold catastrophe can model the behavior of relatively simple primitive societies in which individuals act cooperatively for the common benefit to generate and use resources. In this case, the single key influence or control factor of the Fold catastrophe is identified as the level of cooperation within a society. In development of this model, it was stipulated that larger negative values represent higher levels of cooperation (Figure 7).

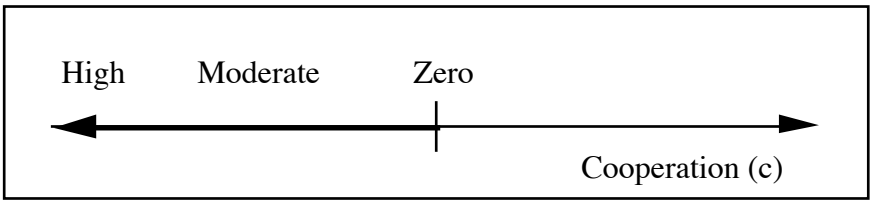


Figure 7: The fold control factor (c) is identified with the level of cooperation.

Potential energy graphs associated with the Fold catastrophe and drawn for different levels of cooperation can illustrate the degree of societal stability that can be supported by different levels of that control factor. In this application, the Fold potential function will referred to as the Fold Resource Distribution Potential. Graphs are drawn for three values of the single control factor (labeled (c) here) representing societies with different levels of cooperation (Figure 8). Decreasing levels of cooperation occur as relationships between individuals change and people are increasingly unwilling to work with others for the benefit of the overall group, for example. This would reduce the local stability of the pattern of resource distribution.

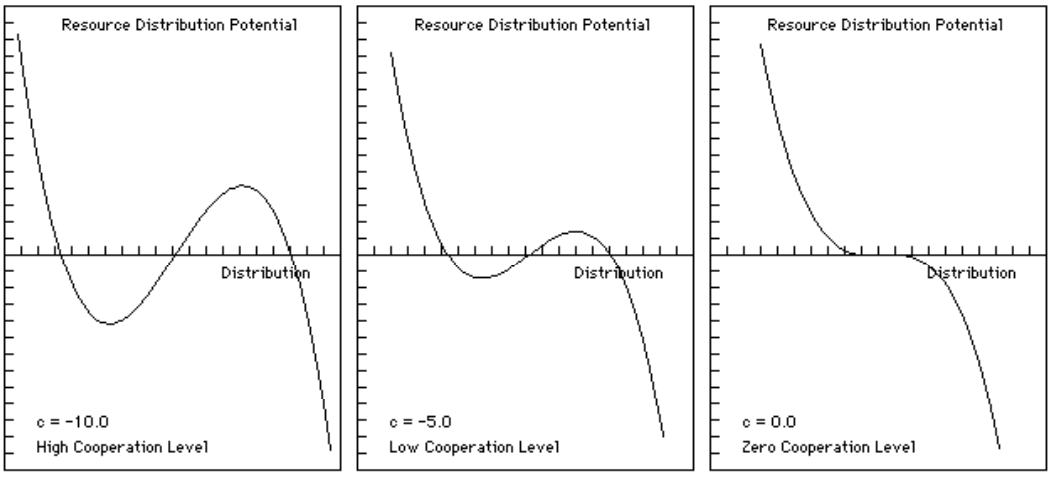


Figure 8: The Fold catastrophe potential function has maximum and minimum values for negative control factor values. The minimum values represent stable states, the maximum values represent unstable states. When used as a model of resource distribution reduction in the level of cooperation causes a decrease in local societal stability.

The degree of stability of societal conditions modeled by catastrophe potentials is indicated by the height of the barrier between the minimum value and the rest of the curve. This barrier prevents transitions from that minimum to another stationary condition. In the

case of the Fold catastrophe the only other available minimum value is located at negative infinity. With the control factor c = -10.0, representing a notionally high level of cooperation, the graph has well-defined single maximum and minimum values and relatively large disturbances are needed to undermine stability. Decreasing the control factor to c = -5.0 causes a reduction in cooperation and a consequential decrease in societal stability. The stationary states disappear at c = 0.0 and the only available stationary state is now located at infinitely negative values. A society under these conditions would be unstable and exhibit highly erratic behavior.

It is such behavior that reveals the inherent instability of systems with one control factor. This behavior is represented by the shape of an entity called the Fold catastrophe landscape, or manifold, (Figure 9) associated with systems whose behavior is controlled by a single control factor. The catastrophe manifold diagram represents the complete ensemble of maximum and minimum values of the potential function, and only exists for negative values of the control factor c. In this and the following examples, resource potential diagrams are drawn for specific values of the control parameters for illustrative purposes only, particular control factor values do not necessarily represent specific societal conditions.

A complete loss of the will to cooperate without the presence of some other form of organizing principle can cause societal disintegration. Such societies may not survive the death of a leader who played an active role in promoting collaboration, for example. Societal systems with two control factors can be modeled by the Cusp catastrophe are inherently stable since they posses two different organizing principles, as described below. Qualitative assessments of the level of cooperation in primitive societies can provide an estimate of the likely stability and therefore survival of such societies.

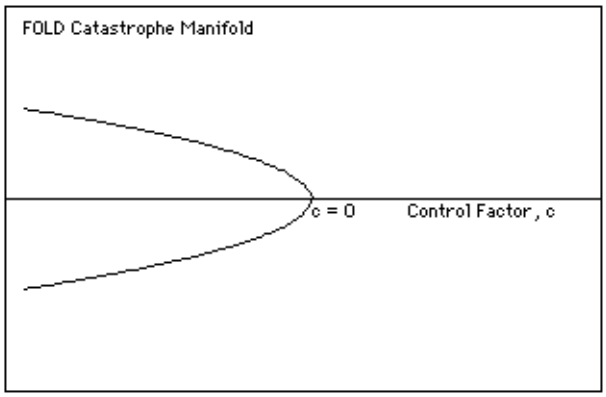


Figure 9: The Fold catastrophe manifold only exists for negative control factor values.

COMPETITION INVOLVES EXCLUSION AND MARGINALIZATION

The introduction of a second major societal influence reflecting the action of competitive as well as cooperative forces has a profound effect on the patterns of behavior that can occur. As described above, cooperation involves the generation of resources that can be consumed by a group or community as a whole. Competition, by contrast, involves selective exclusion of uncompetitive individuals and groups from access to resources and their subsequent

marginalization as they fail to obtain vital materials. Individuals can act in both cooperative and competitive ways both with their own group members and also with those in other groups, involving intra- and inter-group actions, respectively.

The Cusp catastrophe has two key influences, or controls, and therefore can model the effect of cooperation and competition on overall societal behavior. The Cusp potential function can have either one minimum or two minima depending on the values of the two key influences and these minima can represent two qualitatively different types of societal behavior. Specific values of these factors characterize any particular situation can be represented as a position on the catastrophe control plane (a, b), as shown in Figure 10.

Specialized control factors that represent the impact of conflicting forces on system behavior have been defined by Zeeman (see: Zeeman, 1978, and Dockery and Woodcock, 1993, for example) and will be used in subsequent models in this paper. Negative values of the conflicting forces are assumed to represent intra-group activities while positive values will represent inter-group activities (Figure 11). Zero conflicting force values represent an absence of cooperative or competitive interactions with individuals acting in isolation or in an uncoupled manner as free-agents. The overall pattern of behavior can be represented by an entity called the Cusp Resource Distribution Landscape which shows the possibility of dispersed, intermediate, and concentrated patterns of resource distribution (Figure 12).

- *Intra-Group Actions:* Relatively large negative values of the conflicting factors (cooperation = competition = -2.0) represent significant levels of intra-group cooperation and competition in which the forces involved in sharing and restricting the distribution of resources are both at work (Figure 11). These inputs generate a Resource Distribution Potential profile with a single minimum value located in the middle of the distribution axis (Figure 13).

- *Free-Agent Actions:* The absence of cooperation and collaboration (0.0) generates a relatively broad potential function profile that indicates many different possible degrees of resource distribution (Figure 13).

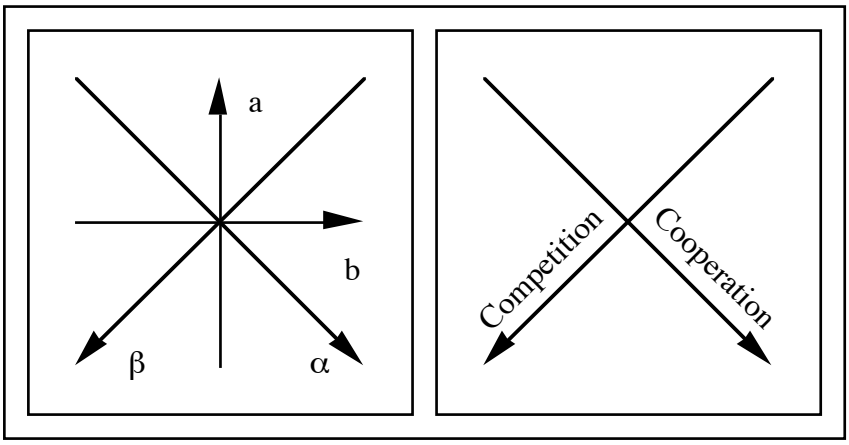


Figure 10: Control factor axes (a) and (b) define positions on the control plane of the cusp catastrophe. Conflicting factor axes (α) and (β) are rotations of the control axes and represent the impact of conflicting influences on system behavior.

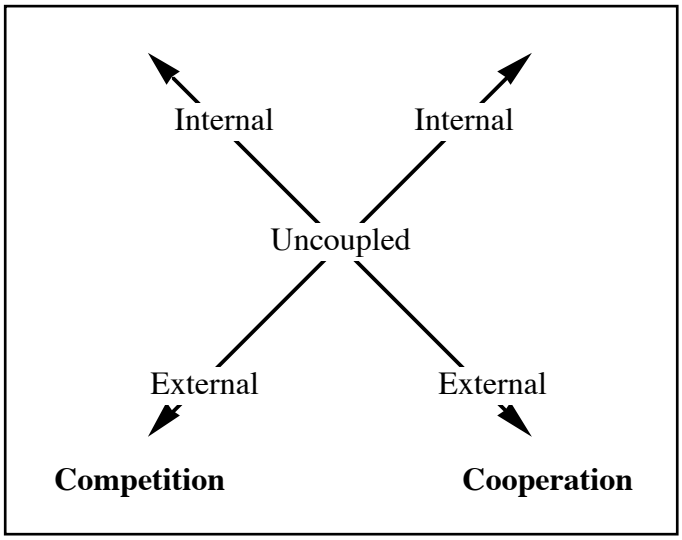


Figure 11: Conflicting factors can represent the impact of competition and cooperation.

- *Inter-Group Actions:* High positive levels of cooperation and competition (2.0) represent inter-group activities that can be reflected in a potential function with two competing minima. One of these minima represents a relatively wide dispersal of resources, the other a significant restriction on their distribution (Figure 13). Which minimum actually represents the behavior of a particular situation can be determined by pre-existing societal conditions.

The qualitative assessment of the levels of cooperation and conflict in a society of interest could provide an indication of the likelihood that resources intended for reconstruction would actually be used for that purpose or be misappropriated by political or military elites for other purposes.

The Resource Distribution Landscape can provide an illustration of the effects of changes in the relative levels of competition and competition on the distribution of resources within a society of interest (Figure 14). The gradual reduction in the level of competition and a subsequent increase in the level of cooperation can lead to the gradual dispersal of resources (path a-b-c, for example). Such resources could be used for general societal reconstruction rather than being under the exclusive control of political or military elites. By contrast, a sudden collapse in competition (path a-d-e, for example) could result in the sudden release of resources under conditions where such resources could be misappropriated by entities other than those for which they had been intended.

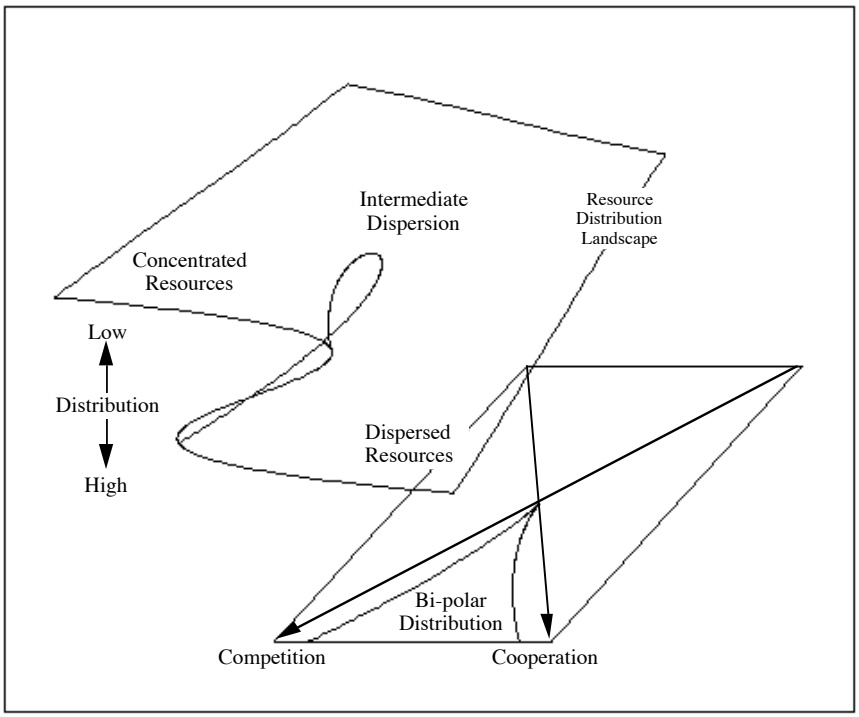


Figure 12: The Resource distribution landscape shows that cooperative and competitive actions can generate concentrated, intermediate, and dispersed patterns of resource distribution.

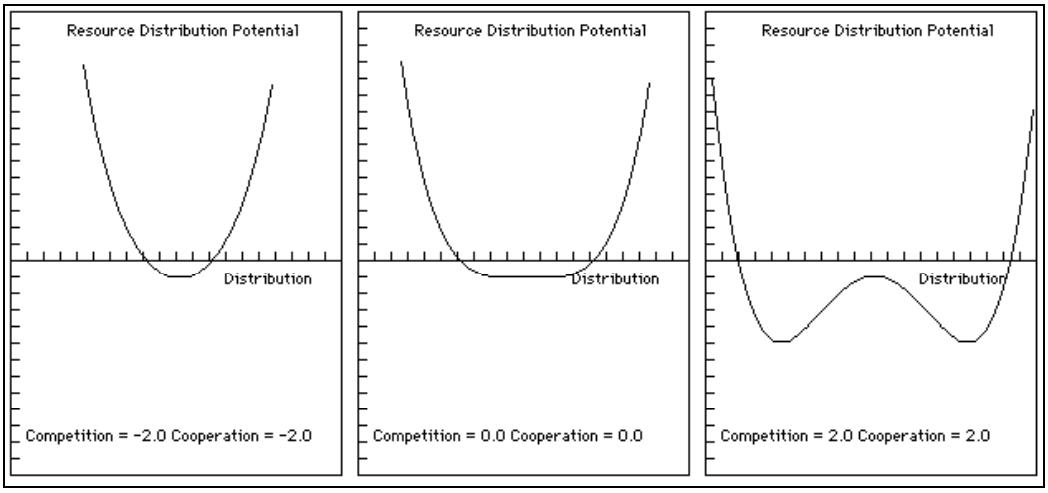


Figure 13: The Cusp catastrophe potential function has either a single minimum value or two minimum and one maximum values for particular sets of conflicting factor values.

CONFLICT IS A DESTABILIZING INFLUENCE

In the thought experiments presented above, it was argued that increased levels of competition could create conditions for the emergence of conflict, which may involve more or less violent actions. The emergence of conflict as a distinct force at work within a society

creates a third societal influence. Based on the catastrophe theory framework, a system with three controlling factors is inherently unstable so the third factor has an inherently destabilizing effect on a previously stable society. Two different types of conflict, called acquisitive and altruistic conflict, have been identified during the development of this societal model.

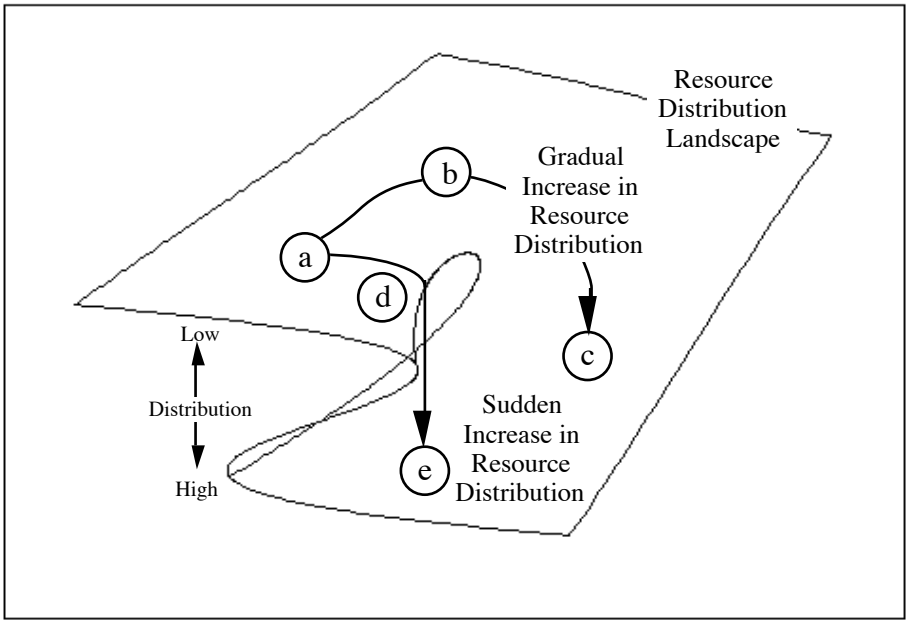


Figure 14: Paths on the Resource Distribution Landscape illustrate the gradual or sudden release of resources under different conditions.

- *Acquisitive Conflict* is involved in the use of force for the acquisition of resources from the victims of such conflict for the benefit of the forces involved in conflict.

- *Altruistic Conflict* is associated with the use of force in such activities as peace and humanitarian operations where resources are provided to disadvantaged individuals and not appropriated for the direct benefit of the forces themselves.

In the context of catastrophe theory-based models, the third factor representing conflict acts as a destabilizing influence. Use of three control factors mandates use of an entity called the Swallowtail catastrophe as a model of societal processes. The Swallowtail is similar to the Fold catastrophe in that both possess infinitely negative stationary states associated with their potential function graphs, as shown below. The nature of these control and conflicting factors is shown in Figure 15. Typical potential function profiles for the Swallowtail catastrophe are shown in Figure 16. As mentioned above, changes in the shape of the Swallowtail Distribution Potential function can illustrate the destabilizing impact on conflict on the pattern of resource distribution as shown by consideration of selected examples (Figure 16) Three different situations involving acquisitive conflict are shown.

- *High Conflict Levels:* The first example involves a high level of conflict (-10.0) and internal competition (-6.0) and relatively low levels of external collaboration creates a situation represented by the shape and location of the

potential function minima in which distribution can occur at a moderate level, or is restricted to few entities. The latter condition is the more stable state, and is more likely to occur under these circumstances.

- *Intermediate Conflict Levels:* Reducing the level of conflict (-6.0) and internal competition (-3.0) and increasing the level of external cooperation (3.0) undermines the apparent stability of the modeled resource distribution process.

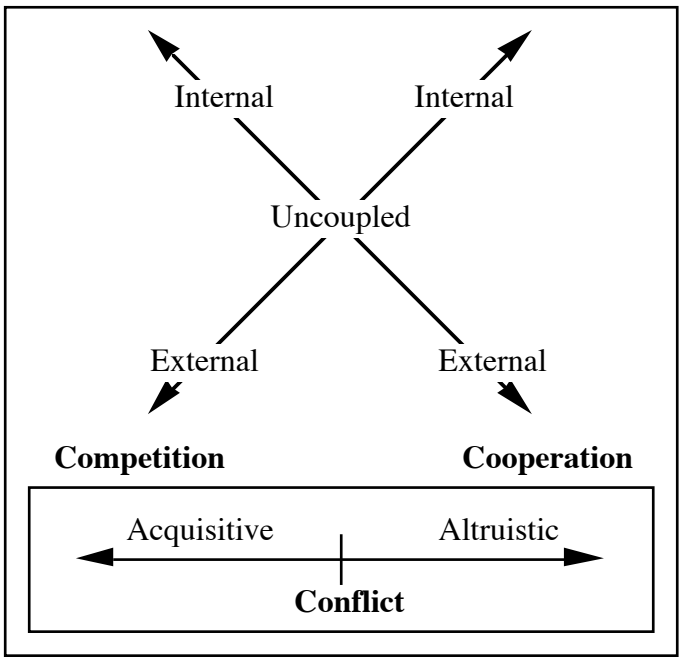


Figure 15: Models based on the Swallowtail catastrophe involve the impact of three key influences identified here as cooperation, competition, and conflict.

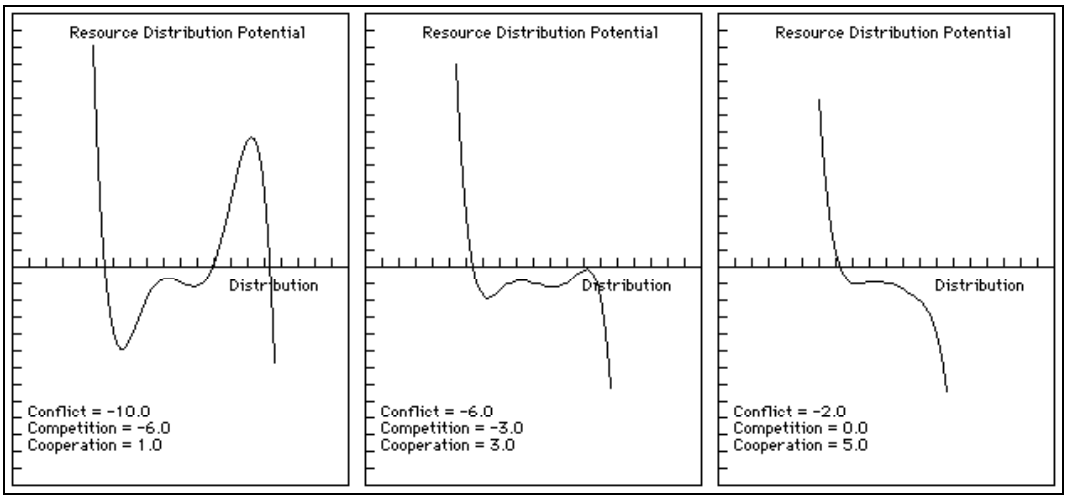


Figure 16: The Swallowtail catastrophe potential function has either two maximum and minimum values, one maximum and one minimum value, or no maximum and minimum values for particular sets of the control factor values (the second case is not shown here).

- *Low Conflict Levels:* Further reductions in conflict (-2.0) and competition (0.0) and increases in external cooperation (5.0) almost completely undermines system stability and the stationary state at negative infinity becomes the most likely outcome. With these levels of cooperation and competition, no stable pattern of resource distribution could exist.

Qualitative assessment of the levels of cooperation, competition, and conflict at work in a society of interest could provide guidance on the likely result of providing additional resources for post conflict societal reconstruction. The catastrophe model suggests that the presence of conflict creates unstable conditions where resources intended for reconstruction might be diverted to support further conflict.

CONCILIATION INVOLVES LAWS, CUSTOMS, AND NON-BELLICOSE CONFLICT RESOLUTION MECHANISMS

The above discussion has demonstrated the destabilizing impact of combat on societal processes involving the generation and distribution of resources. The catastrophe theory formulation suggests that the addition of a fourth influence can introduce stability to an otherwise inherently unstable process. In the earlier "thought experiment" an activity identified as conciliation was identified as a fourth factor involved in the control of overall societal activities. Conciliation involves customs, rules, ethics, and laws that create and maintain societal stability and act to resolve conflict by non-bellicose means. This factor can act as the fourth factor in a catastrophe model and can act to off-set the destabilizing actions of conflict described above (Figure 17).

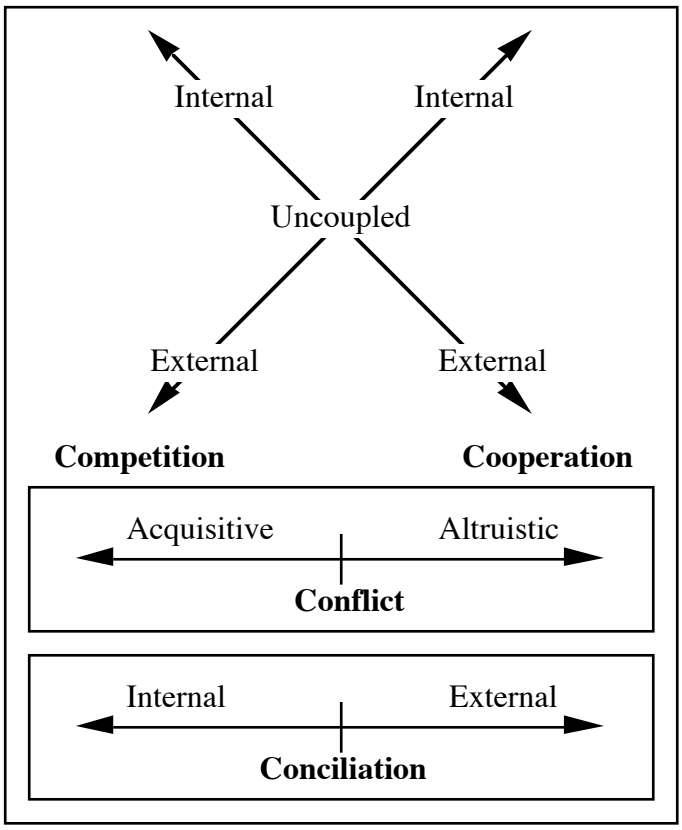


Figure 17: Models based on the Butterfly catastrophe involve the impact of four key influences identified here as cooperation, competition, conflict, and conciliation.

Negative values of the conciliation factor are assumed to reflect conciliation within groups while positive values reflect conciliation between groups. The overall pattern of societal behavior can be represented by an entity called the four-factor Butterfly Resource Distribution Landscape (Figure 18). This shows that internal conciliation in the absence of conflict can generate dispersed, intermediate, and concentrated patterns of resource distribution depending on the relative levels of cooperation and competition at work in a society.

Three examples of the Butterfly Resource Distribution Potential and the impact of different notional levels of cooperation, competition, conflict, and conciliation are shown in Figure 19. High levels of intra-group conciliation (-10.0), low levels of altruistic conflict (2.0), and high levels of external cooperation (12.0) and competition (12.0) generate three stable conditions representing low, intermediate, and high levels of resource distribution. The dominant condition is that of relatively widespread distribution. Moderate levels of conciliation (-6.0) and acquisitive conflict (-6.0) and lower levels of external cooperation (10.0) and competition (10.0) generate two stable conditions representing low and intermediate levels of resource distribution. Further reduction in the levels of conciliation (-2.0) and competition and cooperation (8.0) and increased acquisitive conflict (-14.0) creates a condition of restricted resource distribution.

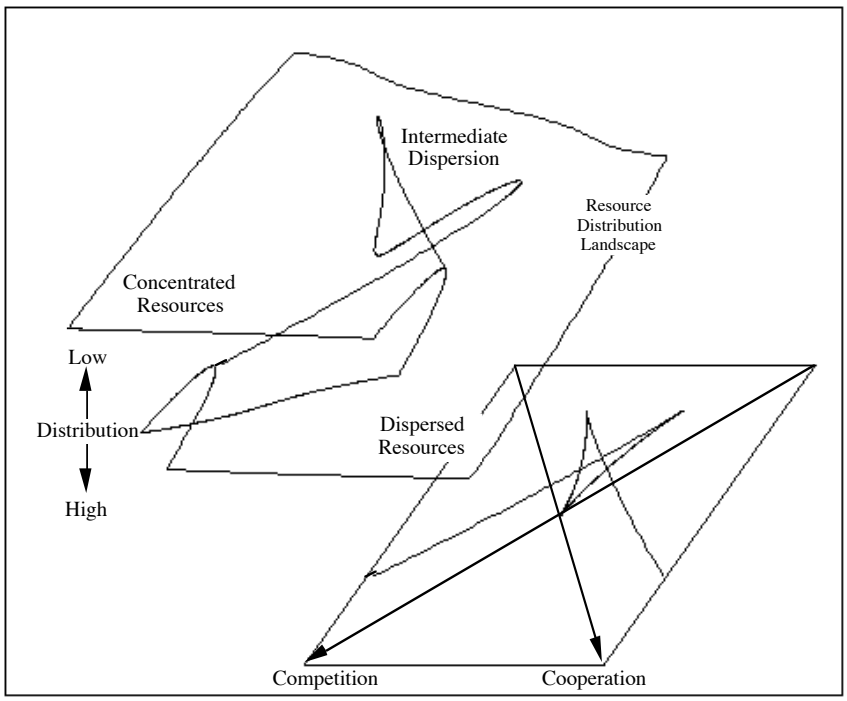


Figure 18: The Butterfly catastrophe-based Resource Distribution Landscape.

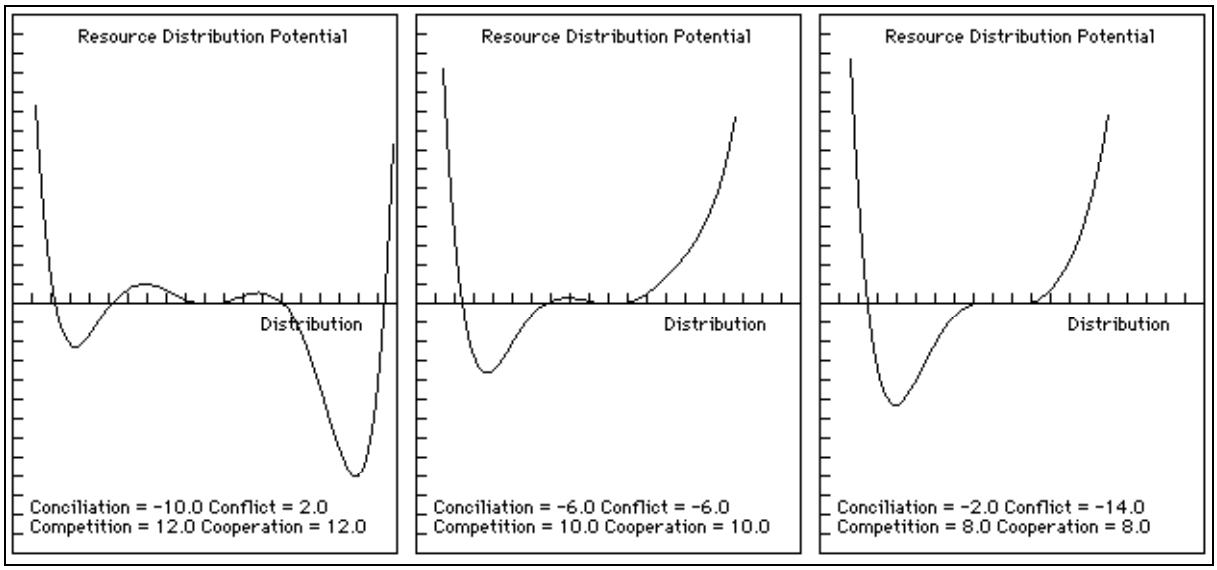


Figure 19: The Butterfly catastrophe potential function has either a three minimum and two maximum values, two minimum values and a maximum value, or a single minimum value.

Qualitative assessment of the levels of cooperation, competition, conflict, and conciliation in a society of interest can provide the basis for establishing the probable pattern of use of externally-provided resources for societal reconstruction. Under conditions of low conciliation, resources could be used by political or military elites in a restrictive manner for their direct or indirect benefit. By contrast, high levels of conciliation can create conditions in which reconstruction would take place with direct involvement of the entities involved in conciliation.

CATASTROPHE MODELS PROVIDE NEW INSIGHTS INTO SOCIETAL BEHAVIOR

These catastrophe-based models have provided a new insight into the possible role of cooperation, competition, conflict, and conciliation in determining overall societal behavior. Identification of cooperation as the basic human instinct has important implications for future societal evolutions since this focuses attention on the need for collaboration in order to insure long-term survival of our species. However, the models suggest that both cooperation and competition are necessary to provide long term societal stability. Cooperation can act to generate and disperse resources while competition places premium on the efficient use of these resources and can lead to exclusion and marginalization of entities that cannot compete adequately with others. A mixture of cooperation and competition appears to be necessary for long-term societal stability.

Increased competition can create situations where conflict can emerge as a third and inherently destabilizing societal dimension. One type of conflict, called acquisitive conflict, is aimed at obtaining and using resources form the benefit of the warrior community. This would lead to the destruction of adversaries and their facilities and their exclusion from conquered territory and other assets, for example. Altruistic conflict, by contrast, can result in the use of force in peace and humanitarian operations, for example, to prevent the repression of disadvantaged entities and to provide them with the resources needed to

support their survival without direct benefit to the forces involved in such operations. While altruistic conflict acts to reduce the effects of acquisitive conflict, the emergence of any type of conflict is regarded as inherently destabilizing. In the absence of conciliation, the catastrophe-based model suggests that an initially high level of acquisitive conflict creates unstable conditions that can result in societal disintegration as the level of conflict is reduced to a low level.

Conciliation is the fourth societal influence, and acts as a stabilizing factor within the context of the catastrophe models. It represents the rule of law that permits the resolution of conflicts in non-bellicose ways that are aimed at off-setting the destabilizing effects of conflict. Combinations of these four influences can characterize many different types of existing societies based on the pattern of resource production and distribution. These factors can also be used to construct a new series of models based on catastrophe theory and on societal dynamical principles that can be used to predict patterns of future behavior. Such models could identify where particular groups or entities might be at risk and where coordinated societal actions can act to prevent their destruction and then support overall societal survival. Failure to so can have disastrous consequences, successful actions can produce at least temporary stability, as clearly demonstrated in Somalia, Rwanda, Ethiopia and Eritrea, Chechnya, Bosnia-Herzegovina, Kosovo, and elsewhere.

The materials presented above have demonstrated, to some extent at least, that catastrophe theory-based models can represent the impact of the impact of the processes of cooperation, competition, conflict, and conciliation on societal reconstruction. The paper now continues development of a theory of political stability described in an earlier paper in the Cornwallis Group series (Woodcock, 1998) to develop a model of the impact of the factors responsible for failed and failing states.

TWO DIMENSIONAL SOCIETIES ARE INHERENTLY STABLE, THREE DIMENSIONAL SOCIETIES ARE UNSTABLE

The ability of catastrophe theory-based models to describe the inherent stabilizing and destabilizing effects of key societal influences can provide interesting insights into the nature of actual political systems, as described below. The earlier part of this paper has shown that catastrophe potential functions with an odd number of control factors or key influences have an infinitely negative potential minimum and can represent inherently unstable societal systems. Catastrophe potentials with an even number of factors do have a lower finite minimum value, and can represent societies that are inherently stable.

Under these circumstances, the destabilizing impact of conflict (identified as a third catastrophe factor) may be off-set by conciliation (a fourth catastrophe factor). An extension of these concepts can provide a method for assessing the long-term survival of existing nation states on the one hand and identifying conditions where states may fail and where new neo-state entities can emerge on the other (Woodcock, 1998). Survival and transformation of existing societal entities and the emergence of new structures will define future landscapes and this paper will end with a description of how such changes can take place, and what may happen in the future.

THE MAGNA CARTA AND THE UNITED STATES DECLARATION OF INDEPENDENCE RE-DEFINED THE POLITICAL LANDSCAPE

The observation that catastrophes with odd numbers of control factors are inherently unstable and those with an even number are inherently stable suggestion that some types of political system may be inherently unstable while others may be inherently stable (Woodcock, 1998, for example). Based on this idea, it is possible to observe that ancient feudal societies are inherently unstable since they owed their existence to the presence of a strong leader who ruled without opposition, and where any emergent opposition was ruthlessly exterminated (Figure 20). Resources were generated and used for the benefit of the feudal leader and his inner circle of supporters. Such societies were inherently unstable and they often failed to survive the death of the leader if control was not inherited and asserted by another strong individual.

It is also tempting to suggest that some modern societies in which all opposition to a central authority has been destroyed can be characterized as neo-feudal, and therefore inherently unstable, societies. Germany under Hitler and possibly the Soviet Union under Stalin are two examples of such societies. Nazi Germany failed to survive the death of its leader and disintegrated. The Germany that emerged provided a forum for political opposition to challenge the government that created a situation that could be considered to be politically stable since it has survived for over fifty years.

Stalin undertook a series of purges and show trials that succeeded in crushing all opposition and maintaining the monolithic power of the communist party. However, the increasing stresses on the Soviet economic, political, and military systems from western nations in the 1970s and 1980s created fatal instabilities. This set the scene for the eventual overthrow of the communist party, the dissolution of the Soviet Union, and the establishment of a multi-dimensional political environment in the new Russia.

Societies in which two foci of political power are in competition for state power can be considered to be inherently stable. The signing of the Magna Carta by King John in England in 1215 legitimized the existence of the forces opposed to the monarchy. In this case, the nobility and the church were jointly recognized as opposition entities and the English political environment could be considered to have been transformed from some form of feudal structure into a pre-modern from of political structure from which democratic structures would emerge. The emergence of the English church as an entity that was politically independent of the monarchy and the nobility would create a three-dimensional political environment that was inherently unstable.

The impact of the dissolution of the English monasteries by King Henry VIII on the inherent stability of the English political system can be examined with guidance provided by catastrophe theory-based models. Henry's abolition of the independent power of the church his assumption of the title of the Head of the Church had the effect of transforming a three-dimensional, inherently unstable, system involving the monarchy, nobility, and the church into an inherently stable system involving the monarchy and nobility since the king became head of the Church of England. The assets of the church were plundered by the king. Some resources were used to support state activities and others were made available to his supporters to insure their loyalty to the crown.

One Dimensional Societies are Inherently Unstable:

- Feudal Societies
- Neo-feudal Societies

Two Dimensional Societies are Inherently Stable:

- Monarchy and Nobility
- Executive and Legislature

Three Dimensional Societies are Inherently Unstable:

- Monarchy, Nobility, and the Church
- Executive, Legislative, and the Judiciary

Four Dimensional Societites are Inherently Stable:

- Monarchy, Nobility, Parliament, and the Church
- Executive, Legislative, the Judiciary, and the Media

Figure 20: The mathematical properties of catastrophe theory-based potential function models suggest that some existing or historical political systems may be inherently stable while others may be inherently unstable (from: Woodcock, 1998).

The situation that emerged after the Cromwellian Revolution in England, in which King Charles I was executed, appeared to involve a single major focus of political power, the parliament. This entity controlled the army and, at least initially, prevented the separate involvement of the nobility and others in the political process. A one-factor structure of this type would be inherently unstable, but might have been stabilized by the assumption of executive power by Cromwell, who appeared to separate himself from the parliament. The restoration of the monarchy, it could be argued, created inherently unstable political conditions involving the actions of three major foci of political power: the parliament, the nobility, and the monarch.

Four-dimensional political systems are inherently stable while three-dimensional ones are not. It is interesting to observe that the American Revolution created a tripartite political system involving executive, legislative, and judicial branches of government. The separation of church and state was a basic principle of the emerging post-revolutionary American form of government. However, based upon the above arguments, it would appear that such a tri-partite form of government would be inherently unstable. It is interesting to observe that the first Amendment to the United States Constitution established the freedom of religion, speech, and the press. This legitimized the role of the media as a participant in the political process.

In the context of the catastrophe theory model, the media, commonly known as the Fourth Estate, becomes the fourth factor that creates an inherently stable political situation. The recent emergence of groups that are attempting to incorporate religious components in their own right directly into the American political structure may be interpreted in the context of creating a fifth focus of overall state power, and inherently unstable political conditions. The

emergence of such a new focus of political power could lead to a fundamental undermining of overall political stability, which could set the scene for the ultimate failure of the state, as described below. Inherent political stability could be restored either by the merging of two of the existing control factors with the consequential reduction in the number of factors to four. Stability could also be achieved by the introduction of a new, sixth factor. This factor could represent a new focus of power such as that provided by the independent involvement of a military force that was outside the control of the normal political process, for example.

FAILING, FAILED, AND EMERGENT STATES INVOLVE SOCIETAL INSTABILITY AND STRUCTURAL CHANGE

The catastrophe theory-based approach to modeling the stability and instability of political structures described earlier in this paper can illustrate the phenomenon of failing and failed political states and the emergence of new state-like entities. Failing states are characterized by a failure of the government structures to provide security, protection, and an environment that supports the growth of a wide range of societal processes. Figure 21 illustrates a pattern of political change in a notional society in which changes in the linkages between a government and its opposition transform an inherently stable situation in to instability leading to state failure.

An emergent political and/or military force could organize the completely disorganized political environment associated with state failure and form a one-dimensional political system. Such a system would be inherently unstable until a legitimized opposition was incorporated into the overall societal framework. The success of new political democracies is often judged by their ability to hold elections and to permit the transfer of power from one group to another after the victory of the second group in such elections. The recent political history of Poland serves as an example of such transfers of political power after the holding of successful democratic elections.

Changes in inherent stability can occur in response to changes in the number of foci of political power in a political system (Figure 21). A system with a democratic government and an opposition that is actively involved in the political process constitutes a two-dimensional system that is inherently stable in the context of catastrophe theory. The associated potential function would always have either a finite minimum value representing a single type of political condition, or sometimes two minima, with each minimum representing qualitatively different political conditions (Figure 22a). One minimum represents a concentration of political power in the hands of a restrictive elite while the other represents a wider distribution of political power. A political system would be inherently stable while the government and opposition entities were involved in a linked political process. This stability would disappear if the linkage between government and opposition was destroyed and a one-dimensional political environment was created.

An entity called a political landscape modeling the interplay of two control factors can illustrate how changes in the relative strength of a government and its opposition can lead to political transitions (Figure 23). Political evolutions can occur as the relative strength of an initially dominant elite reduces gradually (path a-b-c, for example). Political revolutions occur when the strength of the governing elite declines rapidly (path a-d-e, for example). Destruction of the linkage between government and opposition can occur when a government

acts to exclude involvement in the political process. Such exclusion could involve the dissolution of parliament, the censoring of the press, the imprisonment and banishment of opposition leaders, and the declaration of martial law. With the now dictatorial government in control of all of the organs of state power, the political system would be one-dimensional and therefore inherently unstable. Such a political situation can be modeled by the Fold catastrophe function (Figures 22b and 24).

Active challenges to the government by the opposition could reduce the level of political control of the government in a process that can be represented by a change in the shape of the power distribution function. Such conditions can represent a state whose political capabilities are failing. Eventually, erosion of the government can lead to a complete destruction of the existing stationary state of the political power distribution function as the capabilities of the failing state fail completely (Figure 22b). Such political changes can be illustrated by the one-factor political landscape (Figure 24). The reduction in the strength of a single governing elite is represented by the path (a-b-c, for example) which eventually reaches the point of no return at position (c), beyond which the political environment becomes completely disorganized.

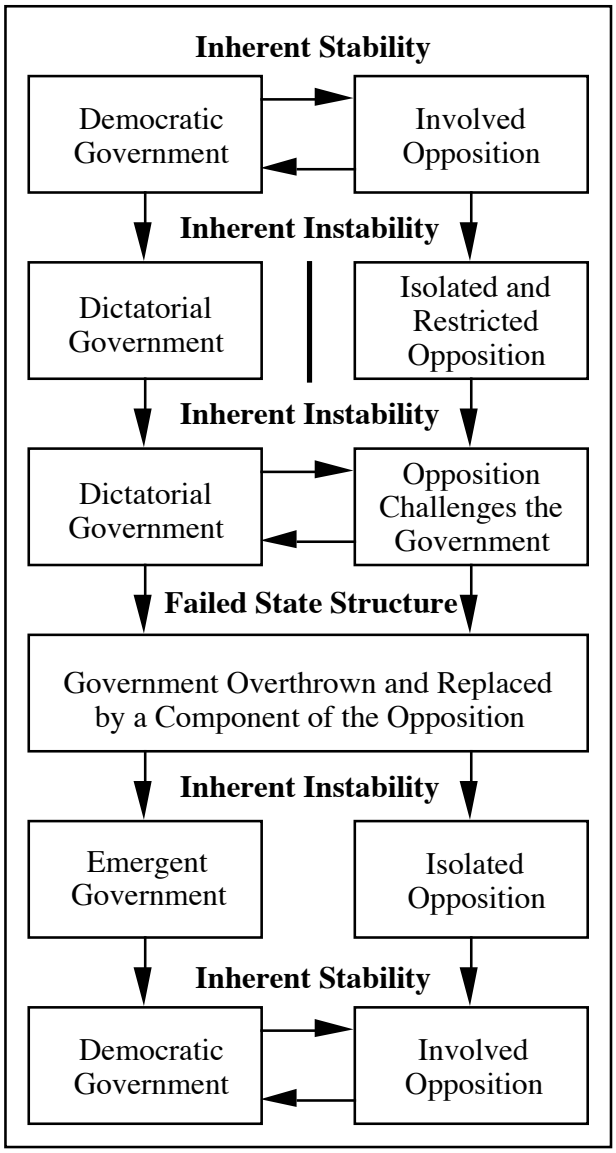


Figure 21: Changing levels of political linkage create political stability and instability.

Destruction of a once dictatorial government can set the scene for the assumption of state power by elements of the victorious anti-government forces (Figure 21). Initial actions of this government entity might also be dictatorial as they attempt to protect their position and defend against a possible counter-revolutionary challenge. Under such conditions, the emerging political organization would be inherently unstable and subject to destruction. It would only be maintained in power through the controlled use of military force which would prevent the coupling of opposition entities into the overall political process.

The emergence of some form of political opposition and its incorporation into the political process by the new government would create a two-dimensional political system. Such a system would be inherently stable. Political evolution could lead to the holding of elections and the active involvement of the initial government and opposition in some form of parliamentary or legislative body. Such a system could be truly said to have come of age when the initial opposition group has defeated the government in free and open elections, and the new government engages in active political dialogue with new opposition entities.

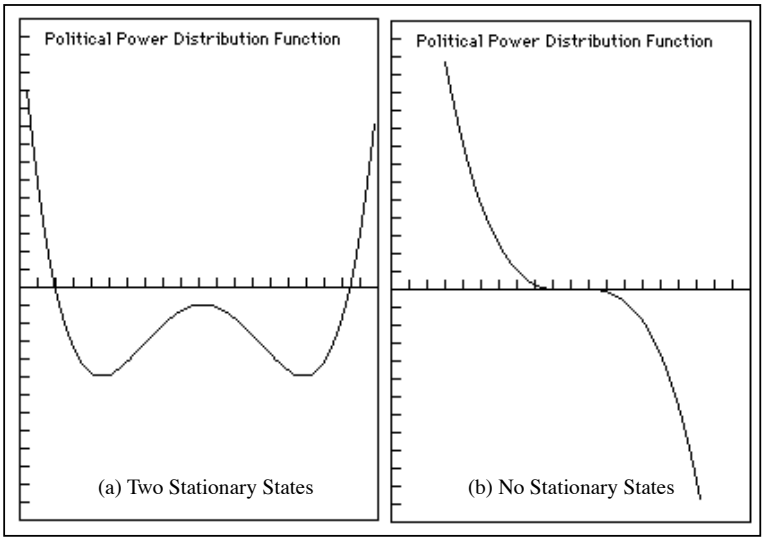


Figure 22: Political power distribution functions show the impact of foci of political power on the stability of a political system.

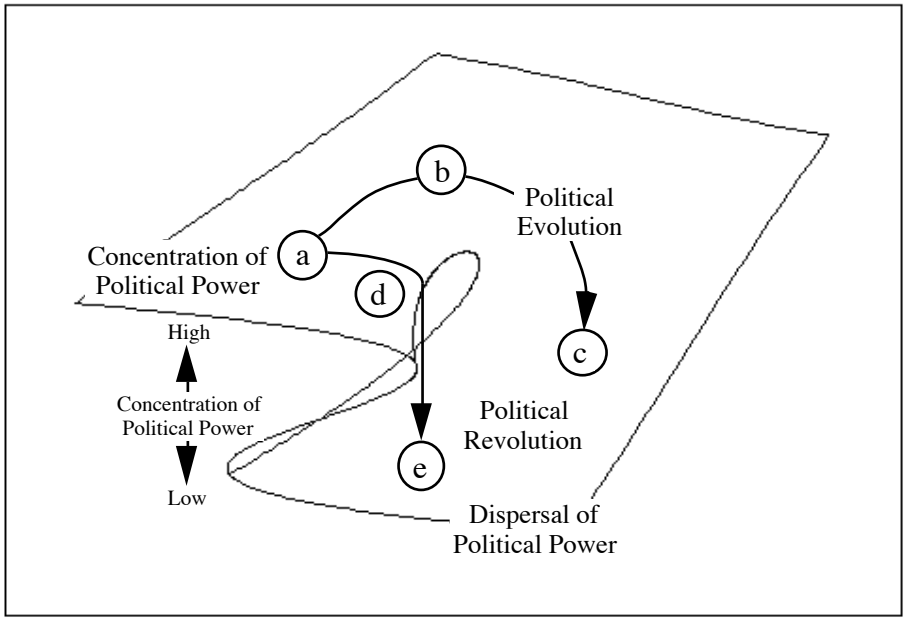


Figure 23: Political evolutions and revolutions can occur as the strength of a governing elite is undermined and political power becomes relatively dispersed.

SUMMARY AND DISCUSSION

The possible evolution of human behavior is illustrated with the aid of a simple "thought experiment." The result of this experiment suggests that survival would have been facilitated if individuals in family groups and other entities worked in a cooperative manner to generate and use resources for the benefit of the whole group. Processes involving the emergence of competition and conflict and the role of conciliation are described. The insights gained from these activities are used to build a series of landscape models based on catastrophe theory. Cooperation, competition, conflict, and conciliation are selected as control factors or key influences whose action determines overall societal behavior. Earlier research (Woodcock and Poston, 1974 and Woodcock, 1998, for example) has demonstrated that systems with an odd number of control factors are inherently unstable while those with an even number are inherently stable.

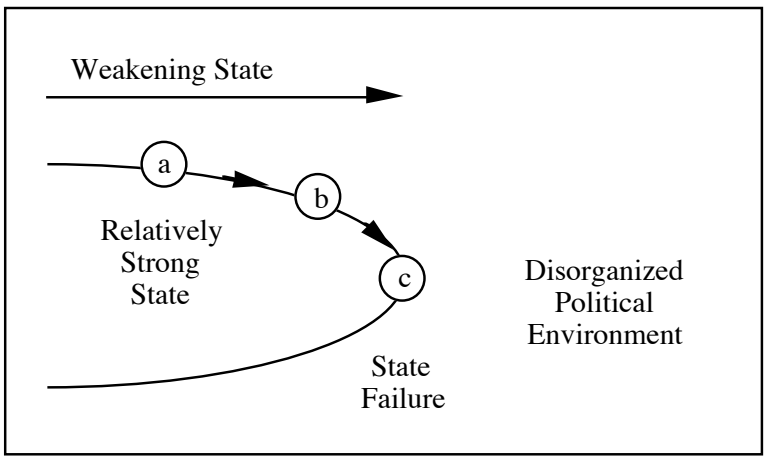


Figure 24: The Fold landscape model can represent the process of state failure as the strength of a dictatorial government entity is undermined and then destroyed.

This finding suggests that societies whose behavior is determined solely by cooperative interactions are one-dimensional, and inherently unstable. The emergence of competition as an additional influence acts, perhaps paradoxically, as a stabilizing factor since societies with two key influences are inherently stable.

Conflict is a third societal influence, and is an inherently de-stabilizing factor in the catastrophe model. The impacts of two different types of conflict called acquisitive and altruistic conflict are identified. The stabilizing effect of a fourth factor called conciliation is described in the paper.

The paper concludes with the use of catastrophe theory-based models to examine the inherent stability of actual political systems and the causes of stabilization and destabilization in the context of failing and failed states and the emergence of new state structures.

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