Carlo Simon-Belli, Ph.D. in *International Relations*, is Adjunct professor at the University for Foreigners of Perugia, teaching *International Relations* and *Peacebuilding and Conflict Transformation*. Research Director in a number of research projects, concerning *Country Risk Analysis*, *Political Forecasting*, *Decisional Support System in Negotiation Processes*, *Role of Communication in Peacebuilding*, and *Water Resources related Conflicts*. Among his latest publications: *Costruire la Pace, decostruire la guerra* (SME, 2016); *Dalla Geopolitica "materialista" a quella "immateriale": la geopolitica della pace* (in *"Cosmopolis"* XVI, 2/2019); *Paradigma spiritualista, azione politica nonviolenta e impegno ecologico: le prospettive di Aldo Capitini e Omraam Mikhaël Aïvanhov a confronto* (in *"Misli"* 6/2019; pp. 36-63); *Tempo e decisione: le incertezze ambientali e le scelte strategiche nella politica internazionale* (in *"Rivista di Politica"* 03/2020).
Contact: carlo.belli@unistrapg.it

Soft Power
Revista euro-americana de teoría e historia de la política y del derecho

Vol. 7,2. Julio-Diciembre 2020
ISSN (online): 2539/2239
ISSN (print): 2389-8232
http://dx.doi.org/10.14718/SoftPower.2020.7.2.10

COMMON IDENTITY BUILDING FOR STABLE CONFLICT REDUCTION[1]

Carlo Simon-Belli
Università per Stranieri di Perugia

Abstract

A new way of analyzing international politics, using a qualitative approach, in order to avoid alternation between war and peace, and foster the establishment of stable conditions of peace through the building of common identities in wider regional contexts.

Keywords

International relations, social constructivism, conflicts analysis, Catastrophe Theory.

Resumen

Una nueva forma de analizar la política internacional, utilizando un enfoque cualitativo, para evitar la alternancia entre la guerra y la paz, y fomentar el establecimiento de condiciones estables de paz mediante la construcción de identidades comunes en contextos regionales más amplios.

Palabras clave

Relaciones internacionales, constructivismo social, análisis de conflictos, Teoría de Catástrofes.

1. Reception date: 30th January 2020, acceptance date: 25th February 2020. The essay is the issue of a research carried out within. Università per Stranieri di Perugia.

Preliminary considerations

The International system sometimes reveals that it behaves on the basis of a kind of "genetic code", which —once known— should allow us a better understanding of the discontinuous alternation of war and peace. We shall try to verify this hypothesis, and under what conditions, in the long run a similar "program" would tend to produce important effects, which would limit the use of organized violence. With the aim of underlining how this happens in the international system, we choose to employ a mathematical, topological model that is greatly efficient in showing how such an "internal scheme" really exists and works.

Reference to a systemic, pre-coded program will not be favorably looked upon for the fact it gives a pre-deterministic vision of reality. However, with our approach the non-deterministic factor is not ruled out altogether, since *how* and *when* the event will take place cannot be pre-determined. In other words, it can be said that this approach hypothesizes the existence of a *predisposition*, but not of a systemic *predetermination*. In this way it tries to overcome the limits of quantitative approaches —be they deterministic and rationalistic, systemic or reductionist— by introducing a highly evolved *qualitative* theoretical method, which is able to deal with the challenge posed by the presence of both chaos and complexity, thus building a new constructivist perspective.

The first objective of this study will be to show how —albeit mainly theoretically— by departing from a revision of International Relations theories it is possible to construct a model, which is able to represent the changes in the state of the international system over a fairly long period of time. Thus, it should be able to have a strong explanatory power, not only towards modern and contemporary systems, but also with regard to those previous to the Treaty of Westphalia, as well as for those likely to be foreseen in the near globalized future.

We will start with a brief description of a particularly efficient and innovative interpretative scheme regarding the functioning of the international system. This scheme organizes the analysis of the international system in four components, or levels: the *structural* level (derived from Kenneth Waltz), the *interactional* level (Barry Buzan), the level of *relations* (Glenn Snyder) and the level of the *units* (Hans Morgenthau).

First of all, we will explain the relations of interdependence which exist between the levels of this hierarchy, describing all the effects that ensue) from the top of the systemic structure downwards, that is to say, towards the level of the units, i.e., States, and/or all possible international non-State actors (*Top-Down Process*). In the second step, we will

outline the *Bottom-Up processes*, specifically, those mechanisms by way of which the level of the *units* influences the higher levels of the systemic structure, causing what can be defined as the "crystallization" —the term means a process by which "certain permanent characteristics" gradually form— of the decisional processes into *consolidated relationships*, or structured interactions, which are able to produce feedback effects on the morphological aspect of the systemic structure.

Normally, in the long term, the systemic structure prevails on the level of the units, obliging the units to evolve and/or put into act modes of behavior, which are able to contribute to the reproduction of structural principles and processes governing international relations. But under certain conditions it appears to be theoretically possible for the units to escape from the "behavioral trap" that the system in which they live imposes on them. In fact, the systemic structure moves on the basis of strong principles which, not only make its survival certain, but also guarantee that the systemic functioning always evolves along an established set of rigid rules. However, in a mature system the units become more and more aware of their potential and hence, are able to evolve in a way that allows them to render obsolete the rules that uphold the systemic structure, bringing about its downfall or, at least, its deep structural change. At the end of this study, we will see in detail how, why and under which conditions this can happen.

1. A theoretical scheme to represent the international system

The model described in the following chapters can be defined as an interpretive scheme of the international system in which the informative principles of Realism are preferred to those of the Liberalists, but the conclusions reached at the end of this study are closer to the constructivist approach. Even if we do not unconditionally accept the assumptions concerning human nature that are typical of classical realism, nevertheless we cannot deny that after Waltz (1959) realism finally consents a systemic and structural vision, which enlarges our ability to understand reality, giving us an *Image* of a superior level. But at the end it should become clear how our basic assumptions are above all constructivists, given the importance attributed to the role of reiterated decisions developed by the actors on the ground of their subjective perceptions, their ideas and values.

As we will be able to show, some of the basic assumptions of realism are best suited to our heuristic prospective, which is better defined by the construction of an explanatory model based on the use of topological surfaces taken from the *Catastrophe Theory*

by René Thom (1972). According to this theory, the evolution of every single system is the result of a sequence of preordained transitions, that can be foreseen, but only in their trend. Such a model —at least until the fundamental characteristics of the system in question remain unchanged— will not require the use of new explanatory factors in order to include new events, since every possible event is already included in the system, as "information" which will take on a specific "form" when the necessary conjectured condition occurs.

This scheme, when integrated with the topological approach, is able to revisit the various contributions made by realism to the study of international systems, by forcing them to enter into a reliable interpretative network, which is rigid enough to indicate which elements should be used and where they should be collocated, and yet sufficiently flexible to allow the great variety of events to be represented.

Besides, one of the emerging problems with which the theory of International Relations must deal is connected with the difficulty of providing a correct interpretation of internal-external relationships; for this reason, an interpretative scheme or model, which contains all the characteristics mentioned so far, cannot exempt itself from trying to overcome this "great divide". In effect, as the process of globalization progressively consolidates, it becomes more and more evident that the study of international systems cannot ignore the role of the internal variables of the units which make it up, nor the weight of the structural variables in the system itself, or —as a consequence— the reciprocal conditioning and the feedback that come into play between the external and internal. Thus, the *idiosyncratic elements* and the *subjective decisions* of the human actors (Image I of Waltz), the results of the *internal political process* of the units (Image II) and the *structural limitations* (Image III) are, in any case, to be collocated at the same level of importance when it comes to the general understanding of international relations. Instead, only the particular considerations and the peculiarities of any single case study allow us to emphasize the role of any one of the mentioned Images in comparison with the others.

In this sense, the process of European integration is emblematic: the internal decisions of single member States are tightly linked with the constraints and objectives of the Union (a supranational union) and, yet again, with the conditioning of international structures, to the point that the borders between the internal and the external disappear, and it is no longer possible to distinguish between the two. This, at least, only when it is necessary to make the analysis of the system easier: in this case then, we are justified in making such a distinction.

In building the theoretical scheme that we are going to use, we decided not to abandon any of the best theoretical approaches developed until now: in so doing, we are likely to show that it is possible to integrate many different perspectives; furthermore, to a certain extent, this permits us to resolve also the abovementioned internal-external dilemma.

As previously said, our scheme is made up of four levels. Starting from the lowest, the first one reflects the position of Morgenthau regarding the role carried out by the units' attributes in the international context. These are integrated with the considerations made by other authors (Buzan, 1993; Snyder, 1997), who have gone to lengths to breakdown and analyze those processes, which bring the units to produce observable actions and behaviors that are relevant for the international system. In other words, in order to be able to evaluate the impact of the "level of the units", it is necessary to define the *comprehensive situation* within which these units are represented. If therefore we conceive the latter in a context of actions and reactions —and this can be done best through a hierarchical network (Saaty, 1996)— it becomes evident how they combine their capabilities, their objectives, their preferences and perceptions as well as their strategies, to the point that these produce decisions, and therefore actions, which are then revealed on the concrete level of international relations. To express this synthetically in "waltzian" words, the "level of the units" can be said to be composed of the sum and of the interaction of the elements which belong to Image I and II.

Let us ignore the intermediate levels for a moment and go immediately to the fourth, the "structural" level, which can be compared to image III of Waltz and is made up of two components: the *"deep structure"* and the *"distributive structure"*. Both of these terms were used by Buzan (1993, pp. 19-80), who has made a radical re-adaptation of the systemic prospective of Waltz, making it easier to adjust it to the description of complexity of the international system, but without renouncing to the principle of anarchy, which is fundamental to Waltz's position. In particular, regarding the first component, Buzan (1993, p. 78) introduces the hypothesis according to which the principle of anarchic order can exist alongside a progressive increase of *"functional differentiation"* of units, which until then had been seen as an element rigidly reflecting the principle of sovereignty. Instead, according to neorealism, the principle of anarchy required the unconditional protection of the sovereignty of actors, yet from Buzan's perspective (i.e., of "structural realism") this is no longer necessary. The principle of anarchy can therefore present itself with different intensity, while even the sovereignty of the units and of the

States is not absolute but can be modulated. It is evident how such new perspectives allow the realistic approach to face up to the changes affecting the international system today in a much more efficient way. In fact, the international system, without losing its characteristic anarchy, is composed by units which are evidently —albeit differently— dependent upon one another, since they have to carry out specific roles in a context of reciprocal interaction, thus making them significantly distinct from a functional point of view.

After having defined the "deep" aspects of the structure, that is, those which characterize its peculiarity, it is also necessary to discover what "moves" and causes the changes in the system itself, therefore defining the role and the functions of the second structural component, specifically, the distributive one. For this reason, it is necessary to introduce a correct notion of power. To do this Buzan (1993, p. 67) defines a first component of power, relating to the units, the "subjective" power. Subsequently, he defines a second one, which instead regards the "distributive structure", deriving from the way the reciprocal positioning and polarization of the units influences the access and the use of this very power in the context of the international system. This second aspect therefore completes the structural framework and clarifies the binding function between it and the other three levels.

Of the two remaining intermediate levels yet to be considered, we will first look at the third, the "interactional" level, which can also be traced back to the previously cited work by Buzan. The author attributes structural values to two particular aspects that guide the interaction activity among the system's units: one related to technology and one related to the complexity of *"shared values and norms"* of the units themselves. Regarding the first, it is quite evident how the development and diffusion of technology (taken in the widest possible sense, therefore military technology, information, communication, transport, financial services,…) and its qualitative changes, make up a complexity of constraints and possibilities with an objective weight, in the sense that they have a unequivocal effect on the interaction capacity between units, thus influencing the relative cost, as well as the length and quality of the interaction itself. In the same way, the complexity of *"shared values and norms"* influences the level of cohesion/contrast (competition) which exists internally and externally with regard to systemic units, and also influences their interaction strategies, hence making them either more conflictual or more cooperative.

In other words, just as there are structurally very stable aspects of the system (the above mentioned *"deep structure"* and the *"distribution of power"*, both belonging to the

first level), there are others as well which influence actors in a particularly lasting, yet not so rigid and unchangeable way. As we will see, the development of these two factors is the product of a purported "condensation" between the activities of the system's units, a sort of "social environmental residue", which in the long run takes on a systemic valence and also conditions its existence.

Lastly, let us come to the description of the functions of the second level, i.e., the relational one, inspired by Snyder's work. We have left this level as the last one to be considered, because the role which it carries out in the scheme is very particular: specifically, it connects the upper levels to the first level, the one pertaining to the units. In effect, a problem that could be seen as arising immediately in the conceptual development of our scheme was tied to the difficulty of finding a way to connect the variegated results of the units' behavior to the very stable structural level of the system.

As far as the opposite effect is concerned, that is the direct conditioning of the "structural" and "interactional" levels on the level of the units, there is nothing to add to what has already been said starting with neorealism. Perhaps, it may be noteworthy to note that such conditioning comes about rather rapidly, almost instantaneously, in the sense that the system's constraints are always present and tend to limit and direct the life and actions of the units. *Vice versa*, still in the context of a systemic prospective, it is not clear if —at least in the long term— "the structural stability" can be conditioned or not by the unsettled evolution of units on the first level. Thus, our aim would be to find out if the international system's evolution is entirely preordained —and therefore, if it is the result of a rigid and immutable evolutionistic program, present in the very structure of the system, that unconditionally affects all the elements of the subsystems— or if instead it is rather the consequence of the constant *interaction* between the first and fourth level.

As we will see through the use of the topological model (chapter 3), following the introduction of the relational level, the most reasonable hypothesis seems to be the second. Precisely, the relational context of behaviors allows us to explain a type of feedback that, starting from the level of the units, very slowly makes its way towards the structural level, influencing the structure or, to be precise, the morphology of the system itself. It is easy to explain how this happens: strategies, objectives, contrasting or common interests, alliances or reciprocal interdependence between the actors, which are all generated in the context of the first level, are destined to interact and, although they are chosen by the intervention of systemic factors, they have the tendency to progressively take on a permanent characteristic, namely to "crystallize",

hence creating the second level, the relational one. In this way, the reiterated behaviors and choices which have developed from the units' level can start to perform a certain feedback effect with regard to the upper levels, particularly with reference to the systemic ones. It is clear of course that the process is slow and progressive, being made up of two distinct processes —given that, once "crystallized", the elements of the relational level must be able to contrast the structural inertia of the system— but this slowness should not be deceiving.

Even when faced with a clear case of "ultra-stability" of the international system, the use of the relational level allows the creation of a forward and backward mechanism which deprives the same system of its unconditioned predominance in generating the changes, thus giving the possibility of singling out a pre-existing cause for a possible collapse of the international structure when choosing the units.

Taking into account the constraints given by the three superior levels, all the different units interact among themselves and create a real scenario, that is, an "observable behavior". This definition allows us to introduce the last element of our interpretive model, the one which summarizes and reinforces the underlying logic of the scheme itself, and more specifically, the topological surfaces taken from the "Catastrophe Theory", an ideal tool when analyzing observable behaviors (and it is not by chance that these geometrical surfaces are also known as *"surfaces of behavior"*). By using these particular geometric structures, it is possible to study the *forms* and *changes* in behaviors —that is, their *morphology* and *morphogenesis*— taking into account the systemic constraints which have enough power to generate a strong structural stability in the system in relation to which it is difficult, for the units within it, not to comply with. In this sense, the "observable behavior" must be understood in the widest possible meaning, as it refers not only to the result of the actions of the single units, but also to the functioning consequence of the systemic structure.

Up to this point we have tried to define an interpretive scheme capable of representing the international system, but the "key" which will make the whole scheme work —that is, the model which will allow our representation to change— is still missing, at least until we introduce the abovementioned Catastrophe Theory. This theory was developed by French mathematician René Thom (1972) in his main work dedicated to topological structures and their capacity to describe the functioning of real systems in a parsimonious way. In the following chapter, before demonstrating how such model can be used to combine the various theoretical hypotheses referred to up this point, we will first underline its heuristic potentials.

2. The descriptive and explanatory powers of topological surfaces

The idea of using the Catastrophe Theory model in the field of International Relations was introduced not only after reflecting on some statements made by Kenneth Waltz on the particular stability of behaviors and the observable interactions in the context of international relations, but also on the grounds of Modelski reflections regarding the endogenous factors which determine change, and which appear as stable in long term curves.

It can be said that similar considerations are also the basis of the theory developed —in very different contexts— by Thom in order to obtain a valid tool for the description of those phenomena which apparently have strongly chaotic characteristics, such as discontinuity and apparent instability, but that in the course of time invariably take on an extremely stable behavior, a characteristic which in the long term seems to be common to all complex systems. In fact, Thom's theory follows the new tendencies concerning the study of phenomena characterized by the contemporary presence of Chaos and Complexity —theory of "Deterministic chaos" (Prigogine, 1993)—, while at the same time it is valuable in studying the behavior of units in contexts which are not only highly structured, but also very stable.

The "Catastrophe Theory" is a simple and sophisticated tool for evaluating and describing reality: it is indeed the ideal type of instrument to help observation, as it is able to free the perception of observers from the fuzziness and inaccuracy they are naturally subjected to, hence allowing them to recognize the principles which really decide the system's functioning. The end of positivistic certainties and the dawning of the awareness, according to which we are forced to live in a reality dominated by uncertainty, obliges us to look for new heuristic approaches, which Thom thinks may be found by rediscovering the ancient ways of thinking, which are not by any means obsolete, and specifically those very ways that allowed ancient philosophers to understand and intuitively recognize the basic principles of reality without the use of modern instruments.

By using mathematical and statistical methods, which are thought to contain unlimited descriptive possibilities, we are able to break down reality into numbers and proportions which have been assigned an absolute value, thus ignoring the weight of indetermination and imprecision through which we are condemned to perceive reality. The rationalistic mentality has conditioned our vision of the world to the point that it has limited our ability to take into account "rebellious" phenomena, such as discontinuity and chaos.

By making a direct reference to Heraclitus above all, Thom reviews the heuristic strategy of the ancient thinkers, which he considers based on an intelligent use of the evocative qualities of images, the ideal instrument to realize and capture the values of qualitative aspects —which are often crucial in defining the evolution of a system. Enriching such strategies with the possibilities offered by the most recent ideas in topological mathematics— which are able to stand up to the challenge given by discontinuous phenomena. Thom (1993) developed a theory that is able to represent the enormous variety of observable behavior by using very uncommon geometric images, thus reaching a "rigorously qualitative thought" (p. 29).

According to Thom, the multiplicity of manifestations produced departing from the existence of any system can be traced back to a limited number of morphological models which show how such multiplicity is finally "forced" to take on certain "forms". He has demonstrated (Thom, 1980) that there are seven *"elementary catastrophes"* (i.e., seven *topological surfaces*) which are needed in order to represent the behavior of systems in the context of our whole reality. From the first and simplest (a *"fold catastrophe"*), to the most complex (the *"parabolic umbilicus catastrophe"*) the choice falls on the one which, given the size of the problem —that is, of its complexity or more precisely, of the complexity of the system being analyzed and of the various behaviors it can take on— can describe its "morphological behavior" best.

Thom has been able to demonstrate these intuitions starting from the idea that these geometric surfaces must be numerically limited, as systems evidently possess a *structural stability* which obliges the "infinite variety" to stay within certain behavioral schemes. In this sense, the infinite variety is only an "illusion of prospective", the result of our incapacity to grasp regularity in relation to the dimensions of time and space of events, which are either too big or too small in relation to the proportions with which we perceive reality. The work of Thom —the validity of which is widely acknowledged today, regardless of the fact that it has been criticized for its somewhat metaphysical character— therefore sets out to demonstrate how the structural stability of systems is a basic reality and as such can be represented by qualitative mathematical models based on the use of geometrical images.

3. Morphology and Morphogenesis of the international systems

At this point we need to specify the logical sequence that will lead us to define the topological model that should be able to represent the interactions between units in the

context of an international systemic structure. First of all, this means that by using the right topological surface we will prove the existence of a relationship of dependence between the components on the interactional level (defined by *"technological quality"* and *"shared values and norms"*), on one hand, and the use of *organized violence* (war, but even violent conflicts), on the other. By observing Fig. 1, it is possible to see how such a relationship can be generically described by a *"cusp behavioral surface"* (a topological surface, were we can see how the *structure of the system* conditions the *behavior of the units*, that are subjected to the influence of no more than two primary factors) which, among other things, is able to underline the different states (or intensities) that can be taken on by the antithetical binomial war/peace.

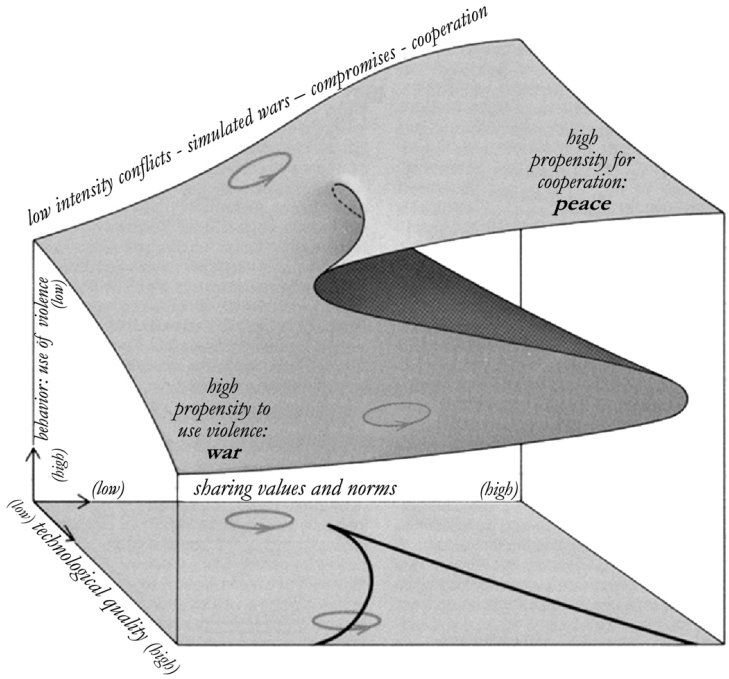

Figure 1. Relationship between war and peace described by a cusp catastrophe

An easy way to understand the mechanisms by which topological surfaces function is to compare the "behavior" adopted by the units to the one of spheres rolling over the topological surface. These spheres are "propelled" or "pushed" by the so called *"factors of behavior"*, that will decide where the behavioral sphere will actually come to rest on the topological (or behavioral) surface; in this way, the model will

reveal the type (or "quality") of the events, resulting from the shift of the sphere from one position to another.[2]

In our case, the first *"behavioral factor"* that affects the "movement" of the sphere representing the behaviors that can be adopted in the international system is the *"technological quality factor";* this one corresponds to the X-axis in the lower plane of Fig. 1: this factor can have a low or high value depending on whether, in the regional context analyzed, the States that are part of it have, on average, a low or, on the contrary, high level of technological development.

The second *"behavioral factor"* that contributes to the "movement" of our sphere (but gives the opposite direction) is the *"shared values and norms factor"* (linked to the sharing of cultural and identity elements); this one corresponds to the Y-axis in the lower plane of Fig. 1: this factor may have a low or high value depending on whether, in the regional context analyzed, the States that are part of it have on average a low or, at the contrary, a high level of shared common identities.

Generally speaking, it can be noted that when the factor named *"technological quality"* is very low, the behaviors of our systemic units are placed in positions which are strongly dependent on the development of the *"shared values and norms"* factor. This concerns systems which are not very evolved from a technological point of view: if there is an increase in the sense of common belonging (therefore, the establishing, defining or reinforcement of borders) the units are led to behave in such a way, that from a state of relatively low intensity conflict (because of the lack of offensive capacity) they will tend towards an attitude of compromise and cooperation. On the other hand, an increase in technological quality puts the non-conflictual tendency at risk, which, as we have seen, is connected to the creation of common borders subsequent to the increase of the sense of *"shared values and norms"*.

Among other things, this relationship seems to suggest the following rule: there is an ideal relationship between these two factors, in view of which actors decide to prefer peace. Consequently, in order to prevent a situation of conflict, the relative value of *"technological quality"* should always be a little "inferior" to that of *"shared values and norms"*. In fact, if the *"technological quality"* becomes "superior" to the corresponding

2. For some overviews of the theoretical principles of the "Catastrophe Theory", and its explanatory, interpretative, descriptive and predictive possibilities (also in contexts related to international relations), see Adelman and Hihn (1982); Dockery and Chiatti (1986); Flay (1978); Holt and Brian (1978); Isnard and Zeeman (1976); Maldonado (2006); Mathews, White and Long (1999); Oliva, Peters and Murthy (1981); Schubert (1989); Varian (1979); Zeeman (1976); Zeeman (1978).

level of *"shared values and norms"*, it becomes inevitable for units to fall onto the lower plain of the surface, which is characterized by a high tendency towards conflict (see Fig. 1).[3]

In other words, every sociopolitical system should always aim at "converting" the growth of technological quality which it is able to achieve, either by strengthening sociopolitical and cultural growth, or by achieving cohesion between the elements that make it up, and therefore by strengthening "shared values and norms". If this does not happen, there is a risk that technological progress will become a source of contrast which will be difficult to heal.

Continuing the description of the underlying logic of our model, it is necessary to take into consideration the effect caused by the introduction of elements from the first level of the international systemic structure, the one defined as "structural". This effect would act on: *a)* the *positions of the plains,* that is to say on the *dimensions* of the topological surface (this is so in the case of the topological factor defined as "divergence", which corresponds to the concept of "power distribution", or "polarity" in the international systems: see Fig. 2), and *b)* on the *shape* of these same surfaces (this is the case of the so called *"butterfly factor"* connected to the principle of order and to the principle of functional differentiation of the units (see Fig. 3 and below in the text).

It can already be said that by merely introducing the *principle of polarity* a first, important morphological variation of the behavioral surfaces will be caused. By keeping the other parameters constant, the splintering of power —with the following proliferation of rival poles— causes an increase in the frequency with which reiterated shifts occur (in topological jargon, *"hysteresis"*) between belligerent behavior (inferior plain of the surfaces) and non-belligerent behavior (superior plain).

3. It is useful to remember that it is not possible to measure the intensity of the two factors of behavior in a quantitative fashion, given we are dealing with elements that are defined also on the basis of components possessing strong qualitative characteristics. which have different intensities and so will make the units behave in different ways (that is even antithetical). At this point, however, it will be the shape of the topological surface that will make the difference. For this reason, we have written the words "inferior" and "superior" in brackets.

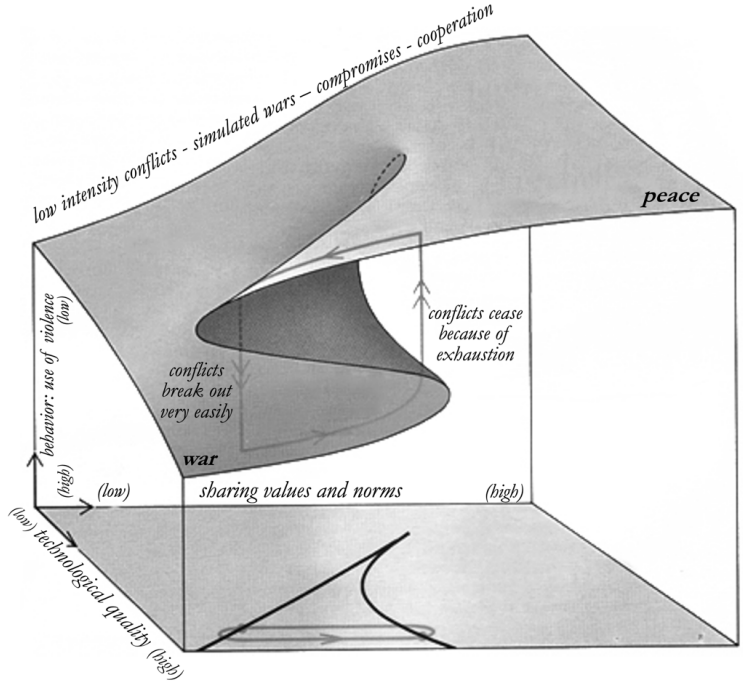

Figure 2. Changes on the cusp surface, due to the introduction of the principle of polarity

As a consequence of this, the "hysteresis" fold —that is, the corresponding complexity of bifurcation (the two lines drawn on the lower bi-dimensional plane, which describe the two alternative states derived from the interaction of the control factors *"technological quality"* and *"shared values and norms"*)— becomes longer and diverges towards the left, therefore towards the area where conflict is more probable (compare the aspect of Fig. 2 with that of Fig. 3). Besides this, the "hysteresis" fold becomes wider and causes a net increase in the probability that situations of conflict will occur.

In a context like this, a belligerent conflict will easily break out (since we are trapped in a *conflictual hysteresis*) and will only cease when both parties are exhausted. It can be said that when the technological level is *relatively* high, the units have a tendency to reject or abandon the ideal of sharing values and norms. In other words, the borders of regional systems —which potentially reduce the conflict between the units of which they are composed— are seen as fragile and insubstantial, while the units prefer to close themselves up in themselves, strengthening their own sovereignty and taking on autocratic attitudes and policies. This mechanism can be explained in view of the fact that

the growth in technological capacity not only increases the opportunity of inter-relationships, but it can also make the unit more aggressive.

Inevitably such a process is carried out within the framework of the model, given that until this moment we have not yet considered the so called *"deep structure"*, which is made up of the *"principle of order"* and of *"functional un-differentiation"*. In reality, this means that for the moment this factor has been tacitly considered as being stable at its maximum level (in other words, the units are all totally undifferentiated from a functional point of view and, therefore, the principle of sovereignty is completely respected, and anarchy is "complete"). In effect this induces the unit to act purely on the basis of the two abovementioned "interactional" control factors (the level of *"shared values and norms"* and the level of *"technological quality"*). In addition, as we have also previously noted, in contrast with the case observed in Fig. 1, the introduction of the *"principle of polarity"* has changed the context: as a consequence, once a certain level of technological quality has been exceeded, the systemic structure (i.e., the behavioral surface) takes on a morphological shape that makes the unit particularly inclined to enter into conflict. Therefore, paradoxically, upon introduction of the first modification, the factor of *"technological quality"* maintains and increases its double-fronted characteristic and has a tendency to make the negative effects prevail on the positive. In Fig. 2 the extent to which the situation has worsened becomes obvious. The conflictual component deriving from the increase of social interaction between groups of individuals and/or units has already been well emphasized (Richardson, 1960). It is therefore evident how the *principle of polarity* —tied to the unequal distribution of resources— in the presence of highly undifferentiated units (therefore, autocratic and not inclined or willing to come to an agreement) easily counterbalance —in a strongly negative way— the unit's tendency to *share* borders established on the basis of *"shared values and norms"*, therefore favoring instead the tendency *of aggressive expansions*.

However, the international system has mechanisms which "compensate" the effects of "conflictual hysteresis". These mechanisms can be traced back to the previously mentioned factor of *functional differentiation*. Contrary to what happens after the introduction of the *principle of polarity*, a greater functional differentiation of the units indeed causes an increase in the cost of the conflict, which helps to stabilize the system. In the case of the topological structure derived from the introduction of this new factor (see the *"butterfly catastrophe"* of Fig. 3, a morphological evolution of the *"cusp catastrophe"*, with two more topological "dimensions"), the form of the surface changes and a new *"behavioral pocket"* emerges, characterized by a "controlled or regulated conflictuality",

a sort of "governed turbulence" (Rosenau, 1990). Inside this "pocket" roles are given and expectations are more secure, even when referring to the use of force.

In other words, the units whose behaviors can be placed in this area of the topological surface "know" better how the others behave (even if only in an approximate way) and so they also know which ones could become aggressive towards them, or which ones would not be inclined to adopt belligerent behavior, or yet again they know on whom they can depend if an emergency should arise, be it military, economic, political, or diplomatic.

The name of the new surface is derived from the particular "pocket" in the center of the surface itself, in which new modes of interaction can take place: it can be classified in the category of compromise of *"governed turbulence"*. This new surface reveals the fact that even if the present systemic structural context survives, actors start *learning* to deal with violence in a brand new and different way.

This in fact happens when there is a growing functional differentiation of the units, which however does not lessen the principle of anarchy. We could say that the functional differentiation causes a "reassuring" effect on the units, which are now forced to accept regulated intermediary behaviors. In this way, the topological structure which was initially used to provide a generic description of the relationship between the intensity of the use of organized violence in the context of competitive interaction, on one hand, and the factors which make up the interactive level of our theoretical scheme (*"cusp catastrophe"* of Fig. 1 and 2), on the other, is finally put into *a mature context*, where even the fundamental principle of anarchy is "mature" (Buzan, 1993).

It could be said that the two new control factors literally add a new "dimension" to the political behavior between actors. Therefore, through a *"butterfly catastrophe"*, we obtain a valid topological model for the entire complex of international systemic structure on which the various behaviors of the systemic units can "move". The usefulness of the model seems to be indirectly revealed by the fact that it is even able to solve the discussion which arises —especially within the realist theories— between supporters of the anti-conflictual tendency of unipolarity and those who instead are convinced that it is bipolarity, oligopolarity or even multipolarity that reduces international tensions. In our model there is room for each of these configurations, as it allows many possible results, may they be conflictual or pacific, in light of the "area" in which the unit is collocated: outside the *pocket of "governed turbulence"*, the proliferation of poles generates conflictual tendencies, while an increase of polarization reduces the risk of *"conflictual hysteresis"*. On the other hand, when the units are in the

"pocket", the proliferation of the poles can also cause an effect opposite to the one just mentioned: specifically, it favors the functional differentiation of the units and therefore allows for the "pocket" to be enlarged with a stabilizing effect. As a consequence, in this area of the surface polarization is deleterious, because it leads to the shrinkage of the "pocket".

Analyzing the morphology of the behavioral surfaces, it is possible to observe how a further increase in the factor of *"technological quality"* can make the unit leave the *"behavioral pocket"* —which could be defined as a "safe place"— and once again they risk falling into a behavioral hysteresis. This indeed corresponds to what actually happens, and it can be avoided only if one of the two following cases occur: *a)* enlargement of the "pocket" of *"governed turbulence"*, which can only happen if the effects of the positive feedback coming from the cooperative learning processes have "crystallized" in the system; moreover, this occurs if the increase in technological quality exerts sequential positive effects, both on the level of the units and on the relational one (the link between the level of the units and the structural one), as well as on the increase of functional differentiation, which will again regulate the dimensions of the *"behavioral pocket"*; *b)* increase in the *"shared values and norms" factor* —often indirectly caused by the increase of technological quality— sufficient to compensate the negative effect produced by an increase of the latter.

However, in both cases it is necessary that a certain amount of time elapses. If this does not happen —that is, when events which should "hold" the units in the *"behavioral pocket"* have not been able to take form— then the units effectively leave the area of compromise. Consequently, time is the crucial variable that intervenes on the retroactive mechanisms linking the various levels and that qualifies them.

To summarize briefly, we have observed how the various states that the international system can take on depend on the interaction between its highly stable structural components (albeit not "absolutely immutable") and the units within them. The crystallization of the units' behavior (defined by Buzan by the term "Process Formation") decides the formation of the "relational context of behavior" (Snyder, 1997), which, by influencing the factors on the higher levels (those of the systemic structure), brings about variations both in the previously mentioned *"behavioral factors"* (which influence the "position" of the different behaviors of the units on the behavioral surface and define its state), and in the structure of the system (the morphology of the planes —that is, their position— and, in general, the shape and inclination of the topological surface).

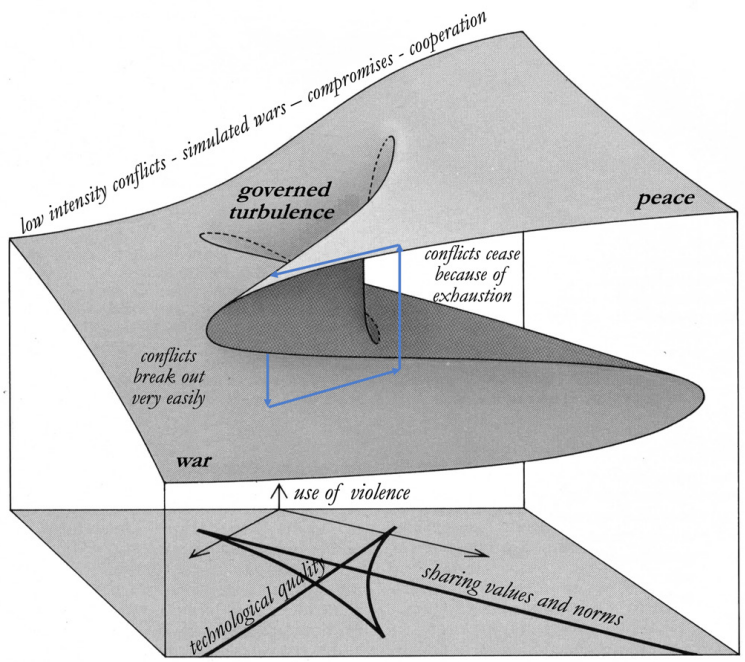

Figure 3. A butterfly surface: the result of the introduction of constraints and rules to the "*deep structure*"

However, this process does not upset the basic principle on which the system rests. It may change its appearance, but not the type of topological surface which will continue to exert its effects on the units in a stable way. This is in fact the main prerogative of the topological surfaces which has led us to employ the "Catastrophe Theory" for the purposes we set out to achieve: dimensions may change, but geometric properties remain unaltered.

Closing remarks

By applying the "Catastrophe theory" to the international system, we saw that when the growth of the *"technological quality"* factor exceeds, in intensity, the *"sharing of values and norms"* factor, it happens that the tendency towards conflicts significantly increases, unless the actors who could potentially be involved in such conflicts are included in a

supranational system, which facilitates a sort of constant and natural increase in the sharing of values and norms among all the members of the system itself.

An example of such a regional supranational system can be given by the European Union, which, however, presents itself as an entity still not well defined from many points of view (among the actors that are part of it there are in fact significant imbalances and inhomogeneity in the economic, fiscal, military, political, and socio-cultural domains), which is why in this particular case the full operativity of the effect generated by the *"butterfly pocket"* is not assured in a durable way. In fact, this particular situation, theoretically capable of regulating in a virtuous manner the behavior of the State actors that are included in it, is weakened and incapable of expressing all its positive effects when the differences (in terms of characteristics and strategic objectives) between the constituent members of a supranational entity are too marked.

Beyond what has been observed so far, it would certainly be interesting to verify if and how much an excessively rapid type of technological evolution, therefore potentially capable of generating conflicts, also affects the type of conflicts between the actors involved. In other words, if a rapid technological evolution (not counterbalanced by the sharing of values and norms) in the field of conventional military technologies generates conventional conflicts; or, when this evolution concerns the field of bacteriological-chemical technologies, if this generates chemical-bacteriological conflicts, or if evolution in nuclear generates nuclear conflicts, and if the evolution in the field of economic-financial technologies, generates economic-financial conflicts and "wars". These hypotheses seem, at first reflection, very plausible and would deserve to be studied in depth.

References

Adelman, I. and Hihn, J. M. (1982). Politics in Latin America: A Catastrophe Theory Model. *Journal of Conflict Resolution*, *24*(4), 592-620.

Buzan, B. (1993). Rethinking System and Structure. In B. Buzan, Ch. Jones, and R. Little, *The logic of Anarchy: Neorealism to Structural Realism* (pp. 19-80). New York: Columbia University Press.

Dockery, J. and Chiatti, S. (1986). Application of catastrophe theory to problems of military analysis. In *European Journal of Operational Research*, *24*(1), 46-53.

Flay, B. (1978). Catastrophe theory and the Study of War. In *Journal of Conflict Resolution*, *22*(2), 171-208.

Holt, R. and Brian, J. (1978). *Catastrophe Theory. Selected Papers 1972-1977*. Boston: Addison-Wesley Pub. Co.

Isnard, C. A. and Zeeman, E. C. (1976). Some Models from Catastrophe Theory in Social Sciences. In L. Collins (Ed.), *The Use of Models in the Social Sciences* (pp. 44-100). London: Routledge.

Maldonado, C. (2006). Teoría de las catástrofes y teoría financiera. *Odeón*, (2), 56-74.

Mathews, M., White, M and Long, R. (1999). Why Study the Complexity Sciences in the Social Sciences? *Human Relations*, *52*(4), 439-462.

Oliva, T., Peters, M., and Murthy, H. S. K. (1981). *A preliminary empirical test of a cusp catastrophe model in the social sciences*. *Behavioral Science*, *26*(2), 152-162.

Prigogine, I. (1993). *Le leggi del caos*. Bari: Laterza.

Richardson, L. (1960). *Statistics of deadly quarrels*. New York: Boxwood Press.

Rosenau, J. (1990). *Turbulence in World Politics. A Theory of Change and Continuity*. Princeton: Princeton University Press.

Saaty, T. (1996). *Decision making with Dependence and Feedback: the Analytic Network Process*. Pittsburgh: RWS Publications.

Scartezzini, R. e Rosa, P. (1994). *Le relazioni internazionali. Lineamenti di indagine sociologica*. Roma: Nuova Italia Scientifica.

Schubert, G. (1989). Catastrophe theory, evolutionary extinction, and revolutionary politics. *Journal of Social and Biological Structures*, *12*(2-3), 259-279.

Snyder, G. (1997). *Alliance Politics*. New York: Cornell University Press.

Thom, R. (1972). *Stabilité structurelle et morphogénèse: essay d'une théorie générale des modèles*, Paris: Benjamin.

Thom, R. (1980). *Modèles mathématiques de la morphogénèse*. Paris : Bourgois.

Thom, R. (1993). *Prédire n'est pas expliquer*. Paris : Flammarion.

Varian, H. (1979). *Catastrophe Theory and The Business Cycle*. *Economic Inquiry, 17*(1), 14-28.

Waltz, K. (1959). *Man, the State and War: A Theoretical Analysis*. New York: Columbia University Press.

Waltz, K. (1979), *Theory of International Politics*, Newbery Award Records.

Zeeman, E. C. (1976), *Catastrophe Theory*, in *Scientific American*, vol. 234, n. 4, pp. 65-83.

Zeeman, E. C. (1978). *Catastrophe Theory. Selected Papers 1972-1977*. Reading, Addison-Wesley (2nd Ed.).