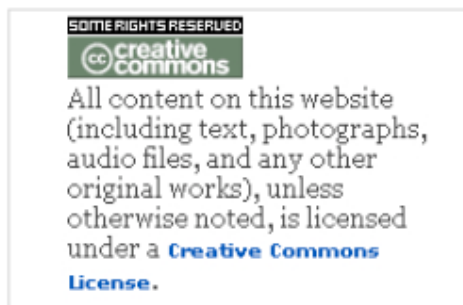**Systemic Complexity for human development in the 21st century**
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APOCOSIS

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Contribution to the design of a world model globalisation and sustainability

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Abstract

This communication is not a finished product while research is the presentation of a process that is commencing with regard to:
a)   the non-existence of a theory which explains what globalisation is and how it evolves
b)   the certainty that this cannot be obtained from research strictly done by sociologists
c)   the need for an interdisciplinary team
d)   the role of the General Systems Theory being essential
e)   the hypothesis upon verifying that the Chaos Theory and the simulation via the Forrester Method may play a key role in the achievement of the Globalisation Theory or, in more specific terms, the possibility of finding chaotic dynamics which may generate recurrent models to be validated. Another possibility is simulating parameters in Forrester models which permit sustainability.

This communication commences with the presentation of a multi-stage research process with which results are currently being obtained that enable the verification and validation of the initial hypotheses. In the near future, research will continue with the collaboration of a team of teachers from the Ciudad Juárez Autonomous University (Mexico).

Keywords: globalisation, systems, chaos, simulation, Forrester

1.   **Background (1):** in relation to the objective of this communication:
This work is based on several hypotheses:
a.   Very important sociologists, e.g., Wallerstein, Held, have come to the conclusion that there is no Theory designed about globalisation (understood in the Popperian or Falsifiability sense).
b.   The interdisciplinary nature is necessary for correct research works, and particularly to formulate such a theory.
In that sense, an interdisciplinary team of researchers at the University of Valencia considered the convenience and need to construct such a theory, a theory which would be supported by a model designed to validate what would, at the time, define the globalisation of the period 2010 and 2030
Various routes are available for this:

a)   One emerged from the Forrester methodology (I_3)

b)   Another emerged from the Chaos Theory and Chaos Dynamics (I_2).

2. **Background (2)**: the background of this communication: Sociology, the Globalisation of Sociology, the Sociology of Globalisation (see " La Conciencia Global hacia una Sociología de la Globalización" , Gil-Manuel Hernández, published by Germanía in 2005).
In relation to attempt I_2 :
As we understand it, prior to detecting the possible Chaotic Dynamics, it would be advisable, and essential perhaps, to not only study the possibility that as Society continues in its inexorable advance over time, it would generate specific individual behaviours in Society,

but also the possibility of Society, in relation to the individual, generating Chaotic Dynamics. That is, the precursors of the three existing hegemonies of the Netherlands, Great Britain and the US.

In that sense, the reading matter in the book by George Balandier ("El desorden, La Teoría del Caos", Gedisa 1988) is most interesting as it reviews the experimental and theoretical considerations of Saint Simon, Durkheim, Marx, Max Weber, Comte, H. Spencer, etc.

Likewise, the reading matter in the cited book by Gil-Manuel Hernández i Martí "La Conciencia Global hacia una sociología de la Globalización" (published by Germanía, 2005) is extremely important, in which the following are presented:

a) The works of sociologists prior to globalisation
b) The globalisation of Sociology
c) The Sociology of globalisation

It is necessary to know the multidimensional positions of Sceptics: Bourdieu, Huntington.

Detectors of the World Capitalist System: Wallerstein, Amin.

Defenders of the political profile of globalisation: Francis Fukuyama, David Held.

Those who encounter the influence of globalisation on culture, anthropology.

Those who encounter the influence of the media on globalisation: Mattesat, Thompson.

Those who study the social impact of globalisation: Zygmunt Bauman.

Those who study the ecological impact of globalisation: Ulrik Beck.

Those who fundamentally attempt to capture the multidimensional aspect of globalisation: Giddens, Castells, Ianni, Held.

During the sociologists debate on globalisation (that is, in the debate which leads to a Sociology of globalisation), the ideas were arranged into three main theses:

a) The hyperglobalist thesis
b) The sceptics' thesis
c) The transformationalists thesis

In our view, the transformationalists thesis puts forward more congruent hypotheses with the models that we wish to construct, in particular, the impact of globalisation in a chronological fashion over time and in a historicist sense.

Several very different authors take part in this hypothesis: systemics, Marxists, neo-Weberians, geographers, anthropologists, economists, etc.

They all consider that globalisation is the driving force behind the rapid social, economic and political and historically novel changes which modern societies are restoring (Giddens, Castells, Beck, Stiglitz).

The Transformationalists Thesis clearly puts forward that globalisation increasingly shapes the world into a global system.

Wallerstein: The World Capitalist System fragmented into centre, periphery and semi-periphery

Luhmann: World Societies System.

De Venanzi: a self-referential and self-policing system ¿Es este el término?

Postures exist from the historic or globalisation origin viewpoint. Globalisation may be defined as a macro process over time (long-term), which contains several processes that are historically connected and converging (mid-term and short-term).

In that sense, Morin stresses the need for the transdisciplinary nature of the approach, the need to overcome specialisation which distorts the systemic view of "man will recover the entirety" (Mauss). Blass Pascal states: "...I believe it is impossible to know the parts without knowing the entirety, just as it is not possible to know the entirety without particularly knowing the parts".

Morin says that "...The consequence of complexity leads to an awareness of the essential change in the Human Sciences paradigm" (Morin 1998).

Lamo de la Espinosa "...what is important is not that there is a new social reality to consider (global and not local. What is important is the need to consider it in another way)". A new way of modelling is necessary because the subject is within the object, and this involves

breaking the positivist-fiscalist model and entering an epistemology which is specific for social sciences: "an epistemology of totality".

Globalisation expects a scientific statute of sociology based on the transdisciplinarity nature of the research task.

The reading matter of the book "Chaos and Governance in the World System", by Giovanni Arrighi (published by Akal, 2001) is clearly related to Fernando Braudel's Transformationalists Thesis, and allows us to check the contribution of the frequently cited Chaos Dynamics.

3. The University of Valencia team's doubts about the methodology:

A two-sided model.

Notwithstanding, the team that undertakes this research believes that it is advisable **not** to be limited to a model based on Chaos Dynamics.

The research project is entitled: "The World Globalisation Model versus Sustainability".

We believe that we must promote **two** parallel and interdependent research works both simultaneously and separately which are validated and which also "converge" in their conclusions. On the one hand, this would be a sign that we have accomplished a "two-sided" model for globalisation, like the god Janus who had two faces.

On the other hand, this globalisation model would be rather like Quantum Mechanics as it would take the form of I_2, and I_3, in terms of the premises from which we commence. It would also be like both the undulatory and corpuscular characters which co-exist, but both are seen with either of the characteristics depending on the type of experimentation involved.

And what are the characteristics of the two I_2, I_3 models?

4. The first summary of the I_3 version of the future model (the Forrester version)

I_3 is a model based on the methodology according to Forrester (which appeared in 1961, and has been established worldwide, and it was not until 1970, once it had been adopted by the Club de Roma, that produced the first World Model). This model was based on level variables, flow variables, exogenous variables, auxiliary variables and rates, which allow for progress and to make long-term forecasts. This model also permits the testing of parameter values (simulation) to be able to know the effect of globalisation on sustainability, and what the action variables should be (politicians, institutions, the state, UN, UNESCO, EE, NATO, WTO WB, IMF, etc.).

I_2, is a model based on finding Chaos Dynamics, to which the rest of this communication is dedicated.

5. A first summary of the I_2 version of the future model (the Chaos Dynamics version)

This is based on the hypothetical existence of Chaos Dynamics in the globalisation stages which existed historically in the Dutch hegemony, and later in the British hegemony, and later still in the US hegemony. This enabled a recurrent globalisation model to be found, which was later validated in the period 1900-2006, and was subsequently used to discover future globalisation (2006-2026). It was finally submitted to the restrictions required to be coherent with future sustainability.

Is this possible?

Yes it is, because three successive hegemonies appear in the period 1648-2006; Dutch, British and American; and there is a fourth one which, to date, remains to be defined. They present significant similarities which seem to originate from a recurrent model for which the hegemony may be deduced as a future reality. Each hegemony is a new step on the stairway to the reality of future globalisation.

And how do we go about obtaining the successive recurrent model?

By definition, hegemonies are, diachronically, successive stages; weakness, growth, maximum strength, deceleration; which create the points needed to, in turn, bring about the Transition from one hegemony to another.

Chaotic systems as such are recognised in two ways:

a) Through the verification in the time series or in the spatial-time series generated by the system, in this case of the corresponding World System, with the axioms:
1) Sensitivity to the initial conditions
2) Density of the periodic time series
3) Mixture of the time series in the XE [0,1] .
b) Or through the verification of the initial conditions in the logic-metaphoric definition (of Professor Lorenzo Ferrer) of Chaos Dynamics of a downward disorder system, which is consistent with the design of an upward order. Chaos dynamics is sustained by self-organisation which emerges from disorder, and which is profound and elaborate enough to gradually convert disorder into order.

Chaos ceases when disorder ceases, and a new order appears which, if the system so wishes, can convert it into a better order than the one before (easy definition).

The team has accomplished each hegemony of the World System to pass in accordance with the following stages:
1) Weak stage in the hegemony
2) Chaos dynamics stage idem
3) Hegemony stage   idem
4) Weak stage   idem

6.1 Summary of the process

The stages of the process in method I_2 .

A1 The recurrent globalisation method is obtained in terms of the chaotic dimensions immersed in the two indicator hegemonies (remote)

Heg H   Heg GB

_____
_____α
1648   1898   1920   2010
        2030
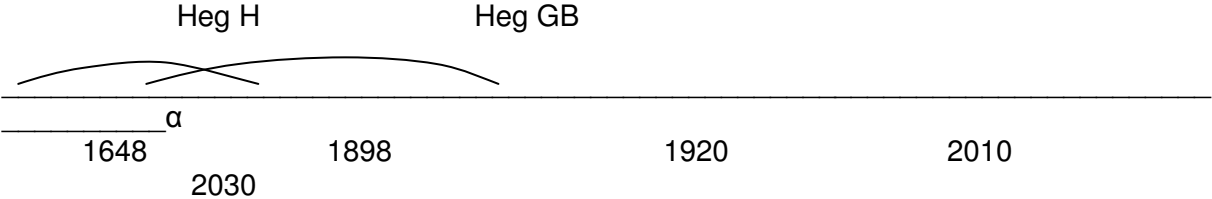
A2 .The recurrent globailsation method obtained is validated by means of forthcoming globalised reality

Validated period

_____
_____α 1648   1898   1920   2010
        2030
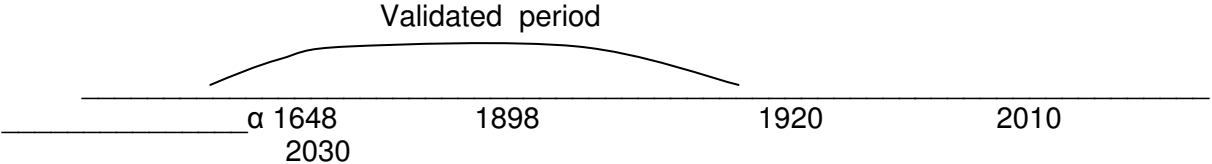
A3. The already validated recurrent globalisation method is used to obtain future globalisations (from 2010 to 2030)

_____
_____α
1648   1898   1920   2010   2030
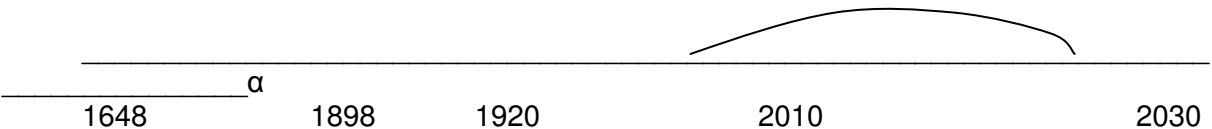
A4. The future globalisation method (2010, 2030) is submitted to the necessary restrictions (ecological footprint, renewable means, sustainability culture) for it to be compatible with sustainability

_____
_____α
1648   1898   1920   2010   2030

4
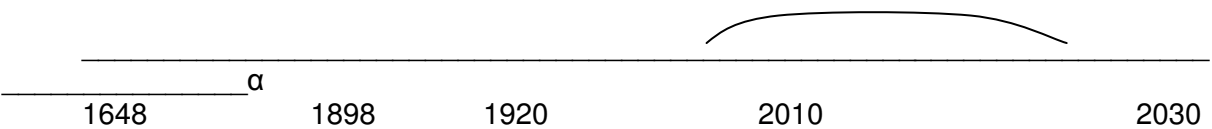
6.2 Stages of the A_1, A_2, A_3, A_4 process

6.3 Development of stage A_1: obtain a recurrent globalisation model

Stage A1: How to obtain a successive recurrent model?

The team considers that the following stages are found in each hegemony in the world System:

α1) Weak stage in the Dutch hegemony
α2) Chaos Dynamic stage   idem
α3) Hegemony stage   idem
α4) Weak stage   idem
β1) Weak stage in the British hegemony
β2) Chaos dynamics stage
β3) Hegemony stage
β4) Weak stage
c1) Weak stage in the US hegemony
c2) Chaos Dynamics stage   idem
c3) Chaotic hegemony stage   idem
c4) Weak stage   idem

The three hegemonies are related as follows:

HH	α1 α2 α3	α4		
HGB		β1 β2 β3	β4	
HUS			γ1 γ2 γ3	γ4
HX				δ1 δ2 δ3

For the purpose of the analysis of the three indicated hegemonies, and with a view to doing the essential comparison of the parts which enable the following areas to be detected :

- Disorder (in the hegemony) Ĥ
- Chaos = co-existence of disorder (former) and order (emerging in hegemony Ĥ
- new order (in hegemony Ĥ)

and which enables the study of the transitions of HX

from   HH   to   HGB
from   HGB   to   HUS
from   HUS   to   HHX

we should bear in mind that:

a) On the one hand, the demographic, economic, political-military, social, cultural and environmental dimensions
b) And on the other hand, and for each hegemony:

      The military political-economic evolution
      The parallel business evolution
      The subsidiary social evolution
      The contrast between western civilisation (Europe) and oriental civilisation (China, Japan, India, Malaysia, etc.)

What are chaos dynamics in general and qualitative terms?

It is essential for us to remember at this stage that, since a system evolves with determinism in $(0, t_0)$ (initial conditions, laws) with no degradation (systems that are in order), it is the subject of an evolution in which several divergences may take place.

The chaos dimension presented is isomorph to a logic-metamorphic model (because it starts out from the former logic on which a metaphor is superimposed).

6.4 The role of Chaos Dynamics in present-day research into the recurrent model

In short, chaos dynamics proposes the possibility of disorder being produced from within a degraded order (sensitivity to initial conditions, etc.). This disorder (chaos in the classic sense) may be a terminal station (noise): a tremendous possibility lost.

Yet if self-organisation (an endogenous process in the system) fights properly, an emerging order may be produced which co-exists for a time with downward disorder until the AO triumphs by achieving, with the disappearance of disorder, a new triumphant order, which appears if the AO has wisely achieved – innovation – a new order which adapts as much as possible to the project objectives.

The importance of the chaotic dimension lies in the recurrent model which each of the following sought in the past:

The Dutch, the British and the Americans, who appropriately opted (self-organisation) to create a new order which meant a rise for the hegemony.

If we are able to detect the AO that they used, and this AO is repeated on several occasions, we are detecting recurrence, a repetition which will be the basis of the recurrent model we seek.

From the logic point of view, obtaining a recurrent globalisation model in our case involves:

$R_1 = $ * detecting the generic structure of the evolution process of social systems

$R_2 = $ * analysing specifically the evolution process of those social systems which accomplished hegemonies

$R_3 = $* checking that this process provides the conditions so that they have accommodated chaos dynamics in both HH and HGB

$R_4 = $ * checking the existence of an isomorphism between both processes: HH and HGB

$R_5 = $ * obtaining a recurrent globalisation model from this isomorphism (to be validated)

6.5 Development of the R_1 process. Detect the generic structure of the evolution process of Social Systems

$\underline{R}_{11} , \underline{R}_{12} , \underline{R}_{13} , \underline{R}_{14} , \underline{R}_{15} , \underline{R}_{16} , \underline{R}_{17} , \underline{R}_{18} , \underline{R}_{19}$

Within the research that is being undertaken, only point R_1 has been reached. This point R_1, is presented below and has been broken down into the following sections $\underline{R}_{11} , \underline{R}_{12} , \underline{R}_{13} , \underline{R}_{14} , \underline{R}_{15} , \underline{R}_{16} , \underline{R}_{17} , \underline{R}_{18} , \underline{R}_{19}$

$R1$ Detecting the genetic structure of the evolution process of the social systems

The present-day world, W, divides man through the action of W's powerful subsystems, and H becomes chaotic = H indecisive

L1 The medical subsystem of W divides man by specialities; it disorders man

L2 The educational subsystem of W creates formations that disorders man

L3 The production subsystem of W submits H to serial chain operations: this undoes the unity of active life, it fractures it, it disorders it

L4 The commercial subsystem of W (consumption, fashion, advertising) generates the renewal of measures, generates man's love of what is short-lived; thus favouring man's pleasure, it brings about disorder in H

L5 The information and communication subsystem of W generates a kaleidoscope view in H, which causes segmentation and disorders man
But another view commences from this same world, W

L6   The subsystem of the regulation of masses of W generates <u>order</u> in its entirety, which immediately leads to breakdowns, collisions, a breakdown in order with bottlenecks in traffic, etc): disorder

A situation of chaos appears = co-existence in H of the disordered H and of H with increasing order

Who triumphs in this co-existence?

It is possible that disorder triumphs and no order appears.

Perhaps a triumphant order appears. For the time being, we have indecisive man (co-existence of disorder α and emerging order β)
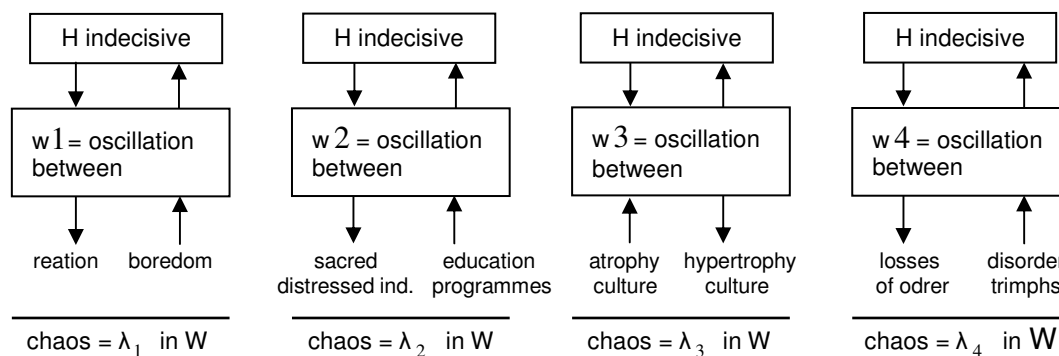
In <u>disorder</u>, H dissolves and becomes too big, but under certain circumstances, man's AO permits man to recover from his growth, to recover his individualism, recover from indifference, to return to social relationships (computers, the Internet, chats) and acquires a certain narcissism: <u>H recovers order.</u> The new order triumphs. He is a <u>manufactured man</u> (<u>body-wise</u> = look, fashion, the gym, aspect, <u>socially</u>, <u>culturally</u>, TV receiver, real-life stories in Spain)

(We move from order →disorder → chaos→ new order)

R1   <u>Chaotic H = indecisive H, and this affects the feedback to W which becomes chaotic</u>

Yet while W causes an effect of chaos dynamics on H via its powerful subsystems (SS) (given the co-existence of disorder and order) which in turn, leads to order after a long spell of indecision.

Indecisive man takes revenge and, in a feedback on W, creates different chaotic universes, $W1$ $W2$ $W3$ $W4$ through different causes = oscillations

H indecisive	H indecisive	H indecisive	H indecisive
$w1$ = oscillation between	$w2$ = oscillation between	$w3$ = oscillation between	$w4$ = oscillation between
reation boredom	sacred distressed ind. education programmes	atrophy culture hypertrophy culture	losses of odrer disorder trimphs
chaos $= \lambda_1$ in W	chaos $= \lambda_2$ in W	chaos $= \lambda_3$ in W	chaos $= \lambda_4$ in W

Before, W produced an indecisive, segmented and chaotic H.

Now indecisive H takes revenge and creates $W1$, $W2$, $W3$, $W4$, chaotic universes through various types of chaos.

All this leads to a sequence of social systems with various feedbacks between W and H.

In other words, the world $W = W1$ $W2$ $W3$ $W4$ =   chaotic worlds.

R1   <u>What would the outline be of the parallel evolutions of W and H in 2006?</u>
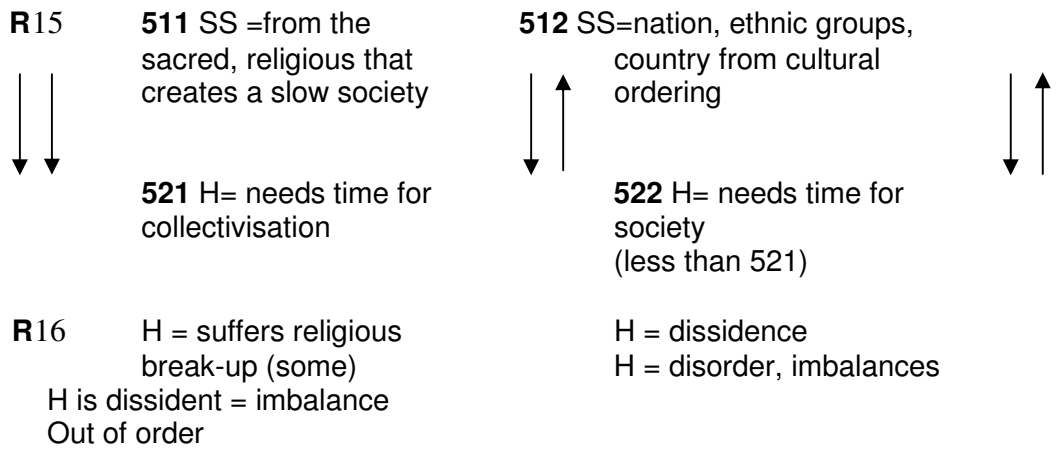   **R11**   We are in 2006
   R12   A W system exists
   R13   immersed in a culture in such a way that:

Society is taken as something approximate and threatened; this is the result of an interaction between order and disorder. Society is always seeking its unification. Therefore phenomena with varying temporalities co-exist in society which cause imbalances and disorder in H's personal time.
   R14   Consequently, this means that several subsystems, SS 1, SS 2, etc., are created in the W= World System which, as we have seen, crush and disorder H

R15   **511** SS =from the sacred, religious that creates a slow society   **512** SS=nation, ethnic groups, country from cultural ordering

521 H= needs time for collectivisation   **522** H= needs time for society (less than 521)

R16   H = suffers religious break-up (some)   H = dissidence

H is dissident = imbalance   H = disorder, imbalances

Out of order

Two types of imbalance appear:

a) horizontal among 521, 522, 523 (endogenous to H)

b) vertical among 511; 521; 512; 522; 513 and 523 (exogenous to H)

That is: between dynamics that are exogenous and endogenous to H.

R17   H = chaotic, indecisive affects the feedback on W, and W becomes chaotic for various reasons $\lambda_1, \lambda_2, \lambda_3, \lambda_4$

R18   The chaotic W, in terms of the endogenous AO, means that

a) no new order W is accomplished

b) a new order W is accomplished

R19   but a subsystem, T of the World System W is also possible, for example, Spain, Rome, Iran, Macedonia at a specific time, to give:

T = chaotic   H = man $\in$ T

T $\rightleftarrows$ H
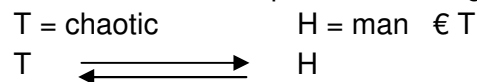
And T = chaotic in terms of its endogenous AO, and achieves a new order which other than its intrinsic novelty, generates a hegemony of T during a period.

Summary of R1:

The former R1 process is one based on feedback as a result of the parallel evolution

H $\rightleftarrows$ W
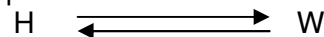
in which chaos dynamics appear and play a relevant role in social evolution

....

All this makes us think that the hypothesis of the creation of behaviours with chaos dynamics in General Society, and especially in the Dutch, British and US Societies, are reliable enough for us to base ourselves on them in order to detect the Chaos Dynamics.