Notes on Chaos and Psychoanalysis

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FORWARD

The aim of this research is to recuperate Freud's (and Bion's) desire of building a scientific psychology founded on natural sciences, that means on psychic processes that are quantitatively determined and measurable, on developmental state, dynamic, and so on. He wrote: "Once again we are confronted with the importance of the quantitative factor, and once again we are reminded that analysis can only draw upon definite and limited amounts of energy which have to be measured..." *(1) Naturally we are not thinking in terms of energy now, but in terms of measurement of some variables that can help us to build up a model for predictability, as the modern sciences suggest.*
This is the aim of my research.
As we know, Freud went out of his premises following, correctly, his clinical intuitions and developing them. It was only during the First World War, and shortly after, that he started to reconsider his original 'Project for a Scientific Psychology'. His intention was to build up a Metapsychology. Unfortunately he destroyed part of these papers and veered the future of psychoanalysis back into the calm floating of mythology, leaving the legacy to psychoanalysts to rethink the 'Project for a scientific psychology' founded on the solid bases of the methodology, principles and universal laws of the natural sciences.
These sciences - that started around the end of the last century, at the same time as psychology and psychoanalysis - had an enormous success and development because of the same historical events by which, instead, psychoanalysis was obstructed and blocked. The quantum theory, the relativity theory, above all, the non-linear dynamics and complexity theory have changed not only most of the scientific paradigms, but also epistemological and methodological views, imposing a radical review of the basic assumptions of research and of the concept of experimental research itself. Naturally they are changing our way of thinking.
Starting from these premises, observations and knowledge of the field of natural sciences, of course with the help of the mathematicians and physicists, and from my personal clinical experience as a psycho-analyst and psychotherapist in the NHS Psychiatric Unit and in private practice, I built up a dynamical-interactive model of the psychoanalytic and psychotherapeutic event. I think that this model can help to account for observed data, to organise them inside the system and its subsystems, to enable their analysis both under geometrical and informative aspects.
If psychoanalysis should be considered a scientific field it has to introduce itself with a clearer and more unambiguous paradigm, and I think this is possible. Further on psychoanalysis can be understood, evaluated and submitted to the rigorous examination of the methodology of the sciences.

INTRODUCTION: Theoretical background

Psychoanalytic relationship is a holistic system that can be metaphorically represented by the image of the bath-tub (2-3). During the analytic interplay, the analyst is busy in feeling, understanding and catching the unconscious meanings while he is building an intimate and vital relationship with the patient. Psychoanalytic research starts when the patient goes out of the consulting room.
Starting from this moment the analyst finds her/himself in contact with her/his conscious and unconscious knowledge, i.e. her/his personal background, countertransference, scientific views, historical and actual researches, cultural exchanges, etc. Usually the analyst reconsiders the session's contents and experience and tries to recognise the direction of the development and progress of the analysis. Yet, he/she focuses on defences, anxieties, state of processes, new understanding and the patient's mental functioning, building up some theoretical aspects or adding some new ideas to her/his personal knowledge. It is exactly what all of us do after Freud's experience and suggestion.

a) Freud's "Project for a scientific psychology"

From the his earliest papers to the last, Freud uses, basically, concepts that he borrowed from natural sciences, such as: phases, quantity, process, motion, frequency, constant, factors, mechanisms, etc. in his effort to try, again and again, to build up a scientific psychology. As we know this project has never been realised, above all because the contemporary sciences had not instruments to understand and describe the dynamic of 'the whole variegation of the phenomena of life' *(4). While modern science is holistic, probabilistic, non-linear and dynamical, Freud's Metapsychology was a slave to old-fashioned ideas such as reductionism or deterministic views, based on last century's hydrodynamics. Instead, for us, the 'rules of evidence', the 'universal laws', the problem of 'the measurement' and predictability, the frame-concept of the 'System' and its subsystems, have to become some of the basic principles of our inner and outer scientific debate.*

b) The problem of measurement in psychoanalysis

I cannot agree with Steiner's quotation that "scientific efforts in psychoanalysis deal with meaning*"(5). Meaning is just the aspect of art; science is inner coherence (Kuhn's paradigm) and communication with other scientists (Popper's view) and requires rules, laws, measurement, etc. We have lots of good tools that can be used as measurement of an ongoing behaviour during a session. If we would like to understand better what happens during a session or the interaction between the sessions or if we would like to communicate*

with other colleagues, we have also to use these tools, not only the meanings. Bion was clear on these aspects, as you can read on "Cogitations"(6), while F. Tustin reminded me that maths can help psychoanalysis in many aspects. At least, it is exactly what we do when, writing our clinical papers, we speak in terms of theoretical views. In my opinion the most important effort we have to make is to try to open our scientific mentality, to change the basic paradigm, or to add a new paradigm, to define new basic assumptions and to internalise them. This new scientific paradigm has to become, first of all, part of our counter-transfer. After, we must use the new tools in everyday practice.

Another aspect that we have to include in our research, and which is one of the main points of this proposal, is the construction of models able to explain the dynamics of treatment in terms of the structure of the holistic system, its oscillation between the observer -the analyst-therapist- and the environment, and the inter-action between the subsystems, together with their evolution along time. These models will include rules, concepts, features and laws of psychoanalytic treatment, in order to communicate and have a real exchange with others, colleagues or not.

c) Structure and States of mind

In Analysis Terminable and Interminable, that Sandler (7) recognises as Freud's legacy and his real book of Metapsychology, Freud rethinks the limits of analytic experiences and feels the need of a synthesis after his failure to build up a scientific psychology. From the beginning of this book Freud poses some questions about the real improvement and effectiveness of psychoanalysis as therapy and he introduces, underlining that this does not depend only on the duration of the therapy, some new epistemological ideas regarding the scientific method, frame and principles or regarding the link with other scientific fields.

To do this, he comes back to the Greek civilisation, as he did with Oedipus, asking help from Empedocle, the man who seems 'to have united the sharpest contrasts' – 'to whom many a secret was revealed' – 'the theory … which approximates so closely to the psychoanalytic theory…' *(8). He signed definitively the second metapattern of his scientific project: the psychoanalysis as a* 'dualistic theory', based on 'two fundamental principles' and on 'the process as a continuous, never-ceasing alternation of periods'(9).

The first metapattern was his triadic recurrent model, at the core of any theoretical proposal: economic, dynamic, and topological relations – conscious, preconscious, unconscious knowledge, - Ego, Id and Super-Ego structure, - oral, anal and genital phase, etc. J. C. Rolland (10) set up Freud's structural model as the image, "metaphorically inclined", that "should not be rejected too quickly". *He spoke in terms of* "a

psychic system as structured around the three agencies". *In my view, this image is one of the basic assumptions of the new sciences.*
'What are metapatterns?' asks Tyler Volk in his book (11). They compare and generalise, they share a common shape and connect, they forge a trail in the possibility space of new configurations. They help to formulate models and to understand the structure of the scientific debates. They are attractors - functional universals for forms in space, processes in time and concepts in mind.
The binaries, the dynamic balance and these triadic processes, are at the core of any natural, social and psychic evolution. The laws that settle these processes are universal, as the Chaos Theory pointed out.

1.1) Basic assumptions

Since Galileo's scientific vision of reality, to have a pictorial image of the nature was at the core of any understanding. Catching the unchanging element of a reality, the whole, the hidden order of the nature, the system of the world, the links between things, the path of growing, was the primary task of any scientists. As G. Borsanti (12), a historian of science, illustrated, three were the pictorial images of the nature that influenced the path-way of the natural sciences: the ladder -the binaries-, the map and the tree -the three agencies.
It is not my intention to explain here all the implications of these pictorial images. I would like to focus and underline the complexity that lies in any psychoanalytic experience, not only in terms of "the transference, an intimate and vital process", but also in terms of building-up a model, scientific methodology and co-operation with the other fields.

1.1.I) The triadic structure of living systems, nature and language

From Galileo's statement that Nature is like a book and the letters of its alphabet are triangle and circle, and the influence of Pascal's triangle on maths and probability theory, to the fractal geometry realised by Mandelbrot, Sierpinski and von Koch with computer graphics, the shape of the triangle is the basic shape for developing, describing and analysing models and complex forms in a lot of different fields of Nature.
As the triangle, number 3, develops from the point, number 1, by line, number 2, so in the evolution of the Indo-European languages, but also in many others, at the beginning there was only the first person, after the second person and, only later, the third. Even if the triangle or the third person are at the end of an evolution, they, at the same time represents the development itself: the combination of triangle generates all others plane and solid figures, while the interaction between I & You with the others, persons or things, is the conceptual frame for any relationships and understanding.

In the living systems also we have three central premises or keys, as Miller pointed out (13). The first is that the living system contains many subsystems; the second key is the complexity while the third is the principle of fray-out, that is, as a system grows in complexity, the subsystems become more differentiated, i.e. the fractals and fractal geometry as a pattern for evolving a complex adaptive system.
We have already considered how Freud organised and rooted his theoretical configuration of psyche with the recursive use of three agencies, " the tripartite mind" *as R. S. Wallerstein (14) calls them.*

1.1.II) The Binaries

In all the world and cultures the binaries male & female, up & down, in & out, left & right etc., are the basic description of any elementary relationships in nature and philosophy, in logic and language and promote a frame of mind. Many words are used to shape the related things in the mind: parallel, oscillation, dyad, opposite, alternation, bifurcation, polarity, dualism, mutually, balance and so on. We have woven this simplest complexity...(15) into conceptual systems, into debates of meaning, into tools for describing. ...An intimate pair is form & function: form is thing, function is form's relation, ... while the dynamic balance is the key to encompass co-operation between opposites and to avoid the risk that the polarities slip into conflict.
Freud underlined his choice of this frame of mind first in The Theory of the Instincts: ... This concurrent and mutually opposing action of the two basic instincts gives rise to the whole variegation of the phenomena of life (16) *and later in Analysis Terminable and Interminable:* ... concurrent or mutually opposing action of two primal instincts - Eros and Thanatos, Life and the death-instinct - never by one or the other alone, can we explain the rich multiplicity of the phenomena of life. *Later on ...* two principles governed events in the life of the universe and in the life of mind ... the process ... a continuous, never-ceasing alternation of periods ... (17).
This alternation of periods is one of the basic assumptions of non-linearity and it is called bifurcation. What is bifurcation?
A brief quotation from Chaos & Fractals, just to introduce the concept of "bifurcation"(18): "One of the great surprises revealed through the studies of the quadratic iteration

$$x_{n+1} = a x_n (1-x_n), \quad n = 0,1,2,\ldots$$

(where X_n is intended to mean the 'value' of a certain observable at certain time, n, and X_{n+1} the value of the same observable at the successive inspection, at time n+1) is that both antagonistic states [order and chaos] can be ruled by a single law. An even bigger surprise was the discovery that there is a very well defined 'route' which leads from one state – order – into the other state – chaos.

Furthermore, it was recognised that this route is universal, *and can possibly be reversed.*
'Route' means that there are abrupt qualitative changes – called bifurcations – which mark the transition from order into chaos like a schedule, and 'universal' means that these bifurcations can be found in many natural systems both qualitatively and quantitatively."
Any person who finds her/himself, consciously or unconsciously, in front of a repeated sequence of bifurcations swings between two poles. Bifurcation and oscillation are dynamic experiences of everyday natural, social or psychic life.

1.2) Freud's Psychoanalysis, Linearity and Non-linearity

Modern non-linear dynamics is one of the most powerful theoretical frames of modern sciences. Even if H. Poincarè built up non-linearity at the beginning of our century and Freud discussed with Einstein about many things, Freud never really understood or was exposed to this new scientific frame and indeed he only quoted the concepts of 'entropy' or 'thermodynamic' a few times. He was completely blocked by the scientific method, the linearity, of his teachers, even if many psychoanalytic ideas contain implicitly most of the concepts of non-linearity.
Following G. P. Williams (19) non-linearity studies how something changes over time, taking into account the whole system, an assemblage of interacting parts; this is exactly what psychoanalysis does. It helps to explain irregular behaviour over time, … it pays to be familiar with new directions and new interdisciplinary topics, … it is … the easiest way to see how something changes with time making a graph … and … shows complex, unsystematic motion. It … deals with long-term evolution; finally … complex behaviour can have simple causes.
Non-linear means that output is not directly proportional to input like in the example of the quadratic iteration presented above or that change in one variable does not produce a proportional change or reaction in the related variables. As Nature does not produce processes that are linear, so even what happens in the psychic reality is non-linear.
M. J. Feigenbaum suggests that a new principle of 'economy' immediately emerges: why put out Herculean efforts … when anything else possessing the same qualitative properties will yield exactly the same predictions and results (20)?
In my research I would like to understand, for example, if the long term four sessions per week psychoanalytic experience could yield the same result of a brief, medium or long-term one to three sessions per week psychoanalytic psychotherapy. Only making a measuring device, a ***'grid'*** *that is able to record and measure these different experiences, I think we could clarify which changes produce this or that experience and so to make predictions, to verify premises and outcomes and to*

test efficacy.
The modern theory of non-linear dynamical systems seems the best suited to achieve this aim. In fact, it is focused on the analysis of a series of "observations'' one can make on a system, whether simple or complex. Its techniques, like e.g. phase space embedding, are universal, and do not make reference to any specific model of the system under observation--the better, for in our case no specific model can certainly be complete. Moreover, we shall make use of the experience accumulated in the physical sciences to determine whether a "motion'' regularity is increasing, whether it is heading towards a fixed cycle, or a chaotic phase. Equivalently, this theory allows to control and direct the effect of small external perturbations on the dynamics: quite clearly, this has profound relevance to therapeutical practice.
To know more about psychoanalysis and non-linearity you can read:

1) G. Pragier & S. Faure-Pragier*:*
Un siècle après l'"Esquisse": nouvelles métaphores?
Métaphores du nouveau. Rev. Fran. de Psychanalyse, 6, 1990.

2) J. I. Sashin & J. Callahan:
A model of Affect Using Dynamical Systems.
(unfortunately I have a copy of this paper, without a reference).

3) J. S. Grotstein:
Nothingness, Meaninglessness, Chaos, and the "Black Hole"
I – II – III – Contemporary Psychoanalysis, 26, 1990 – 27, 1991.

4) M.G. Moran:
Chaos Theory and psychoanalysis: the fluidistic nature of the mind. Int. Rev: of Psychoanal. 18,1991.

5) V. Spruiell: (*)
Deterministic chaos and the sciences of complexity: psychoanalysis in the midst of a general scientific revolution. JAPA,41, 1993.

6) R. M. Galatzer-Levy
Psychoanalysis and Dynamical Systems Theory:
Prediction and Self-similarity. JAPA 43,1995.

7) J-M. Quinodoz:
Transitions in psychic structures in the light of Deterministic Chaos Theory. Int. J. Of Psychoanal. 78,1997.

(*) D*uring our exchange of correspondence we agreed on the need for a measurement device in psychoanalysis. He wrote me:*
"I take a cautious view concerning our ability to make use of non-linear dynamics, except metaphorically, until we become literally capable of measuring some interacting variables".
It is exactly what I am trying to do.

2.0) Detailed description of the project

Bion (21) wrote: "possibly we do attempt to formulate a kind of architectonic, the building-up of a system of thought into a stable form. I can think, of various versions of it. Like Cantor's exploration of matrices. We are familiar with Freud's attempt to build up a system … he had not completed his investigation. The problem has to be passed on, delegated to his survivors, the inheritance…".
Bion wrote this suggestion many years ago: I think it is time to start to try to formulate a kind of an architectonic model of a psychic event like the psychoanalytic and psychotherapeutic relationship.

2.1 A dynamic system model of the psychotherapeutic event

Looking at the figure 1 it is possible to have a clue of the model.
I take in consideration six interacting, identically structured, sub-systems (relationship, defences, anxieties, analytic process, drives and ego functions) each of them has a developmental axis of 5 states into 3 phase spaces [variables from 3 to 8] .
This set moves to and from three bipolar dimensions: relaxation-tension, masculinity-femininity, schizo/paranoid-depressive positions [variables from 9 to 11] and swings between the events [variable 12] and the observer, the analyst-therapist [variables from13 to 21], the strange attractor.
This system develops in time [variable 2]. The patient is the variable 1. All variables are 21.

2.2 The three basic relationship

As I showed above, the triangle and the first, second and third person set up the three basic patterns of any relationship, the attractors to which a group of states converge. See figure 2 and 2bis.

I **–** ***Structural*** *- represents the personal inner organisation, the departure of any connection with others and reality.*
YOU **–** ***Developmental*** *- represents the necessary help in the processes of the psychological, biological and social growth and in the aspects of everyday life.*
IT **–** ***Interactive*** *- represents the continuous exchange with the outside world, the complexification that makes the varietion (and viceversa) of life.*

2.3 The structure of the subsystems

Following figure 3 you can understand the same organisation of the six subsystems inside the structural and developmental basic relationship. The partitions of the set of parameters comprehends:

A) The Poles *are the branching configurations of the self-similarity of basic relationship that enlarges and refocuses the inner coherence and complexity of the whole model.*

B) The Dynamics of Interaction *is the pattern of change and growth of a phenomenon or of an aspect of the psychic and relational life.*

C) Coupling Interaction *represents the rules, laws or functions, of different axes, that fit together like a toroid chain. Any ring of the chain contains the other laws, rules or functions in different proportion.*

D) The Phase Space *is an abstract mathematical space in which the parameters represent the variables needed to specify the phase of a dynamical system at any time.*

E) The State *is an arbitrarily defined sub-range, usually with specified numerical boundaries that one or more variables of a system can be in at one particular time.*
I would like to underline that the concepts of phase and state were considered, by Freud, very important ideas in many papers.

F) Vector *is a straight line representing a quantity that has both magnitude and direction, drawn from its starting point to its terminal point. Vector could be called also 'the agent of change'.*

2.4 The subsystems: the six developmental axes

As in the languages, where the first and second persons signed the evolution of their structure, so in the psychoanalytic process the relationship between I and You repeats, following the self-affine pattern, the single human development. As you can see in figure 4, I selected six evolutionary structures to plot the process of psychic change and growth.

1) relationship*: the variables represent the original and fundamental relationship, from birth to the most mature inter-change: intimacy;*
2) defences: *the variables represent the mechanism that a person uses to protect her/his constitutional, interacted with parents' fantasies, original project of life. They represent also the conflicts between a static, in equilibrium structural identity with the need of a dynamical flow of interchange;*
3) anxieties: *the variables represent the difficulties in preventing the original project and the risk of failure in the resolution of the conflicts arising along the analytic process;*

4) process: *the variables represent the steps of the analytic /therapeutic relationship, but also, because of the self-similarity/ self-affine patterns, the life evolution and, consequently, the inner model of any relationship;*
5) libido: *the variables represent the structure and the differentiation of the pleasure of living. The aim of life is the creation of a new life, more in terms of the emergence of innovation than in term of a biological reproduction;*
6) Ego functions: *the variables represent the evolution of human thinking. Learning is a typical interactive process.*

2.5 Oscillation and its three dimension of life

If the binary is one of the structures of metapatterns of nature, the oscillation (Freud's alternation) *is the motion, the flow over the time, the plotting images of the cycle of life. The session, like life, swings between moments and experiences of tension & relaxation, masculinity and femininity, schizo-paranoid & depressive position.*
These three dimensions repeat, under some aspects, the three phase state, while the states are nine instead of five. As a matter of fact, the relaxed body is an evident expression of pleasure of living, more easily recognised than the deep-rooted oscillation between shizo-paranoid and depressive positions.

2.6 The three independent variables

1) ***time****: if the patient is the variable 1, it is just to offer us the possibility to analyse and compare lots of data coming from different subjects in order to make more generalised considerations and outlines. The variable 2, the date of session, is the most important because it helps us to build up a profile, to plot and to recognise what happens inside the patient during and after the period of analysis /therapy.*
Non-linearity is based on development in Time. "The view that growth and form are interrelated has a long tradition in biology … We might call the form of an organism, an event in space-time, and not merely a configuration in space" (22*). The change is always over the time and they are the two fundamental, interrelated concepts of any growth and evolution.*

2) ***the observer****: the variables from 13 to 21 represent the interplay between the analyst and the patient inside the analytic/therapeutic setting. I selected nine situations of the work of every session in order to plot what happens during a session, using a unit of five minutes as a unit for a graph.*

3) ***the events****: the variable 12 represents the events, the impact of outside reality on inside reality. Because events influence any relationship, even in a simple way, we have to quantify this influence, both negatively and positively.*
All these variables, that you can see on figure 5, enable us to follow, session by session, the analytic process in order to compare the evolution of many subjects, to describe the inner change more than outer, as usually the researches does.

3.7 The items analysis grid

Following Prismeyer (23) to graph a phase portrait of attractors that operate in a system, we proceed in this way:

1) *We identify the variables that are regular oscillating functions;*
2) *We identify the interactive relationships;*
3) *We make a two dimensional grid to plot the variables.*

Using only one item of any variables of figures 4 and 5, we are able to plot the data for research. All the items of the grid are interrelated, that means, they are, at the same time, inside a specific process and part of a functional structure, they evolve as a result of a process and they work as an input for other parallel processes. Naturally all these items and their partitions would be subjected to further investigation.
Because of this complex adaptive system we decided to use the non-linear and complex theory to analyse, to plot and to interpret the data. As Galatzer-Levy pointed out (24) this kind of prediction is closer to out clinical interests than classical prediction theory was.

3.0) Expected results

We are expecting many intermediate results. Because of the historical situation by which psychoanalysis has not a 'grid' for a measurement of process and outcomes, the primary task is to be able to build up a kind of architectural model as a fundamental instrument for measurement.

3.1 Configuration of the model – Descriptive capability

The configuration that I have illustrated above is a proposal that, first of all, has to be tested, re-elaborated and discussed in order to make an agreement for a real trial. In our research we plan to test:

a) ***features****: many questions could be elaborated working on the items, patterns, system and subsystems, etc., the features of the model. First of all I will ask four other volunteer colleagues, plus a*

psychoanalytic supervisor (prof. Mantica will be the mathematic supervisor), to re-discuss all the items of the grid and the configuration of the system on the basis of the accumulated experience in the research we have proposed to carry out. To have an agreement, to define and to write a final model of the dynamic system of analytic/therapeutic event will be the first result. As we have already said this will be done using:

b) ***Simulation images.*** *After one year (approx. ten months) data, we shall produce graphical and geometrical images from the psychoanalytic data recorded that will enable us to make some simulations in order to analyse and interpret the data before making theoretical inductions /deductions.*

c) ***Personal shape****. Using geometrical simulations we shall try to build up a personal evolving shape of the patient. What is the most natural shape to represent the structure of personality? What is the most natural shape of this subject? What is the picture most able to illustrate the status, the development, the nucleus and the border of the configuration of a person?*

3.2 A probabilistic predictive outline

When we realise that a model and tools are reliable to reproduce the reality that we are trying to understand with fidelity and credibility, we have to start to think: is this model able to offer us some predictive outline? So, the second task is to organise a research upon the predictive ability of this model.

a) the assessment*: if this model is able to plot pictorial images of a development of the person, following the self-similarity/self-affine and scale invariance principles are we able to make a predictive shape with the four to ten session of an assessment?*

b) confrontation between psychoanalysis and psychoanalytic psychotherapy: *we are expecting to make a confrontation on outcomes, related to different settings, of psychoanalysis and psychotherapy. I would like to understand, for example, if the long term four sessions psychoanalytic experience has the same efficacy as a brief, medium or long-term - one to three sessions per week – psychoanalytic psychotherapy. Are we able to measure these different experiences? Which changes produce this or that experience? And so on.*

4.0) Methodology

I followed this plan:

A) One year (approx. ten months) testing and recording data.
Starting from 1st of September 1998 I selected 10 patients:
- 6 from my psychotherapeutic work in the Outpatient Unit
3 women and 3 men
3 who had a diagnosis of psychosis (2 W and 1 M)
3 SPD (1 W and 2 M)
only one man had two sessions per week
- 4 from my private practice
3 women and one man
3 sessions per week.
From the 1st of September to the 31st of May 1999, at the end of any session I filled the grid.

B) During this time I also collaborated with Non-Linear Dynamic Centre at the Como University to:
1) *take down and plot the data;*
2) *analyse and re-elaborate the tested data, the grid and the configuration of model.*

C) Now, I would like to:
1) *write a final report on theoretical frame and methodology;*
2) *set up a final adjustment of grid;*
3) *make plans for further extended more accurate research stemming from results.*

To End

When the patient is in our metaphorical hands we have to use both left and right hands as any good artist or craftsman does when creating a masterpiece. My left hand uses non-linear dynamical systems instruments, while my right hand uses psychoanalytic understanding. Each hand helps the other. Working with only one hand is more difficult and the outcome probably modest. We have to be open to suggestions from modern sciences, but we have also to be able to use – and not only metaphorically – the instruments that these modern sciences offer us, such as strange attractor, bifurcation, stretch and fold, or the Lindermayer System, etc. These are real tools that can help us in understanding the dynamics of the session, e.g. how a fantasy moves along the session. Non-linear dynamical systems theories speak in terms of universal laws (not a law for everything!); laws that are able to give rise to a kind of mental-visual dynamic.

So we have to be able "to consider and measure three or more mutually interacting variables at a time" and therefore to go out of linear dynamics, the historical frame of our science, psychoanalysis.
To do this, we have not only to get acquainted with modern science but to sit down and listen to some mathematicians or physicists, interact with them, learn some specific details and appropriate tools and start to study how to apply what we have learnt to our field.

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Lecco, 14 January 1998
Lewis Carroll and Kurt Godel Anniversary

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