A methodology for the measurement of therapeutic process in Psychoanalysis and Psychoanalytic Psychotherapy.

"The book of nature is written in mathematical language, and the letters are triangles, circles and other geometrical figures, without which means it is humanly impossible to comprehend a single word".

Galileo

Abstract

Freud's original intention in writing *Project for a Scientific Psychology* in 1896 was to develop the discipline of psychology as a science of nature founded on quantitative data. He continuously stressed this view (1915,1937), but only in the last decade psychoanalysts have suggested that the patient/therapist interaction would be better understood using dynamic system theories (Langs, 1919; Spruiell, 1993; et al.). Recently Kauffman (1999) stressed that psychoanalysis should build up a methodology for the measurement of process and changes, if it aspires to become a science of nature, as in its premises.

Although these articles clearly indicate the way along which researchers can develop new methodologies, this goal has never been realised. The majority of psychoanalysts believe that psychoanalysis is the science of meaning and so they decline any step toward the construction of psychoanalysis as a science of nature. Nevertheless the question remains: can psychoanalysis continue to develop if its members reject any kind of mathematical representation of its effectiveness, while the main psychological theories are working on the single case study design (Blampied, 1999)?

This research is an attempt to proceed toward this purpose involving the modern science of non-linearity. It is argued that the psychoanalytic setting is a recursive pattern and so can be measured and visualized as a set of data in a mathematical model. Based upon the theory of non-linearity, a grid was constructed from 21 variables, which are intended to represent the therapeutic process, and a pilot study was conducted. Using time series measurement and plotting variables or combinations of variables, information was obtained which aided in identifying the changes taking place in the therapeutic process. If extended researches can produce evidence on the reliability of the model, it will be possible to show the effectiveness of treatment, a comparison between different approaches and probabilistic predictions regarding treatment outcomes.

Mario Pigazzini – IPA Psychoanlyst
Psychotherapist at the NHS Psychiatric Unit – Lecco Hospital – Italy
Visiting Research Fellow – Adelaide University – Dept. of Psychiatry at the RAH.

Lecture in Sydney, 3rd June 2000

OUTLINE

1.0 Introduction
1.1 Theoretical background
1.2 The aim

2.0 The Freud legacy and the contemporary literature on measurement
2.1 Freud's "Project for a Scientific Psychology"
2.2 The contemporary literature
2.3 The problem of measurement in psychoanalysis

3.0 Tools
3.1 Changes which occur during therapeutic process
3.2 Psychoanalysis and Non Linearity

4.0 The construction of a model
4.1 The triadic structure of living systems, languages and nature
4.2 A dynamic system model for the therapeutic process

5.0 The grid
5.1 The three basic relationships
5.2 The Poles
5.3 The Dynamics of Interaction
5.4 Coupling Interaction
5.5 The Phase Space
5.6 The States
5.7 Vector

6:0 The content of the grid
6.1 The subsystems: the six developmental axes: 1) relationship
2) defences
3) anxieties
4) process
5) drives
6) Ego functions
6.2 Oscillation and its three dimensions of life
6.3 The three interdependent variables: 1) time
2) observer
3) events .

7 A pilot study

8 Diagrams and the analysis of the grid

9 The value of this research.

10 Possible extensions

11 Proposal

12 Conclusion

References

1.0 INTRODUCTION

1.1 Theoretical background

I would like to introduce my view on psychoanalytic relationship as a holistic system that can be metaphorically represented by the image of the bath-tub (J. Laplamce, 1983). During the analytic interplay, the analysts are busy in feeling, understanding and catching unconscious meanings while they are 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 analysts find themselves in contact with their conscious and unconscious knowledge, i.e. their personal background, counter-transference, scientific views, historical and actual researches, cultural exchanges, etc. Usually the analyst reconsiders the session's content and experience and tries to recognise the direction of developments and the progress of the analysis. They focus 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 their personal knowledge.

All of us do this, following Freud's experiences and suggestions.

1.2 The aim

My proposal is linked to this aspect of psychoanalytic understanding and the aim concerns a methodology for the measurement of the therapeutic process within the specific field of Psychoanalysis and Psychoanalytic Psychotherapy.

As you know, the methodology of quantitative measurement in psychoanalysis is still a source of considerable debate.

2.0 The Freud legacy and the contemporary literature

2.1 Freud's "Project for a scientific psychology"

Freud argued for quantitative analysis as early as 1896 with his *Project for a Scientific Psychology*. From this earliest paper to the last one, *The Analysis Terminable or Interminable* in 1937, Freud periodically used concepts that he borrowed from natural sciences, such as: *phase, process, motion, frequency, constant, quantitative factors, mechanisms, periods,* in his effort to build up psychoanalysis as a scientific psychology.

This project has not been realised, above all because contemporary sciences did not have the means, conceptual as well as technical, to understand and describe the dynamic of 'the whole variegation of the phenomena of life' (1915:14). Freud's *Meta-Psychology* was a slave to reductionist and deterministic views that were based on 19th century hydrodynamics (Maiocchi, 1995).

2.2 Contemporary literature

The English psychoanalyst Wilfred Bion (1993) first suggested that Poincare's (1997) mathematical devices were possible avenues for the measurement of the psychoanalytic process. Bion himself 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 has not completed his investigation. The problem has to be passed on, delegated to his survivors, the inheritance…"(1998,48).

Bion began to build up a matrix or grid with psychoanalytic parameters along the x axis and intensity on the y axis, so that change could be represented and measured, but he did not test this grid in practice.

During the last decade, psychoanalysts such as Langs (1991), Moran (1191), and Van Spruiell (1993) in America, Haymal (1993) in Europe and many non-psychoanalysts such as Lonie (1992), have suggested that the patient/therapist interaction would be better understood using different dynamic systems theories. Their tendency to link psychoanalytic theory with non-linearity has been dominated by the use of metaphor, but more is clearly required.

2.3 The problem of measurement in psychoanalysis

I cannot agree with Steiner's quotation that "scientific efforts in psychoanalysis deal with meaning"(Fonagy,1997). Meaning is just one aspect of the analyst's work. Science is universally recognised as a methodology which shows an inner coherence, shares the emerging knowledge with other scientists and requires rules and tolls for the measurement to facilitate the search of the laws of natural systems.

If the analysts want to compare what happens in different spheres of thinking during a session, look at the iteration along the sessions, put down the topics of the interaction and communicate the values or the intensities of a patient's progress to other colleagues, it can be extremely advantageous with the results of measurement, instead of only meanings.

Bion was clear on these aspects, as expressed in "Cogitations" (1993), while F. Tustin further reminded me that maths could 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 open our scientific mentality (Scott, 1995:187), to add a new paradigm as Lonie suggested in '92, to define new basic assumptions and to internalise them. This new scientific paradigm has to become, first of all, part of our counter-transference (Faimberg, 1995). Then later, we can use the new tools in everyday practice.

3.0 Tools

3.1 Changes, which occur during the therapeutic process.

My experience in long term psychoanalytic psychotherapy led me to understand that patients may put therapists in an apparently locked situation, even for as long as two years, during which it seems that nothing is happening in the therapy and the patient's bizarre, erratic behaviour seems not to change.

During this time, patients test the therapist in many ways (Pigazzini, 1997,1998) and, as a consequence of the therapist's ability to cope with unbearable projections, changes can briefly appear in the course of sessions. How do we map these changes?

3.2 Psychoanalysis and Non-linearity

Non-linearity theories, like Chaos Theory and Fractal Geometry, or Complexity and Bifurcation, offer models to shape changes in the recursive events and interactions over time, both in natural occurrences and in living organisms.

Non-linear dynamic theories are among the most powerful theoretical frames of modern science. Although Poincarè built up non-linearity at the beginning of our century and Freud discussed many things with Einstein, Freud never really understood or was exposed to this new scientific frame and indeed he only quoted the concepts of 'entropy' or 'thermodynamics' a few times. He was completely blocked by the scientific method of his teachers, even if many psychoanalytic ideas contain, implicitly, powerful concepts of non-linearity, such as iteration, sensitivity to initial conditions or the "economy principle": " ... *anything else possessing the same qualitative properties will yield exactly the same predictions and results"* (Feigenbaum, 1992:6).

Following G. P. Williams (1997), non-linearity studies how something changes over time, taking into account the whole system; this is also 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"(3-7).*

Non-linear means that output is not directly proportional to input or that change in one variable does not produce a proportional change or reaction within related variables. To visualize these investigations, it is necessary to plot out variations occurring in each parameter and these are called orbits.

An *orbit* is the trajectory traced on a map by a moving point through the values of a phase-space of the selected variables of a grid. The latest reason for this research is to become able to draw up a shape, the *stable periodic orbit* (Artuso, 1999) by which we can control the random evolution of a system by a more desirable periodic response.

The next diagrams will clarify these points.

transparency 4 and 4 bis

This diagram represents 9 months' correlation between the basic relationships in the psychotherapy of a young girl with schizophrenia, during her second year of psychotherapy.

The dot-points series above the line on 1 support the idea that the patient is unable to relate, as a person, with:

- *outside reality, represented by the series of dot-points under the line on 1, marked by the squares;*
- *the therapist, represented by the series dot-points also under the line on 1, marked by the crosses.*

You can see that the patient is more object related in the second part of this year's psychotherapy.

Comparing diagram features at the dot-points with my clinical notes, around a time of 150 days, the change is connected with her first conscious experience of testing my emotions by destroying some leaves of a beautiful ficus plant. Being able to express her aggressive feelings, without escaping from the room, means that, at this point, she was starting to take under control her destructiveness and the connected anxieties.

4.0 The construction of a model

To realise the purpose that I assumed above, I am developing a model whereby psychoanalysts or psychotherapists can map out the development of the therapeutic process across time with an individual patient. A *model* is a *tool* by which it is possible to find information about *selected dimensions,* which are expected to represent the processes that are to be investigated.

Psychoanalysis being a series of interactions *over time*, I selected a model that is able to give a picture of the most important phenomena of growing and phases of development. To do this, I have adopted Bion's idea of Cantor Set, which is complex and also self-similar, based on binary and triadic expansion.

> *Each point in the interval has a binary expansion.*
> *Each binary expansion corresponds to a path in the binary tree for binary numbers.*
> *Each such path has a corresponding path in the triadic tree for the set.*
> *Each path in the triadic tree identifies a unique point by an address in the triadic expansion.* (Peitgen, 1992:75)

4.1 The triadic structure of nature, living systems and language

From Galileo's statement that nature is like a book and the letters of its alphabet are triangles and circles, the shape of the triangle is the basic shape for developing, describing and analysing models and complex forms in many different fields of nature. Other talented scientists have supported this conception. Pascal's triangle influenced math and probability theory; Poincarè's analysis of the three bodies interactions founded the non-linearity and recently Cantor, Mandelbrot, Sierpinski and von Koch realised the fractal geometry with computer graphics.

In living systems also we have three central interrelated keys, as the great biologist J. Miller pointed out (1978). 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.

Finally, language is the fundamental tool to communicate between people as well as in the psychoanalytic relationship, the talking cure. In almost all languages the three persons, I – YOU – THEY are the necessary form of any verbal interpersonal interaction. This structure is particularly evident in the Australian Aboriginal languages which show a unique fractal organisation of the three persons, for the reason that each of the three dimensions of number, singular, dual and plural, includes the three persons, I, You and They. (Goddard, 1993; G. Breen, IAD in Alice Spring, October 1999, personal communication).

Freud himself organised and rooted his theoretical configuration of psyche with the recursive use of three agencies: Ego, Es and Super-Ego; conscious, preconscious and unconscious; oral, anal

and genital phases, and so on. R. S. Wallerstein (1997) called this recurrent organisation of Freud's model of mind: "the tripartite mind".

I applied this set of conventions to the fractal model of the *Sierpinski Gasket* (Peitgen *et al.,* 1992). ***Figure 1 – transparency 5***

4.3 A dynamic system model of the Therapeutic Process

Figure 2 – transparency 6

Looking at **Figure 2** it is possible to gain an insight into the model. I take into consideration 2 interacting, identically structured, sub-systems, with three variables each.

Variables 3-4-5 are related to **I:** (3) - relationship,
(4) - defences,
(5) - anxieties;

Variables 6-7-8 are related to **YOU:** (6) - analytic process,
(7) - drives,
(8) - ego-functions.

Each of them has a developmental axis of 5 states (items), inside 3 phase spaces.

This set oscillates between three bipolar dimensions:

Variable 9 - **R**elaxation-**T**ension,
10 - **M**asculinity-**F**emininity,
11 - **S**chizo/paranoid-**D**epressive positions,

and swings between the events, variable 12,

and the observer, the analyst, all variables from13 to 21.

This system develops in time, variable 2.

The patient's code is variable 1.

There are 21 variables in all.

5.0 The grid

To shape the development in time, I built up a grid as an instrument to make a measurement of the dynamics of the system. I stress the concept of a *system* as a *whole composed of interacting dimensions able to change over time.*

In any dynamic system based upon a recursive pattern, in order to simulate the process, we have:

- to set the rules that govern the system,
- to clearly define each item,
- to remain within the deterministic development of the intervals of any variable.

Figure 3 – transparency 7

In **Figure 3**, we can see the structure of any variable. The four lines at the bottom are the rules of the system.

5.1 The three basic relationships

Following the above premises, the triadic pattern sets up the interactive model of therapeutic relationship.

I – Structural - represents the personal inner organisation, the departure of connections with others and reality from inner world.

YOU – Developmental - represents the necessary dealing in the processes of psychological, biological and social growth.

THEY – Interactive - represents the continuous exchange with the others, the complexification and the variation of life.

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

5.3 The Dynamics of Interaction is the pattern of change and growth, an aspect of the psychic and relational life.

5.4 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 proportions.

5.5 The Phase Space is an abstract mathematical space which contains the parameters. These represent the deterministic evolution needed to specify the phase of a dynamic system at any time. I followed Freud's original organisation of three phases: psychotic, neurotic and mature dependence.

5.6 The States are the parameters which specify the phase space at any particular time.

5.7 At the top there is a **Vector,** the agent of change. A vector is *"a straight line representing a quantity that has both magnitude and direction, drawn from its starting point to its terminal point"* (Williams, 1997:470).

6.0 The content of the grid

As a consequence of these principles, I have structured a grid.

Figures 4 & 5 – transparency 8 and 9

I would like to call your attention to the following points:

- This grid has already been tested, but all these contents are still under investigation and are being redefined.
- The reliability of this grid is the most problematic part of this research.

6.1 The subsystems: the six developmental axes

6.1.1 **Relationship**: the variable represents the original and fundamental relationship, from birth to the most mature inter-change, intimacy.

6.1.2 **Defences**: the variable represents the mechanisms that persons use to protect their constitutional organisation, the original project of life. They represent also the conflicts between the static - in equilibrium - structural identity and the need for a dynamic flow of interchange.

6.1.3 **Anxieties:** the variable represents the difficulties in preventing the original project and the risk of failure in the resolution of conflicts arising along life and the analytic process.

6.1.4 **Process**: the variable represents the therapeutic process and, also, because of the self-similarity patterns, life evolution.

6.1.5 **Drives**: the variable represents the structure and the differentiation of the pleasure of living. The aim of life is the creation of a new life, in terms of the emergence of innovation as well as in terms of the biological reproduction.

6.1.6 **Ego functions**: the variable represents the evolution of the process of thinking and learning, imagination and knowledge.

6.2 Oscillation and its three dimensions of life

The oscillation (Freud's *alternation* between death and life instincts) is the motion, the flow overtime of any system. During a therapeutic

session, the patient swings between moments and experiences of tension & relaxation, masculinity & femininity, schizo-paranoid & depressive position.

6.3 The three independent variables

6.31 Time

Non-linearity is based on development overtime.

> *"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"*
>
> (D'Arcy Thompson, 1922).

The change is always over the time. Change and time are the two fundamental, interrelated concepts of any growth and evolution.

Variable 2, the date of session, helps us to build up a profile, to plot and to recognise what happens inside the patient during the period of analysis/therapy.

6.3.2 The observer

Variables from 13 to 21 represent the interplay between the analyst/therapist and the patient within 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.

6.3.3 The events

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.

7 The pilot study

The diagrams that I will show are the result of the pilot study started on 1st September '98 and ending on 31st May '99. Ten clients were under investigation, from both the Psychiatric Unit where I work as Consultant Psychologist and Psychotherapist, and from my private practice as Psychoanalyst. After each session I filled a grid in manually and, later on, I entered them into Access, ready to be analysed.

This model offers the possibility to analyse thousands of diagrams in order to:

- grasp new information;
- discover new aspects of the therapeutic process;
- understand missing meaning;
- control the initial hypothesis;
- make many combinations and comparisons;
- check the different evolutions between the dimensions;
- underline the differences between psychoanalysis and psychoanalytic psychotherapy.

8 The diagrams and the analysis of the grid

Following Prismeyer (1992), to graph a phase portrait of attractors that operate in a system I have proceeded by:

1) identifying variables which are regular oscillating functions;
2) identifying interactive relationships;
3) making a two-dimensional grid to plot variables.

Using only one parameter of any variable of figures 4 and 5, I am able to plot data for analysis. As Galatzer-Levy pointed out (1996), this kind of prediction is closer to our clinical interests than classical prediction theory was.

Now I will show a series of diagrams, which have been analysed by mathematicians from both Como University, using Gnu Plot and other software, and Adelaide University, using MatLab.

transparency 10

This diagram shows a high correlation between the 3 Basic Relationships. I chose this example because:

- it designs the classic phenomenology in which borderline pathologies continuously cross boundaries;
- the high variation shows stronger evidence of the high correlation.

Transparency 11

This diagram shows an example of potential comparisons between clients. You can compare the evolution of each variable, or a group of selected variables, in different pathologies, and also the similarities.

Transparency 12 and 13

These two diagrams show that you can visualize the evolution of the same – but also a group of – variables in a wide range of graphs, in order to collect more information. This client is a young schizophrenic girl whom I meet once a week in the Outpatients Unit.

Transparency 14 and 15

These two graphs show the same variables. This is a middle age man in his fourth year of analysis.

Transparency 16

This is a diagram of two variables, which I randomly chose, of a patient at the end of her analysis to show that the model measures what I like to measure, in this case the features of psychoanalytic theory, example, an improvement after conflict and the increase of anxieties approaching separation.

Series of transparencies with diagrams.

9 The value of this research

I have used, and I intend to use, this model for the following things:

- for comparing:

  a) different clients' evolutions and outcomes;
  b) the development of different pathologies;
  c) different features of the use of different techniques;

- for visualising the therapeutic process, and this is usually called longitudinal or single case study design, in order to:

  a) help my understanding of the outcomes;
  b) mark the influence of external and random events on therapeutic action;
  c) check the assessment and evolution of therapy at any time;
  d) understand counter-transference;
  e) check errors and their consequences;
  f) help the client to focus on what is changing and what is not;

- for analysing different dimensions and their evolution in both a single client and a range of pathologies, in order to evaluate the work that I have done;
- for building up the shape of the mind's interactions;
- for making probabilistic predictions .

10 Possible extensions

My first target is to organise a group of colleagues with whom I may:

- negotiate an agreement on the grid's contents and structure;
- conduct new research and later,
- build up a useful instrument that integrates the classical narrative method, by which analysts/therapists can easily
- talk to each other using images or graphs and diagrams.

This information will help us to identify, discuss and compare:

- how changes take place during the therapeutic process,
- the configurations of changes,
- the influence of errors,
- the effectiveness of treatment,
- the common ground and differences between various techniques,
- predictions of outcomes.

All these features will be useful also for patients, who can:

- look at what is changing and how change is occurring;
- feel secure in their confidentiality;

and also for legal authorities such as parents or guardians,
and Government or Insurance companies, who can:

- gain a picture of what is occurring;
- make more accurate validation of professional activity.

11 Proposal

I would like to:

A) find a group of colleagues, or a couple of groups, one in Italy and one in Australia, who are interested in this research;

B) organize a meeting or an e-mail list, to:

1) discuss the grid and research configuration;

2) make an agreement on terminology and glossary;

3) define criteria to select patients for research;

C) spend from 2 years (psychotherapy) to 5 years or more (psychoanalysis) testing and recording data;

D) organise a research-meeting to:

1) plot, analyse and re-elaborate the tested data;

2) write a final report on the theoretical frame and methodology;

3) set up a final adjustment of the grid;

4) make plans for further extended more accurate research stemming from results.

Conclusion

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. The left hand uses non-linear dynamic systems instruments, while the right uses psychoanalytic understanding. Each hand helps the other.

We have to be open to the suggestions from modern sciences, but we have also to be able to use – and not only metaphorically – the instruments that these modern sciences offer to us. Non-linear dynamic system theories speak in terms of universal laws, laws that are able to give rise to a kind of mental-visual dynamic.

References

Bion ,W. R. 1993. *Cogitation*. London: Karnac Books.

Bion, W. R. 1998. *Taming Wild thoughts*. London: Karnac Books.

D'arcy Thompson, 1942. *On Growth and Form*, New Edition, Cambridge University Press, quoted by P*eitgen et al.*(1992:355).

Faimberg, H. 1992. The Countertransference Position and the Countertransference. *International Journal of Psychoanalysis.* 73(4):541-547.

Feigenbaum, M.J. 1992. Foreward, in *Peitgen ed al.* Chaos & Fractals, idem.

Freud, S. 1986 *Project for a Scientific Psychology*. (I refer to the Freud's writings included in Volume 24 of the Standard Edition published in London in 1952).

Freud, S. 1915. *The Theory of the Instincts*.

Freud , S. 1937. *Analysis Terminable or Interminable*.

Galatzer-Levy, R. M. 1995. Psychoanalysis and Dynamical Systems Theory. Prediction and Self-similarity. *Journal of American Psychoanalytic Association.* 43 ( ) - .

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

Guastello, S. 1995. *Chaos, catastrophe, and Human affairs*. New Jersey, L. Erlabaum Ass.

Haynal, A. 1993. *Psychoanalysis and the Sciences*. London: Karnac Books.

Kauffman, S. 1999. in Palombo S. R. *The Emergent Ego. Complexity and Coevolution in Psychoanalytic Process*. Madison: International University Press, xi-xiii

Langs, R. 1992. *Science, Systems and Psychoanalysis*. London: Karnac Books.

Laplance, J. 1983. *Le Baquet*. PUF. Paris.

Lonie, I. 1992. Chaos Theory. A New Paradigm for Psychotherapy? *Australian and New Zealand Journal of Psychiatry.* 25(4) 458-560.

Maciocchi, R. 1995. *Storia della Scienza in Occidente*.Firenze: La Nuova Italia.

Miller, J. 1978. quoted by S. Guastello (1995*) Chaos, catastrophe, and Human affairs*.

Moran, M. G. 1991. Chaos Theory and psychoanalysis: the fluidistic nature of the mind. *International Review of Psychoanalysis*. Vol.18.

Narby, J. 1998. *The Cosmic Serpent. DNA and the Origin of Knowledge*. London: Victor Gollancz.

Peitgen, H-O. *et al.* 1992. *Chaos and Fractals. New Frontiers of Science*. Berlin: Spinger-Verlag.

Pigazzini, M. 1995. 'The bounded space' in H. Lang, H. Weiss and G. Pagel, eds. *Die Klinik der Psychosen*. Wurzburg: Koninghausen & Neuman: 119 – 131.

Pigazzini, M. 1997. 'Do you Perceive my Pain? The Psychodynamic Approach to Schizophrenia'. *American Society of Psychoanalytic Physicians. The Bulletin.* 85 (1): 57 – 66; (2): 69-83.

Poincarè, H. J. 1908. *Science and Method.* London, T. Nelson (1927). New Italian translation: 1997.

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

Priel, B. and Schreiber, G. 1994. On psychoanalysis and non-linear dynamic: The paradigm of bifurcation. *British Journal of Medical Psychology.* 67: 209-218.

Prismeyer, H.R. 1992. Quoted by S. Guastello, 1995. Idem.

Quinodoz, J. M. 1997. Transitions in psychic structures in the light of Deterministic Chaos Theory. *International Journal of Psychoanalysis. 78 ( )* - .

Scott, A. 1995. *Stairway to the Mind*. .N.Y. Copernicus.

Spruiell, V. 1993. Deterministic chaos and the sciences of complexity: psychoanalysis in the midst of a general scientific revolution. *Journal of American Psychoanalytic Association.41 ( )* - .

Steiner, J. 1995. quoted by P. Fonagy . *International Journal of Psychoanalysis*,78 (4) - .

Williams, G.P. 1997. *Chaos Theory Tamed*. London: Taylor & Francis.

Wallerstein, R. S. 1997.Foreword, in J. Sandler ed. *Freud's Models of the Mind*, London, Karnac Books, xiii-xvi..

Wilson, E. O. 1998. *Consilience. The Unit of Knowledge*. London: Little, Brown and Company.

Mario Pigazzini – IPA Psychoanalyst

Visiting Research Fellow - Adelaide Un.- Dept. of Psychiatry at RAH.

☎ *08-82225141 fax 08-82323298 mario.pigazzini@adelaide.edu.au*

SA - 50 Acacia St., 5049 Seacliff ☎ *08-83584025 mariop@camtech.net.au*

After 24th June:

Home - *via Mentana 28, 23900 Lecco Italy* ☎ *001139-0341-497229*

Work - *NHS Psychiatric Unit – via XI Febbraio 9, 23900 Lecco Italy*

☎ *001139-0341-482623*