

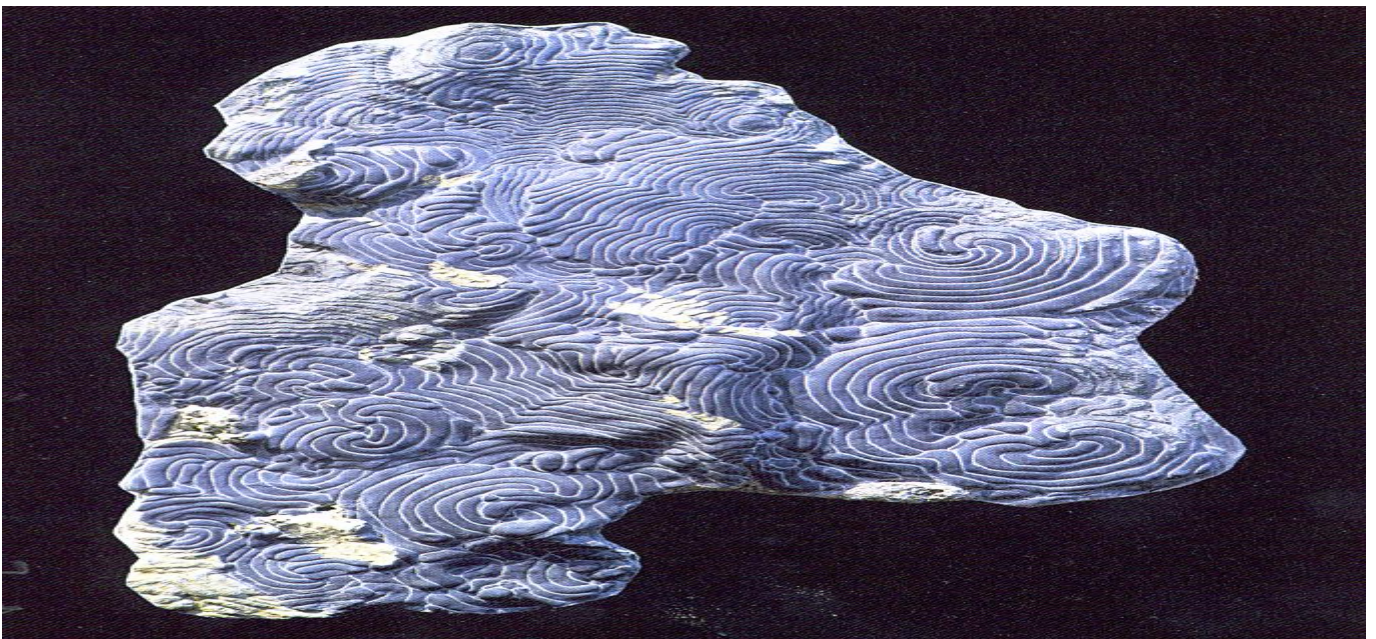
# LIESGANG RINGS and Natural Art in SELF – Organization Phenomena

Paper in preparation of the meeting on SELF ORGANIZATION PHENOMENA Florence NOV/14/2008

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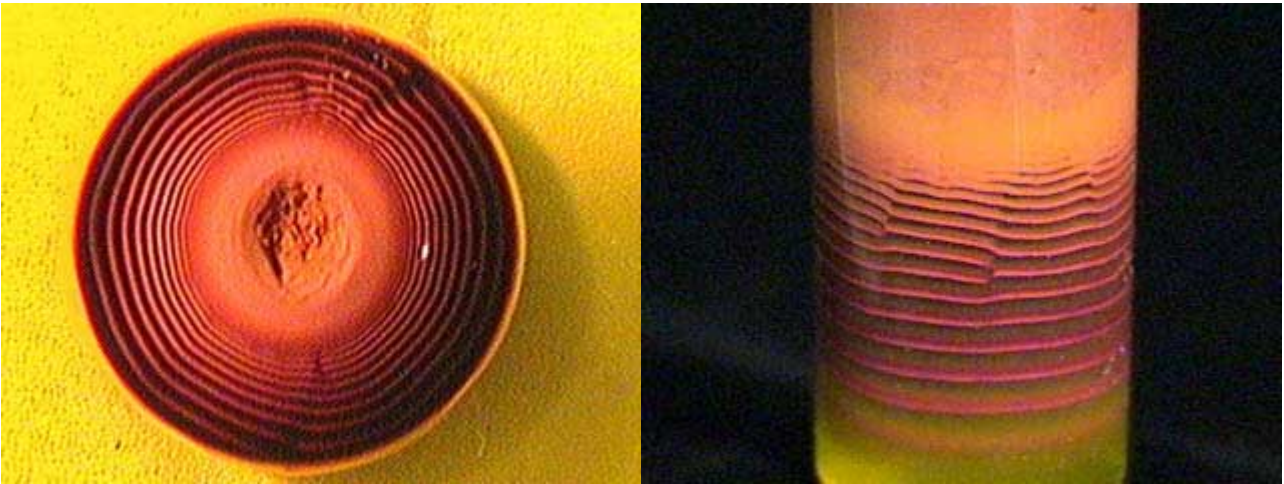
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*The love for science and art does not based on the utility but for both is  
driven by the curiosity*

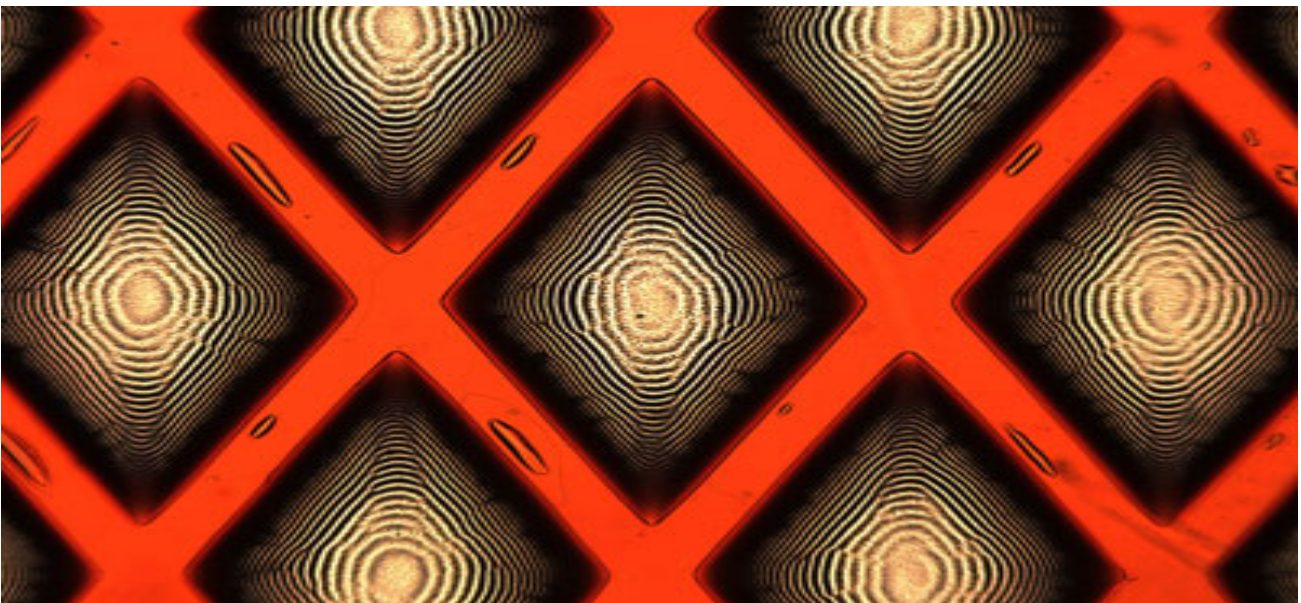


Stone waves in fossil. [www.fossil-art.dk/Paneler/spor34.html](http://www.fossil-art.dk/Paneler/spor34.html)

“In antique science “petrified fossil’s stones” are considered “jokes of nature”; similarly mechanistic science till today considers periodic precipitations or Liesegang fossils as very mysterious events.” In fact the formation of regular chemical patterns in oscillating reactions was a physical paradox for more than a century. As a matter of facts Liesegang rings (1), (2), are easily visible structures of self organization phenomena that develop spontaneously in a chemical reaction systems working far from equilibrium with a slow kinetic of the reaction. (3)



LIESEGANG RINGS IN GEL : [cps-www.bu.edu/ogaf/html/chp62exp1.htm](http://cps-www.bu.edu/ogaf/html/chp62exp1.htm)



<http://www.nikonsmallworld.com/gallery.php?grouping=year&year=2007&imagepos=24>

Alternating series of regular precipitating zones demonstrates a not chaotic behavior of the development of “**bonding and not bonding**” rings in an stabilized oscillating Liesegang reactions as it is easily shown in natural –artistic structures like the Liesegang Rings in Agate. (4)

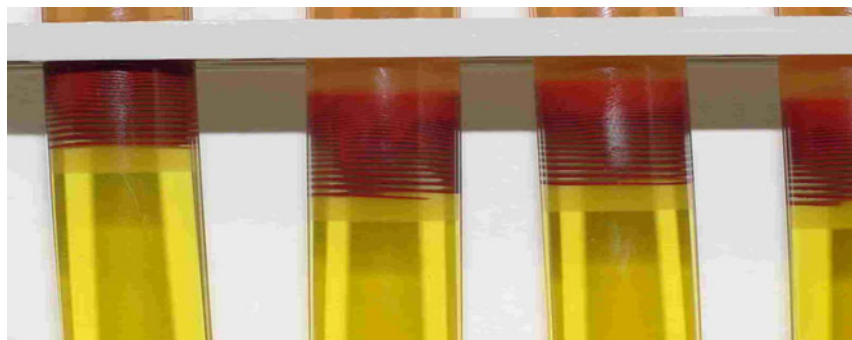


[www.horo-achate.de/entstehung/entstehung\\_eng.shtml](http://www.horo-achate.de/entstehung/entstehung_eng.shtml) ; [www.agate-nodule.com](http://www.agate-nodule.com)



Ring AGATE - Collection: [www.marbelalan.com/nonglass](http://www.marbelalan.com/nonglass)

The dynamic of formation of rhythmic pattern of precipitates giving the growth of Liesegang rings in gel inert medium, is very easily to reproduce in a test tube ; in spite of this experimental reproducibility mechanistic science is no able to understand why Liesegang patterning develops through a series of “bonding” and “no-bonding” bands in a space-temporal progressive ordering events. (5)



Liesegang Experiment in test tube : [www.chiralitaet.de/mh\(imag.html](http://www.chiralitaet.de/mh(imag.html)

A lot of interesting experiences can be made with rhythmic banding precipitates in colloids that are not expensive and do not need of very complex instrument to detect.

- 1) introducing a flaw in the symmetry of formation of the rings that imperfection is being reproduced as a mirror in subsequent circular patterns
- 2) also we can see the developing interference of matter-waves in meeting between the fronts of diffusion of two periodic reaction starting from different centers spreading the construction of Liesegang rings.

Ultimately Liesegang periodic space-temporal ordering phenomena, are also common events miscellanea in biology. A set of examples are: the lamellar rings around the Haversian canals in bone;... the pigmentation of the iris;... the color of butterfly's wings; the growth rings of trees; ...the agate structure of crystals; ...the shells of mollusca; ...the bands of starch grains and of many seeds, the fungi and bacteria organizations ... and so on .. all those experiments demonstrate that the formation of “**bonding/no-bonding**” Liesegang patterns, are a general phenomena for implementing the studies of **self-organization in nature**.

In spite of this large amount of experimental knowledge , Liesegang rings are often at the border line of the mechanistic knowledge; so that normally are excluded by formal science teaching. As a matter of fact, in the context of mechanical science , there is not a shared a theory of *simultaneity of communication at distance* , as it is seriously necessary for understanding any self-organizing cooperation in spontaneous auto-organization of natural phenomena.

Finally the endless array of beautiful patterns and shapes in nature has long been a source of joy and wonder to artists and scientists alike. Therefore discovering how such patterns emerge spontaneously in an order space-time environment, nowadays is becoming a cultural and societal enterprise for advancing future knowledge economy.

Certainly a good solution-model , for interpreting at distant communication can be found in the Quantum-entanglement based simultaneity of communications (6) .(7).

**About this problems would be possible to advance with an open dialog at the meeting on Self-Organization Phenomena organized by EGOCREANET/ON-NS&A in Florence the → Nov/14/2008 . (8)**

#### **Biblio on line**

- (1) - Liesegang Rings : [www.insilico.hu/liesegang/](http://www.insilico.hu/liesegang/); [www.sas.org/tcs/weeklyIssues/2004-04-30/chem/](http://www.sas.org/tcs/weeklyIssues/2004-04-30/chem/)
- (2) - Raphael E. Liesegang (1869-1947): <http://science.birkenheadschoo.co.uk/middle/index.php?id=Liesegang%20Rings>
- (3) – Catalytic time : [http://www.edscuola.it/archivio/lre/tempo\\_di\\_catalisi.htm](http://www.edscuola.it/archivio/lre/tempo_di_catalisi.htm) (*in italian*)
- (4) – Liesegang Rings in geology : <http://irna.lautre.net/Tout-ce-que-la-nature-ne-peut-pas.150.html>
- (5) – Chemical bases : [http://www.edscuola.com/archivio/lre/chemical\\_bases.htm](http://www.edscuola.com/archivio/lre/chemical_bases.htm)
- (6) – Entangling Information Theory : <http://www.wbabin.net/science/manzelli18.pdf>
- (7) - Entanglement in Bidimension of Space-Time : [http://www.edscuola.it/archivio/lre/bidimensional\\_space\\_time.pdf](http://www.edscuola.it/archivio/lre/bidimensional_space_time.pdf)
- (8) – Self Organization Meeting : [www.egocreanet.it](http://www.egocreanet.it) ; [www.wbabin.it](http://www.wbabin.it) ; [www.quantumbionet.org](http://www.quantumbionet.org)