

Ответственность науки перед обществом

**“Climate Change and the
Integrity of Science”,**

Science, Vol. 328, 7 May 2010

“We also call for an end to McCarthy-like threats of criminal prosecution against our colleagues based on innuendo and guilt by association, the harassment of scientists by politicians seeking distractions to avoid taking actions..

Society has to choices:

We can ignore the science.. Or we can act in public interest to reduce the threat of global climate change..”



What is Physics? (What is Science?)

- ***Traditional approach' based on definition of Physics as the scientific discipline..***

- “The Game of Eternity” as a metaphor:

Its “rules” are introduced by ??
 (“Designer”, Creator, Nature)
 from the outset .. And “Reality Show” was launched according to this rules..Big Bang!

No more “Divine Interventions”(?)

We (the humans) are trying to decipher that rules (the Laws of Nature)

Two greatest components (mysteries of this game)

- Mystery of Universe:

The Task is to construct the scenario with time line of its evolution (from Big Bang to “Self-Organization” in multitude of forms of celestial objects

- Mystery of Life:

The equivalent task is to understand
The Origin of Life



Nuclear alpha decay as quantum mechanical tunneling (1928)

**The liquid-drop model in nuclear physics
The element formation in Universe
(Nucleo-genesis)**

**Models of red giants, supernovae, and
neutron stars**

***The "Big Bang Theory" of the
universe***

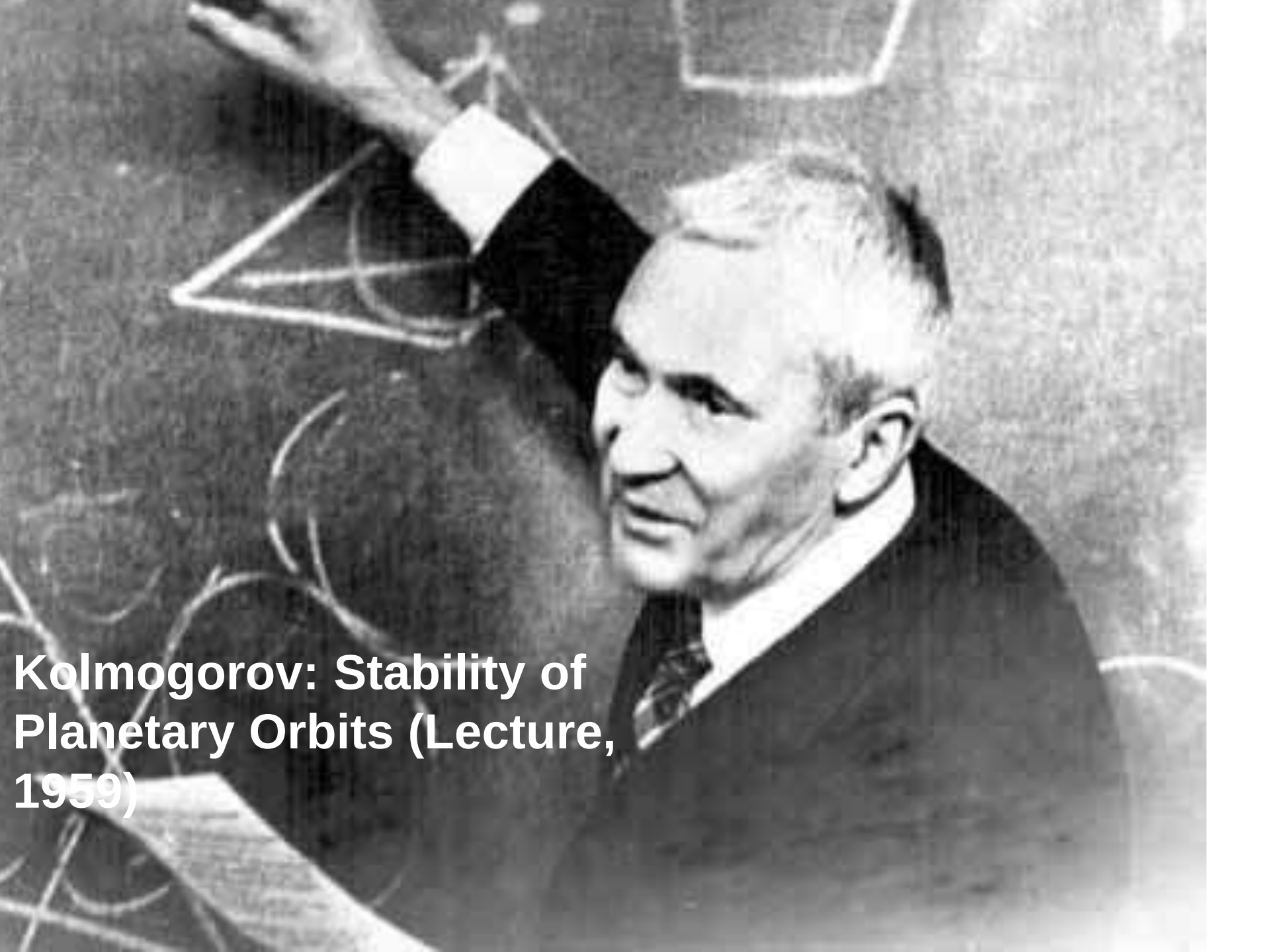
**George
Gamov**

1904-1968

***First suggested how the genetic code
might be transcribed (1954)***

KAM-theorem, QLT of plasma, Chaos and beyond

- Everything started with “Stability of Solar System”
- KAM theory
- Did it make Planetary motion more stable?
- Quasilinear Theory is opposite limit re:KAM (Landau Resonances vs. Planetary Resonances)
- Hamiltonian Chaos

A black and white photograph of a man, likely a mathematician, pointing at a chalkboard. The man is wearing a dark suit, a white shirt, and a patterned tie. He is looking towards the left of the frame. His right arm is extended, pointing towards a diagram on the chalkboard. The chalkboard contains several geometric diagrams, including a large triangle with internal lines, a circle, and some curved lines. The text "Kolmogorov: Stability of Planetary Orbits (Lecture, 1959)" is overlaid on the bottom left of the image.

**Kolmogorov: Stability of
Planetary Orbits (Lecture,
1959)**

Going beyond 2-body problem (adding planet/planet interaction)

- Newton
- Laplace
- Poincare
- Perturbation technique and extraction of secular effects
- Planetary resonances of higher orders
- KAM theorem



Philosophiæ
Naturalis
Principia
Mathematica

1687

**Newton/s conjecture - Solar System is UNSTABLE;
needs DIVINE INTERVENTIONS (how frequently?)**

Pierre-Simon Laplace

1749-1827

Mécanique céleste

Exposition du système du monde



“Je n'avais pas besoin de cette hypothèse-là”

Stability of the State or Process in Nature (vs. fluctuations, random forces etc.)

- Stability of Solar System
("from Newton to Kolmogoroff")
- Newton: unstable if left to itself (needs "Divine Interventions")
- Laplace: stable
- KAM theorem: effect of non-linear resonances must be contained (limits of stability)
- Contemporary computational approach

50 years after

- Is there light at the end of tunnel for Fusion ?

*Optimist (Velikhov):
Industrial Prototype
in 2050*

vs

*Skeptics:
Not in 21st century*

- What happened to other applications of Plasmas:

-MHD generators vanished

-Plasma Processing – moderately successful, may pick up further

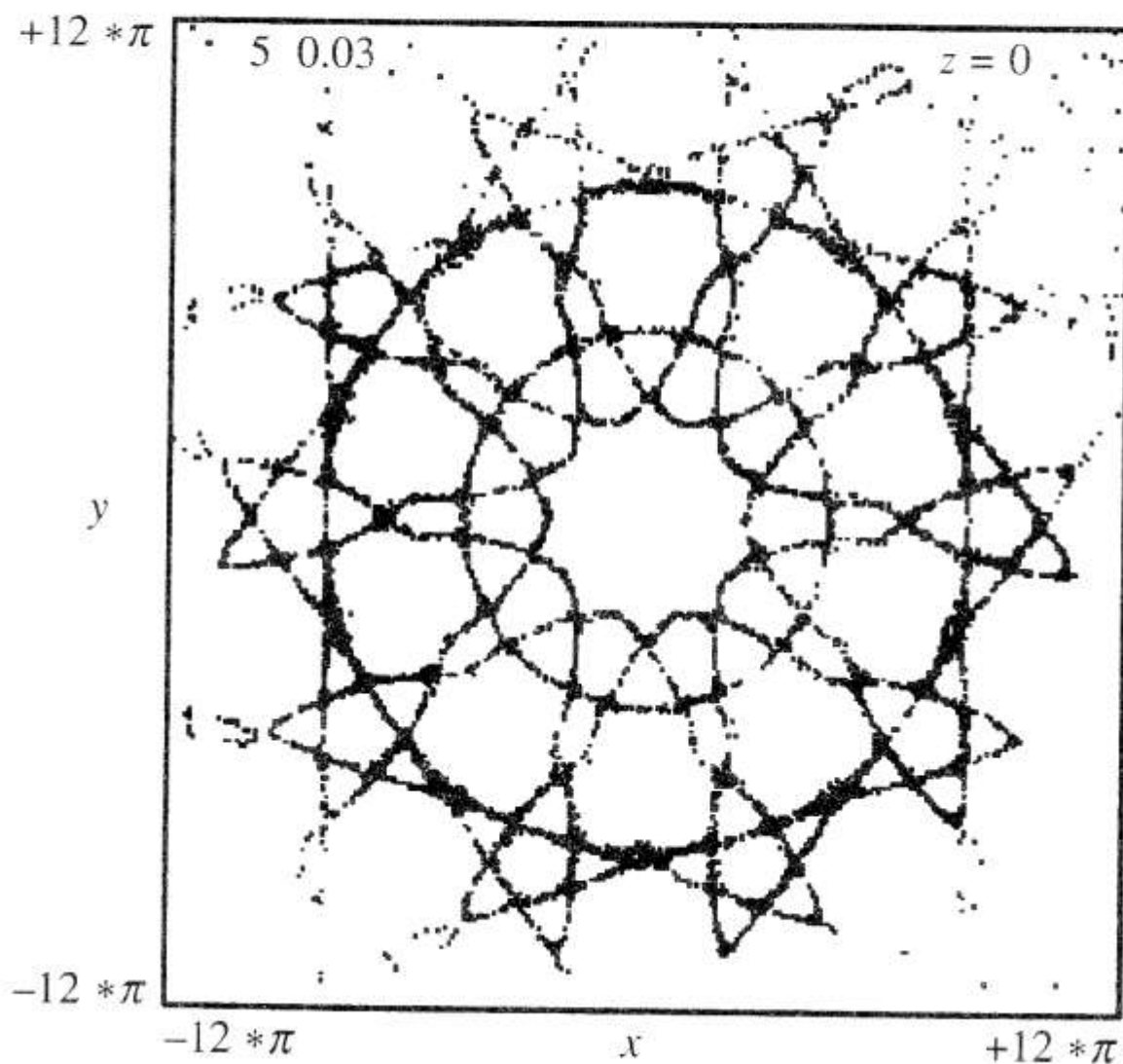
-Plasmonics – interesting, but if successful does not need much plasma

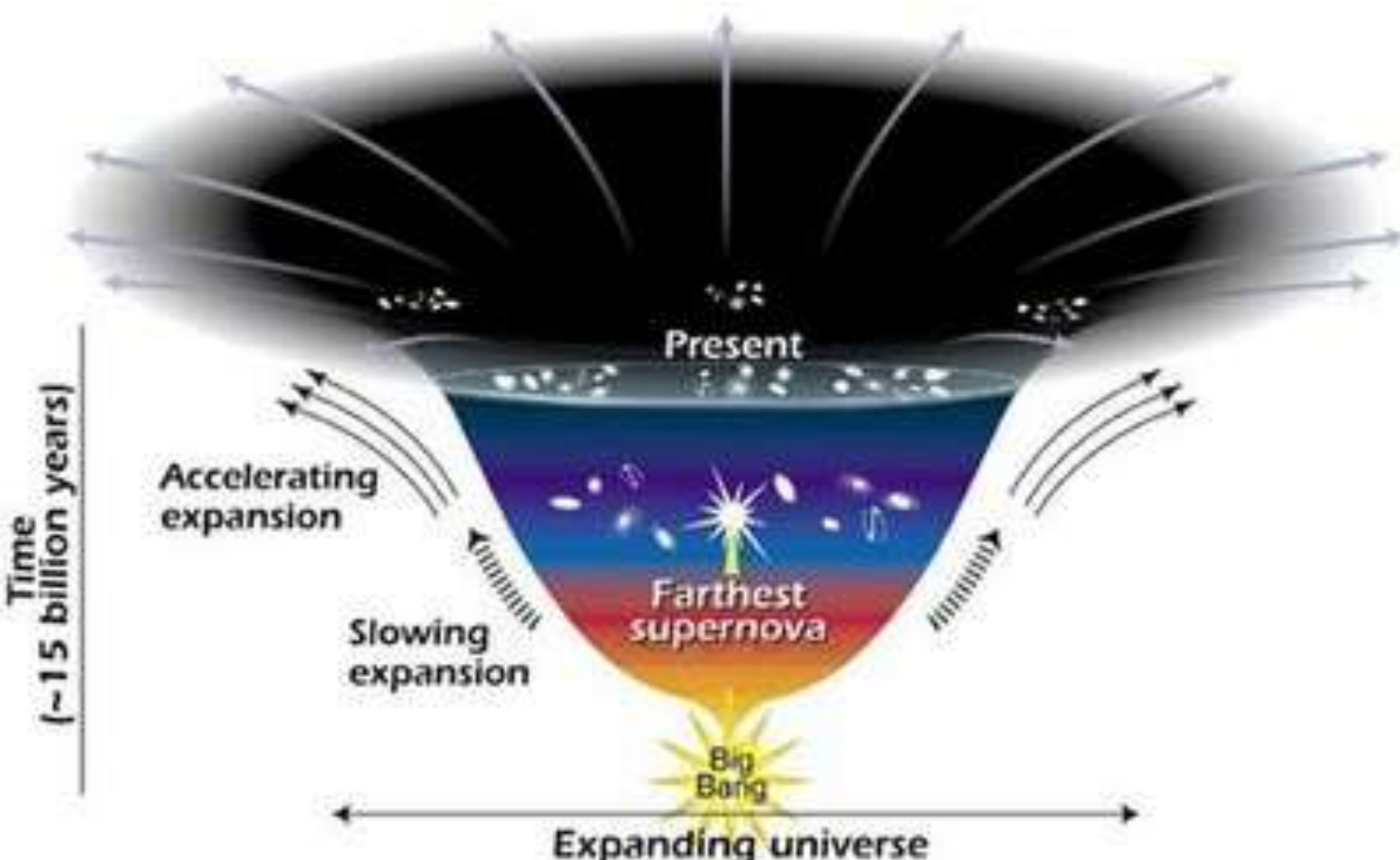
-Space: in survival mode (losing competition to Planets)

-Pulsed Lasers- new renaissance: Table-top accelerators, Potential medical applications

Astro-: remember the Masters of Universe?

Fig. 9.4.1 A stochastic web of stream lines with fifth-order quasi-symmetry in the plane $z = 0$. The solution of equations (9.3.1) corresponds to $q = 5$ and $\varepsilon = 0.03$. The size of the square is $24\pi \times 24\pi$. Reprinted by permission from *Nature*, 337, 113 [22]. Copyright © 1989 Macmillan Magazines Ltd.





George Zaslavsky was born on May 31, 1935 in Odessa, now Ukraine, graduated from Odessa State University and took a job at Institute of Nuclear Physics in Novosibirsk. Degree of Candidate of Science - 1964, degree of Doctor of Science – in 1970. 1970-1984 the Head of Theory at the Institute of Physics in Krasnoyarsk. 1984-1991- Head of the Dynamical Systems Group of the Space Research Institute (Moscow). Since 1992 - Professor in the Department of Physics and Courant Institute of Mathematical Sciences of the New York University as a professor of Physics and Mathematics.



displaying phyllotaxis have a cylindrical or conical shape which has certain characteristics of a quasi-crystal with fifth-order symmetry [17].

It has been found [18, 19] that the seeds of a spruce cone or scales of a pineapple form a certain quasi-regular tiling of the surface in which we can easily notice the arrangement of the neighbouring cells in spirals

Fig. 10.2.3 Comparison of cross-sections of symmetrical fourth and fifth order (Melathallia) (Haeckel [15]).

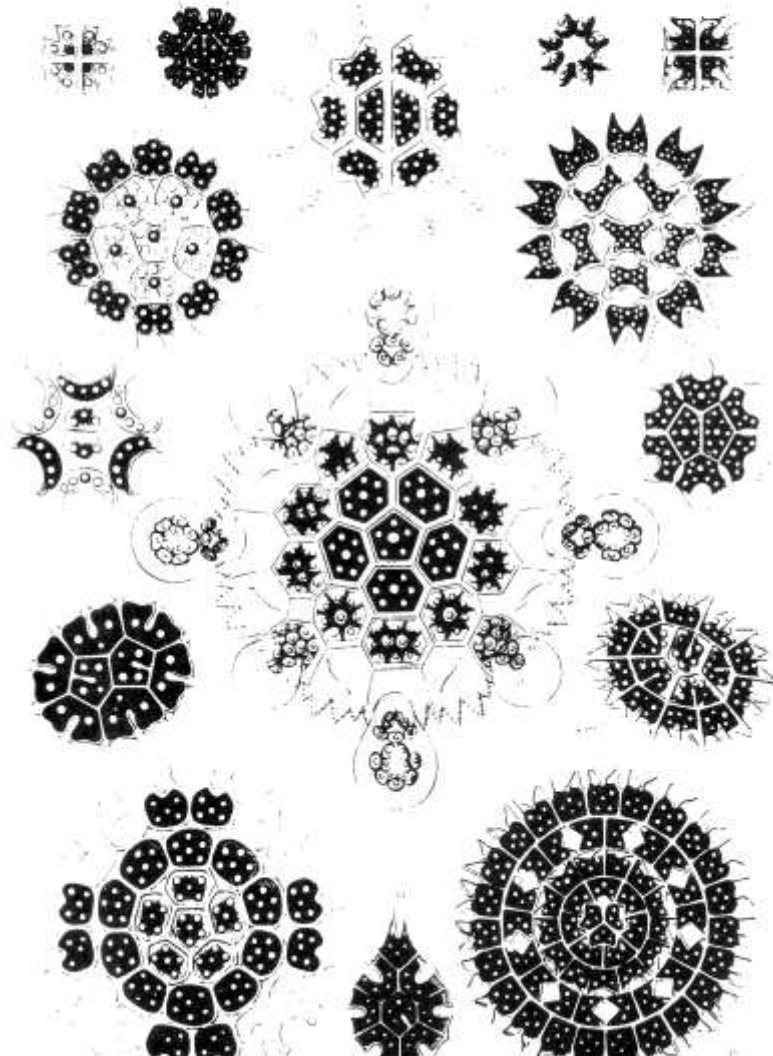
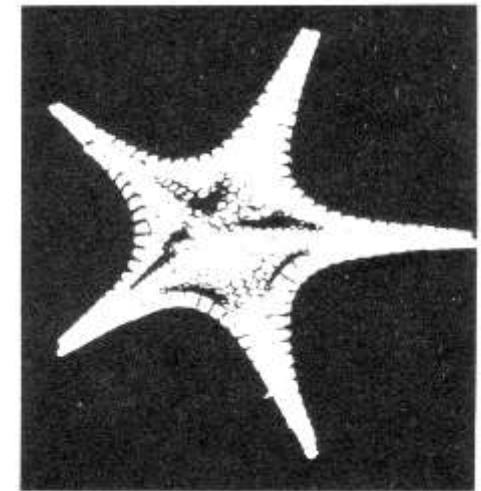
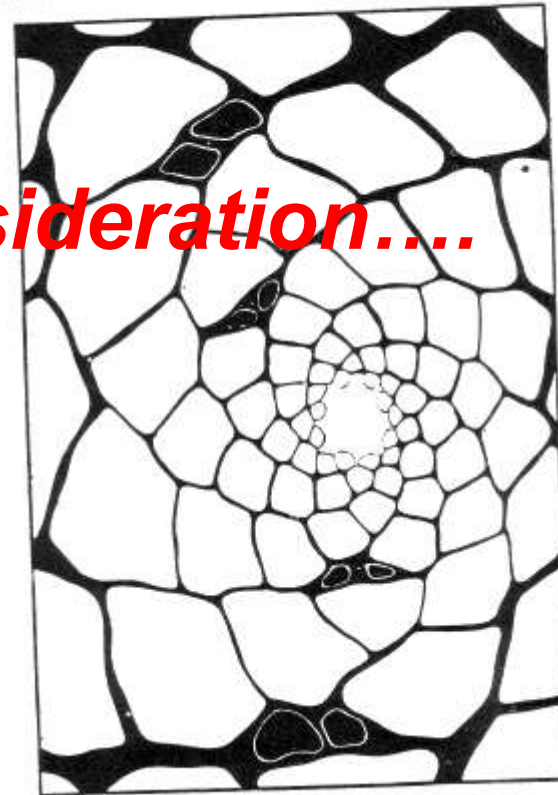


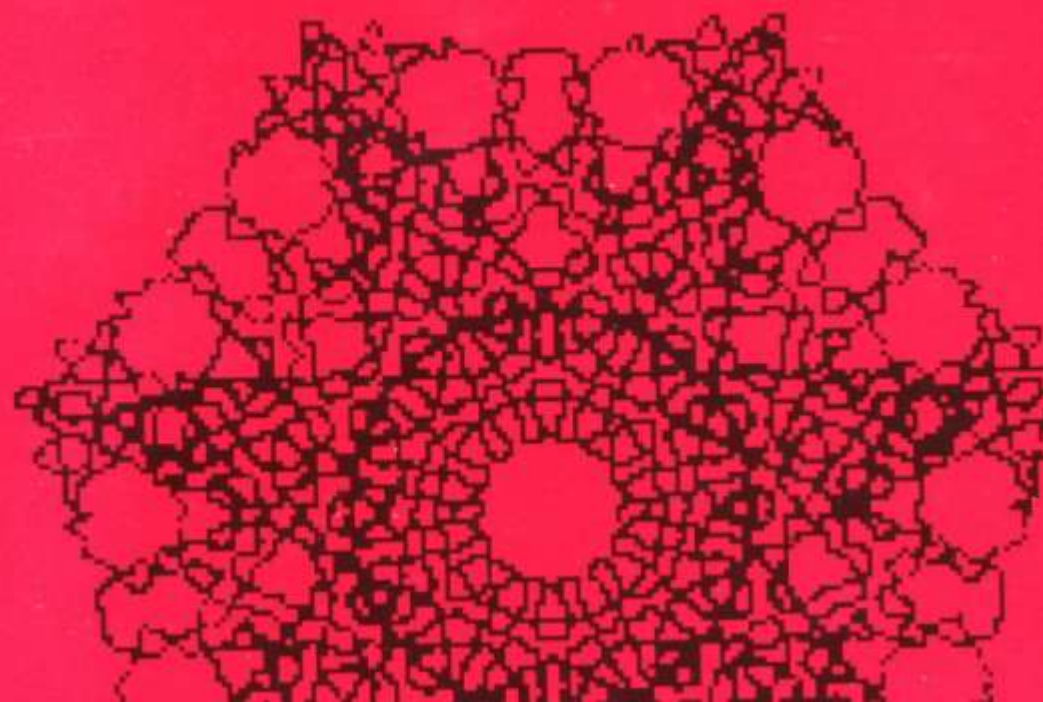
Fig. 10.2.6 Logarithmic spirals on the section of the apex of *Araucaria excelsa* (Church [21]). The numbers of parastichs are 8 and 13.



Add symmetry consideration....

Weak Chaos and Quasi-Regular Patterns

G.M.ZASLAVSKY R.Z.SAGDEEV
D.A.USIKOV AND A.A.CHERNIKOV



Alhambra, Nasrid dynasty's palace



The Worldline of *Владимир Евгеньевич* *Захаров*

- 1939 born (Russia)
- 1948 (first sighting, Kazan, Tatarstan)
- 1959 (second encounter, Moscow, Energy Institute) – Live with Plasma media
- 1961 (landed in Siberian Campus/
“Academgorodok) True Love Affair
with “Water” (and Waves), shared
with Love Affair with Poetry
- 1970-tieth (Landau Institute,
Chernogolovka)
- Since 1990: Deliberate choice to live in one
of the worlds most “arid zones”
(Arizona)



Zakharov and Poetry

- Is Poetry compatible with Theoretical Physics?
(P.Dirac and R.Oppenheimer episode)
- “Poet in Russia is more than a Poet..”