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CURRICULUM VITAE

BORN: 26 January 1953 Sofia, Bulgaria
DEGREES: Senior Research Fellow, Candidate of Physical and Mathematical Sciences Ph.D.

EDUCATION

- 1967 - 1970 National Physical and Mathematical Gymnasium
- 1970 - 1977 Physical Faculty of the Moscow State University Sternberg State Astronomical Institute. Diploma thesis on Non stationary Disk Accretion of Strongly Magnetised Neutron Stars.
- 1978 - 1983 Space Research Institute at the Soviet Academy of Sciences and Physical Faculty of the Moscow State University. Post graduate research under the leadership of academician Ya.B.Zeldovich. Candidate of Physical and Mathematical Sciences with Thesis defended on Non stationary Disc Accretion.

POSITION

- 1983 - 1987 Head of High Energy Astrophysical Group at the Central Laboratory for Space Research.
- Since 1988 Head of Space Astronomy Division and High Energy Astrophysical Department at the Space Research Institute.
- 1988 - 1990 Deputy Director of the Space Research Institute.
- Since 1990 Vice - President of the Scientific Council at the Space Research Institute.
- Since 1995 Vice- Director of Sciences of Space Research Institute

PROFESIONAL TRAINING

- 1978 - 1983 Ph.D. student in Space Research Institute at the Soviet Academy of Sciences and Physical Faculty of the Moscow State University.
- 1981 Language qualification - England

PROFESIONAL VISITS

- MPI fur Extrerrestrishe Physik - Germany
- ISAS, Nagoya University - Japan
- Francaty, Roma University - Italy
- JPL - USA
- Abastumany Observatory - Georgia
- Brassel Free University-Belgium

ACADEMIC ACTIVITY

- 1983 - 1987 High Energy Astrophysics Group Theoretical Research, Development of X - Ray Instrumentation
- 1983 - 1989 Scientific leader of the Bulgarian part for the fast rotating X - Ray telescope PODSOLNUCH, GRANAT International Mission (USSR, France, Bulgaria, Denmark)
- 1986 - 1988 National Co-ordinator for the Space Physical and Astrophysical Programme for the flight of the Second Bulgarian Cosmonaut onboard MIR Station. Scientific leader of the astronomical complex Rogen operating onboard MIR Station.
- 1983 - 1990 Leader of 6 diploma theses of which 4 are collaborators of the institute.
- Since 1991 Leadership of 2 Ph.D. researches.

SOCIETIES (Membership)

1. Bulgarian Union of Scientists - member
2. International Astronomical Union - member
3. International Academy of Astronauts - academision membe
4. COSPAR Committee on Astrophysics from Space - member
5. Space Exploration Committee of the International Astronautical Federation - member
6. International Scientific Committee on Spectra - Rentgen - Gamma - member
7. International Society for Optical Engineering (SPIE)-member
8. European Astronomical Union - member

INTERNATIONAL ACTIVITY

- 1983 President Local Committee COSPAR Symposium on High Energy Astrophysics and Cosmology, Pamporovo, Bulgaria
- 1987 Member - International Scientific Committee
- President - Local Organising Committee of COSPAR
- Symposium on the Physics of Compact Object - Theory versus Observation, Sofia, Bulgaria
- Since 1984 Co - chairman - Space Astronomy Session, IAF Space Exploration Symposium
- Active participation in COSPAR, IAF, ESA events.
- Leader - Bilateral agreement between the Bulgarian Academy of Sciences and CNR - Italy in the field of high energy astrophysics, between Space Research Institute and Nagoya University in the field of Space Research.

STATEMENT OF RESEARCH INTERESTS AND FIELD OF RESEARCH

The main scientific interests are related with the theoretical astrophysics , nonlinear physics and mainly with relativistic astrophysics. Being student and graduate trainee of acad. Ya. B. Zeldovich I had worked in the field of the physics of compact objects. My works are mainly oriented toward high energy astrophysics, X - and Gamma - ray astronomy. My thesis on Nonstationary Disc Accretion initiated a series theoretical work for group analysis of solution of equation describing accretion discs. The results obtained showed that the discs are ideal synergetic system with nonlinearity, irreversibility and openness. That is why together with acad. Zeldovich we explored the idea that the majority of dynamic manifestation of objects where accretion fluxes are observed or assumed should be systemized and interpreted based on the theory of the self - organisation. The investigation applies two parallel method - the synergetic via obtaining wide class of analytical solutions and criteria to demonstrate under which conditions these objects express manifested tendency toward self - organisation. This is rather euristic approach. The second approach is related with the investigation of the dynamic instability of the accretion fluxes. The instability of hydrodynamic and magnetohydrodinamic Quette flows may give the answer to one of the crutial questions in the theory of the disc accretion - the problem of the nature turbolization. The self - gravitational and

non self - gravitational instability of primordial accretion, solar and planetary dust layers in guasi - Keplerian differential rotation around a central gravitational field was theoretically investigated. For this purpose linear and non-linear perturbation analysis were applied to the full system of hydrodinamical equations of the Euler type. Bending wave modes and compression waves were studied separately both for radial and tangential propagation directions. For radial waves a similar instability criterion like that by Goldreich and Ward is obtained. However, for tangential waves a different criterion is found clearly showing that the onset of the instability sensitively depends on the direction of propagation. This work is now successfully extended to the case of viscous accretion discs. Recently I am working on the non-linear physics of accretion discs. The expected effects in this systems are:

1. Shock waves may occur as result of inflowing or outflowing nonstationary flux.
2. Selforganisations may be obtained as result of feed back between accreting substance emissivity flux from the inner edge of the disc on the equatorial plane.
3. Defined current structures may occur from Rosby type solutions.
4. The appearance of most various types of instabilities which modulate the observational manifestation of these phenomena.

   And many other effects which influens the dynamics of the accretion flux. In dependens on whether the disc is in the active galaxy nucleus, around black hole, neutron star, white dwarf or protostar the developing phenomena would different. Therefor I have the idea to unify these phenomena and look for the guiding parameters in these systems in order to establish good classification. Another problem I am interesting in is the turbulence mechanism in result of the evolution of a non-linear system. A non-linear theory of the hydrodynamical instability does not exist yet. Therefor I decided to apply the idea to describe non-linear parabolic equation as a revealing method for initial generation of pulsations with finite amplitude in accretion discs. For more than 10 years have been trying to apply the ideas of synergetics and non-linear physics in astrophysics. Recently I am interesting mainly in the problem of selforganisation of open and nonequilibrium systems witch in fact are widely found in astrophysics. Speaking In terms of mathematics if in one open and nonequilibrium system transfer and a sours of energy exist (either of internal or external nature) which being set up in a self - consistent structure formation should start and on the contrary, if this self - consistency is broken up then the system evolves again until self - consistency appears once again. The problem is which are the guiding parameters characterising this evolutionary phase sequence " structure - transition - structure" for various astrophysical objects. It is clean that for the systems with a gravitating centre in the sense of the star the phases will undergo the following evolutionary process " authowave process - quasistationary state - autowave process - ...". For the systems without such a gravitation centre the the phases should be "chaos - structure - chaos - …" and ofcours one intermediate phase may exit. Then the turbulence intervince with the authowave processes and the whole processes assumed a more complicated but more physical meaning. Such is the case with accretion discs, protoplanetary systems and galactic discs. One of the problems which motivated the works is that in the cause for the development of turbulent motions in such rotating systems. The idea is that

THIS PHENOMENON HAS CAUSED BY THE FACT THAT SUCH AN OPEN AND NONEQUILIBRIUM SYSTEM WITH DIFFERENTIAL ROTATION CAN NOT RESIST GRAVITY IN NO OTHER WAY BUT DEVELOPING SUCH CHAOTIC MOTION

therefor the question what methods from the self - organisation theory can be applied in support of such a hypotetics emerges. The unification of the synergetics and the theory of dynamics instability will provide for the development of non-linear astrophysics, the premises of which we may find in the non-linear theory of star pulsations, jet and galactic dynamics. The development of the non-linear astrophysics would give the possibility many of the observed phenomena to be identified and classified and on the other hand new phenomena and physical manifestation would be revealed the existence of which may not be assumed with the classical linear approach. Important role in the rapid solution of these problems will be the combination of theoretical and numerical experiment on one side and the comparison of the obtained results with the avalanche of data from the specialised space and ground observations on the

other. Many of these problems are reflected in publications other are projects of future work. Another field of scientific interest is the investigation of hot raredied plasma in astrophysics. This problem was identified recently related with the investigations and the diagnostics of such plasma type around collapsed objects and on Sun. The future plans of main envisage serious work on the problem of astrophysical radiation hydrodynamics and the eventual further combination with the problems of the non-linear astrophysics. On the base of all this I conclude the contract with the Brussels Free University for two years after the begin of 1995 over the theme " Non-linear evolution of accretion discs" with Prof. G. Nikolis.

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5. L. G. Filipov, V. Markov, Chr. Bliznakov, V. Genov, High Energy Astrophysics in Bulgaria - Problems and Prospectives, Rep. BAD - 85 - 607, I Nat. Conf. Cosmos - 85 Varna 14 -16 Nov., 1985.
6. L. G. Filipov, Space - Based Astronomy, Rep. BAD - 85 - PD - 11, I Nat. Conf. COSMOS- 85, Varna 14 - 16 Nov., 1985.
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