

## THE FIRST 30 YEARS OF REM SOLOUKHIN SCHOOL IN BELARUS

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The first registered shock run in Belarus is dated by October 14, 1976. During the first day of Professor Brossard's (Bourges, France) short stay in Minsk in 1976, Rem Ivanovich Soloukhin, Nikita Fomin, and Oleg Achasov have performed This run. The shock tube has been transported from Institute of Theoretical and Applied Mechanics (ITAM) SB USSR Acad. of Sciences, Novosibirsk and has been mounted in Heat and Mass Transfer institute of BSSR Acad. of sciences during the summer of 1976. Since that time, a number of shock tubes have been constructed here and series of both experimental and theoretical investigation of physical gasdynamic phenomena in non-equilibrium conditions have been accomplished, see [1-9] and Fig.1. The first studies have been:

- resonance absorption of carbon dioxide laser radiation by propane;
- high power mixing gasdynamic lasers;
- "super-equilibrium ionization" in supersonic flows;
- detailed diagnostics of molecular levels by laser spectrograph;
- electro-discharge laser physics;
- non-equilibrium kinetics.

On the basis of these studies Nikita Fomin, Seirhey Zhdanok, Oleg Achasov (1954-2002), Serguei Labuda, Dmitrii Ragozin, Serguei Khizhnjak, and many others have presented their PhD theses.

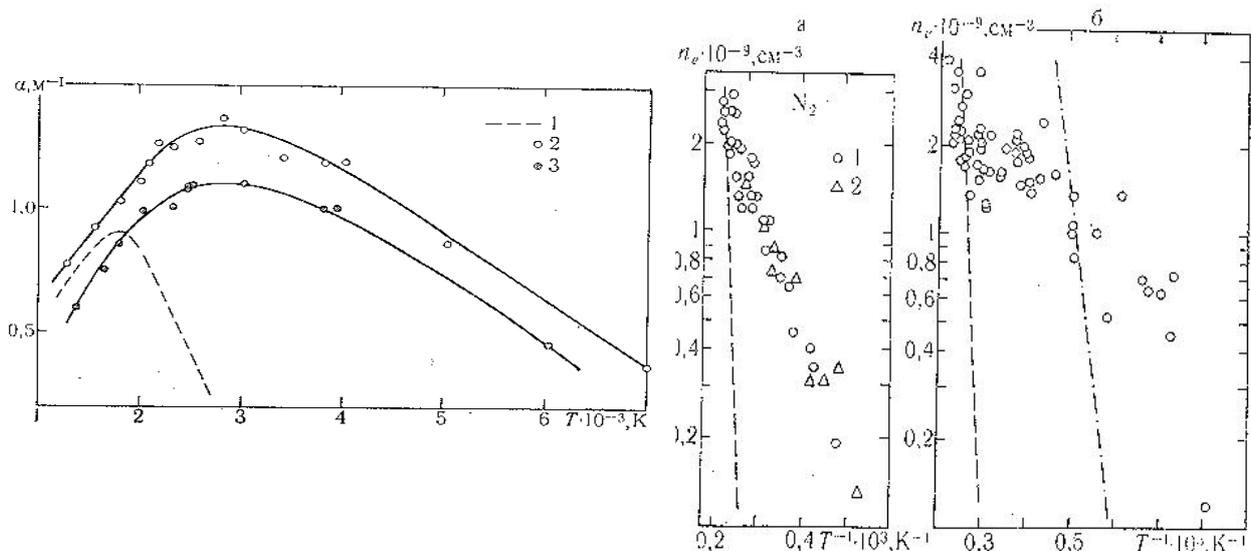


Fig. 1. Gain of gasdynamic laser, see [3,4] (on the left) and "super-equilibrium" ionization in supersonic flow [5]

The original scheme of laser spectrograph with spatial distribution of different wavelength has been developed in Novosibirsk under guidance of Rem Soloukhin and Yurii Jakoby. We start to call such laser systems as Soloukhin-Jakoby spectrographs. We have built a series of such devises, have patented a number of similar schemes, and have performed precise measurements of molecular levels distributions in strongly non-equilibrium conditions using these Soloukhin-Jakoby spectrographs (see [10-13] and Fig.2.

Since 1985, a new diagnostic approach, based on statistical optics has been developed here. The approach called speckle photography, which now is a new digital laser image acquisition system with subsequent statistical image data analysis. Rem Soloukhin has been very enthusiastic about this novel technique [14-15].



Photo 1. The Winner of “Socialistic competition” of Heat and Mass Transfer Institute in 1987 - Convective and Wave Processes Laboratory.



Photo 2. Department of Non-Equilibrium Processes of Heat and Mass Transfer Institute in 2000

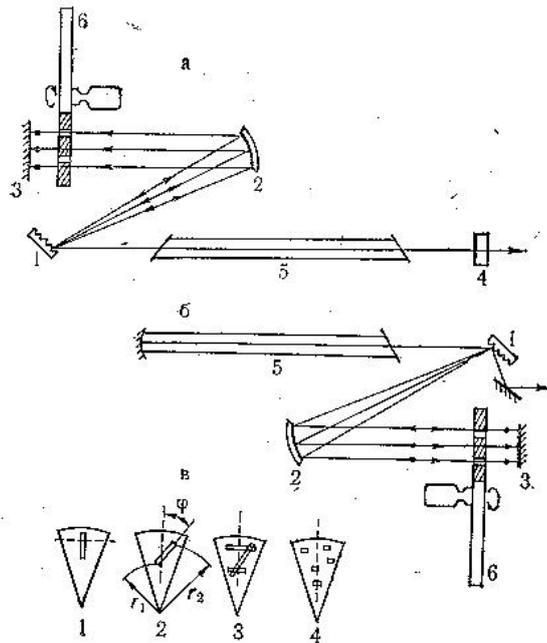


Fig. 2. Different schemes of Soloukhin-Jakoby laser spectrograph

## References

- [1] Soloukhin R.I. Shock tubes in flow laser research, modeling and application. In Shock Wave Research, University of Washington Press, Seattle and London, 1978.
- [2] Brossard J., Fomin N.A., Soloukhin R.I. Shock tube ignition and detonation studies by resonance absorption in propane. *Acta Astronautica*, v. 6, 1979.
- [3] Fomin N.A., Soloukhin R.I. Gasdynamic Problems for Optically Inverse Media. *Revue de Physique Appliquee*, tome 14, 1979.
- [4] Achasov O.V., Labuda S.A., Soloukhin R.I., Fomin N.A. On the diagnostics of the carbon dioxide molecular states in terms of resonance absorption of CO<sub>2</sub>-laser radiation. *DAN SSSR*, v. 249, No. 6, 1979.
- [5] Achasov O.V., Zhdanok S.A., Ragozin D.S., Soloukhin R.I., Fomin N.A. Associative ionization of atomic molecules at adiabatic expansion in the supersonic flow. *ZhETF*, v.81, No. 2, 1981. (in Russian)
- [6] Karnyushin V.N., Soloukhin R.I. Macroscopic and Molecular Processes in Gas Lasers. Moscow: Atomizdat, 1981. (in Russian)
- [7] Fomin N.A., Golovichev V.I., Munjee S.A., Soloukhin R.I. Modeling of Gasdynamic and Relaxation Phenomena in Mixed Flow Lasers. *Progress in Astronautics and Aeronautics*. v. 76, Princeton, USA, 1981.
- [8] Zhdanok S.A., Soloukhin R.I. The specific features of vibrational relaxation of diatomic gases under adiabatic expansion in a supersonic nozzle. *Letters in ZhTF*, v. 7, No. 10, 1981. (in Russian)
- [9] Achasov O.V., Fomin N.A., Ragozin D.S., Soloukhin R.I., Zhdanok S.A. Plasma Generation in Vibrationally Nonequilibrium Molecular Gas Flows. *Revue Phys. Appl.*, v. 17, N1. 1982.
- [10] Soloukhin R.I., Fomin N.A. Gasdynamic Mixing Lasers. Minsk: Nauka i Tekhnika, 1984. (in Russian)
- [11] Achasov O.V., Kudryavtsev N.N., Novikov S.S., Soloukhin R.I., Fomin N.A. Diagnostics of Non-Equilibrium States in Molecular Lasers. Minsk: Nauka i Tekhnika, 1985. (in Russian)
- [12] Achasov O.V., Fomin N.A., Labuda S.A., Ragozin D.S., Soloukhin R.I. Laser diagnostics of molecular states in non-equilibrium flows. *Journal Experiments in Fluids*, v.3, N4, 1985.
- [13] Krauklis A.V., Samtsov P.P., Soloukhin R.I., Fomin N.A. Volume discharge in the supersonic non-equilibrium-ionized gas flow. *ZhTF*, v. 56, No. 10, 1986. (in Russian)
- [14] Blinkov G.N., Fomin N.A., Soloukhin R.I. Multidirectional speckle photography of density gradients in a flame. In *Dynamics of Reactive Systems. Part 1: Flames*, volume 113 of *Progress in Astronautics and Aeronautics*, pages 403-416. AIAA - Press, Washington, 1988.
- [15] Fomin N.A., Soloukhin R.I. Speckle photography of density gradients in reacting flows. *Proc. of International Workshop on Flame Structure, Part I*, Novosibirsk, 1988.