

**PAO**



**Joint Workshop of  
Russian Acoustical Society (RAS) and French Acoustical Society (SFA)  
on**

**HIGH INTENSITY ACOUSTIC WAVES IN  
MODERN TECHNOLOGICAL  
AND MEDICAL APPLICATIONS**

**Moscow, November 14 - 15, 2005**

The 1<sup>st</sup> Joint Workshop of the Russian Acoustical Society (RAS) and French Acoustical Society (SFA) was held in Moscow, Russia, from 14 to 15 November 2005, as a special session of the XVI Meeting of the Russian Acoustical Society. The main idea of the workshop was to bring together the experts in a particular field from France and Russia, to present the results of successful collaboration between the teams of the two countries, to initiate new contacts, and to develop interaction between the Societies. The workshop was very successful and it has been decided to continue the effort on expanding the contacts between the two Societies, in particular, in the form of organizing the next joint meeting in about 2 years.

***CONGRESS VENUE***



The Congress was held in the Moscow State Mining University, which is located very close to downtown Moscow on the Lenin Avenue and has a convenient access from the hotel Akademicheskaya, where most of participants stayed.

***NUMBER OF PARTICIPANTS***

The number of participants presenting the papers was 20; 11 from France (Paris, Tour, Marseille, Lyon, and Lille) and 9 from Russia (Moscow and Nizhni Novgorod). The participants of the XVI Meeting of the Russian Acoustical Society also attended the workshop, so the whole audience was about 50. Representatives for the French Embassy in Moscow A. Leynet, C. Lormelle, L. Breuil (in charge of the Science and Technology of the Embassy) and the Director of the CNRS office in Russia, Prof. P. Le Fort also attended the meeting.



***OPENING CEREMONY***

The President of the Russian Acoustical Society, Prof. N.A. Dubrovsky, Vice-Rector of the Moscow State Mining University, Prof. E. Kuzmin; the President of the French Acoustical Society, Dr. Ph. Blanc-Benon, and one of the organizers of the workshop, Dr. V. Khokhlova gave introductory speeches at the opening ceremony.

## ***TECHNICAL SESSIONS***

20 papers were scheduled for 3 sessions of 14 and 15 November. The talks were grouped as devoted to nonlinear effects in therapeutic applications of ultrasound, medical diagnostics, nonlinear waves in inhomogeneous media, nondestructive testing, and thermoacoustics.

## ***PUBLICATIONS***

A book of the program and 80 copies of the hard copy version of the Proceedings were printed and distributed among the participants of the workshop. The program of the workshop was displayed in Internet at [http://www.akin.ru/e\\_main.htm](http://www.akin.ru/e_main.htm), the full papers of the Proceedings together with the English versions of the Proceedings of RAO session will be also displayed on the Internet.

## ***SOCIAL EVENTS***

After the opening ceremony there was arranged a tour to the Museum of Mineralogy of the University for the participants of the Workshop. The banquet included in the registration fee was in café Pushkin in the evening of November 14. Transportation to and from the restaurant was provided.

## ***BUDGET***

The total budget of workshop consisted of the registration fees of the participants and financial support from the Acoustical Society of America, International Commission on Acoustics, French Acoustical Society, Physics Department of the Moscow State University, Acoustical Institute, and Moscow State Mining University.

## ***ORGANIZING INSTITUTIONS***

**Russian Acoustical  
Society**



**Physics Department  
M.V.Lomonosov Moscow State University**



**Moscow State  
Mining University**



## ***SPONSORING ORGANIZATIONS:***

**Acoustical Society  
of America**



**International Commission  
for Acoustics (ICA)**



**French Acoustical  
Society**



**Andreyev Acoustical  
Institute**



**Russian Foundation  
for Basic Research**



**Federal Agency  
of Science and Innovation**



## ***ORGANIZERS OF THE XVI MEETING OF RAS:***

Nikolai A. Dubrovsky, RAO President; Elena V. Yudina, RAO Executive Director

## ***ORGANIZERS OF THE WORKSHOP:***

Philippe Blanc-Benon, SFA President; Vera A. Khokhlova, Oleg A. Sapozhnikov, MSU

# Program

**Monday, 14 November 11:30 – 14:00**

Registration

Tour in the Geological Museum of the Moscow State Mining University

Lunch

**Monday, 14 November 14:00 – 18:00**

1. 14:00 – 14:30. J.-Y. Chapelon

**High Intensity Focused Ultrasound in the Treatment of Localised Prostate Cancer**

*INSERM, Unite 556, Lyon, France*

2. 14:30 – 15:00. M. Tanter, M. Fink

**Time Reversal of Acoustic Waves in the Nonlinear Regime: Application to Harmonic Imaging in Medical Ultrasound**

*Laboratoire Ondes et Acoustique, Universite Paris VII/ESPCI, CNRS UMR 7587  
ESPCI - 10 rue Vauquelin, 75231 PARIS Cedex 05, FRANCE*

3. 15:00 – 15:30. L.R. Gavrilov

**Improvement of the performance of high-intensity linear and spherical phased arrays for application in surgery**

*Andreyev Acoustical Institute, Moscow, 117036, Russia.*

**Coffee break 15:30 – 16:00**

4. 16:00 – 16:30. O.A. Sapozhnikov<sup>a</sup>, A.V. Morozov<sup>a,b</sup>, and D. Cathignol<sup>b</sup>:

**Acoustic Holography and Laser Vibrometry to Characterize Vibration of Piezoceramic and Piezocomposite Transducers used in Ultrasound Therapy**

<sup>a</sup> *Dep. of Acoustics, Faculty of Physics, M. V. Lomonosov Moscow State University, Moscow, Russia*

<sup>b</sup> *INSERM, Unite 556, 151 Crs Albert Thomas, 69424 Lyon France*

5. 16:30 – 16:50. C. Lafon, J.-Y. Chapelon, D. Cathignol

**The use of bubbles for enhanced heating in interstitial therapy**

*INSERM, Unite 556, Lyon, France*

*151 Crs Albert Thomas, 69424 Lyon France*

6. 16:50 – 17:10. S. Catheline, M. Tanter, J.L Gennisson, and M. Fink

**Nonlinear Propagation of Shear Waves in Soft Solids**

*Laboratoire Ondes et Acoustique, Universite Paris VII/ESPCI, CNRS UMR 7587  
ESPCI - 10 rue Vauquelin, 75231 PARIS Cedex 05, FRANCE*

7. 17.10 – 17.30. Maksimov A.O.

**Effect of the shock wave envelope on cavitation bubble dynamics**

*Pacific Oceanological Institute, Vladivostok, Russia*

**19:30 Banquet (included in the registration fee)**

## Tuesday, 15 November 9:30 – 13:30

1. 9:30 – 10:00. V. Preobrazhensky<sup>a</sup>, P. Pernod<sup>a</sup>, A. Brysev<sup>b</sup>, L. Krutyanski<sup>b</sup>, F. Bunkin<sup>b</sup>  
**Nonlinear acoustics of phase conjugate ultrasound beams. Ten years of the Russian-French collaboration**  
<sup>a</sup> *Institut d'Electronique et de Micro-electronique du Nord (IEMN-DOAE-UMR CNRS 8520), Ecole Centrale de Lille, Villeneuve d'Ascq, France*  
<sup>b</sup> *Wave Research Center of General Physics Institute RAS, Moscow, Russia*
2. 10:00 – 10:20. V.A. Khokhlova<sup>a</sup>, P. Blanc-Benon<sup>b</sup>, M.V. Averianov<sup>a</sup>, R.O. Cleveland<sup>c</sup>  
**Diffraction of nonlinear waves in randomly inhomogeneous moving media**  
<sup>a</sup> *Dep. of Acoustics, Faculty of Physics, M. V. Lomonosov Moscow State University, Moscow, Russia*  
<sup>b</sup> *LMFA, UMR CNRS 5509, Ecole Centrale de Lyon, 69134 Ecully Cedex, France*  
<sup>c</sup> *Department of Aerospace and Mechanical Engineering, Boston University, Boston, USA*
- 3 : 10:20 – 10:40. O. Bou Matar, V. Preobrazhensky, P. Pernod  
**2D Axisymmetric Pseudospectral simulation of supercritical phase conjugation of ultrasound in active solid media**  
*Joint European Laboratory LEMAC, Institut d'Electronique, de Micro-electronique et de Nanotechnologie (IEMN-DOAE UMR CNRS 8520), Ecole Centrale de Lille, Villeneuve d'Ascq, Wave Research Center of General Physics Institute (RAS), Moscow, Russia*
4. 10:40 – 11:00. V. Tournat<sup>a</sup>, V.E. Gusev<sup>b</sup>, V. Yu. Zaitsev<sup>c</sup>, V.E. Nazarov<sup>c</sup>, B. Castagnède<sup>a</sup>, Ph. Béquin<sup>a</sup>, C. Inserra<sup>a</sup>  
**Nonlinear acoustic effects in unconsolidated granular media**  
<sup>a</sup> *Laboratoire d'Acoustique de l'Université du Maine UMR-CNRS 6613, Université du Maine, Av. Olivier Messiaen, 72085 Le Mans cedex 9, France.*  
<sup>b</sup> *Laboratoire de Physique de l'Etat Condensé UMR-CNRS 6087, Université du Maine, Av. Olivier Messiaen, 72085 Le Mans cedex 9, France.*  
<sup>c</sup> *Institute of Applied Physics, 46 Uljanova street, Nizhny Novgorod, 603950 Russia.*
- Coffee break: 11:00 – 11:30**
5. 11:30 – 12:00. Ph. Blanc-Benon, D. Marx  
**Nonlinear effects in a standing wave thermoacoustic refrigerator**  
*LMFA, UMR CNRS 5509, Ecole Centrale de Lyon, 69134 Ecully Cedex, France*
6. 12:00 – 12:20. G. Penelet<sup>a</sup>, V. Gusev<sup>a,b</sup>, P. Lotton<sup>a</sup>, M. Bruneau<sup>a</sup>  
**Experimental and theoretical studies of nonlinear saturation processes in an annular thermoacoustic prime mover**  
<sup>a</sup> *Laboratoire d'Acoustique de l'Université du Maine, UMR-CNRS 6613, avenue Olivier Messiaen, 72085 Le Mans cedex 9, FRANCE*  
<sup>b</sup> *Laboratoire de Physique de l'Etat Condense, UMR-CNRS 6087, avenue Olivier Messiaen, 72085 Le Mans cedex 9, France*
7. 12:20 – 12:40. M. Mironov, P. Pjatakov and A. Soloviev.  
**Tuning of acoustical refrigerator: theory and some results.**  
*State research center of Russia, Andreyev Acoustical Institute, Moscow, Russia*

## Tuesday, 15 November 14:00 – 18:00

1. 14:00 – 14:20. N. Sebaa<sup>b</sup>, ZEA. Fellah<sup>a</sup>, C. Depollier<sup>c</sup>, and W. Lauriks<sup>b</sup>

### **Direct and Inverse Scattering Problem in Cancellous Bone: Application of Biot Theory**

<sup>a</sup>*Laboratoire de Mécanique et d'Acoustique, UPR-CNRS 7051, 31 chemin Joseph-Aiguier  
13402 Marseille cedex 20 France*

<sup>b</sup>*Laboratorium voor Akoestiek and Thermische Fysica, Katholieke Universiteit Leuven,  
Celestijnenlaan 200D, B-3001 Heverlee, Belgium*

<sup>c</sup>*Laboratoire d'Acoustique de l'Université du Maine, UMR-CNRS 6613, avenue Olivier Messiaen,  
72085 Le Mans cedex 9, FRANCE*

2. 14:20 – 14:40. Ph. Lasaygues

### **Imaging the shape of long bones using ultrasound tomography.**

*Laboratoire de Mécanique et d'Acoustique, UPR-CNRS 7051, 31 chemin Joseph-Aiguier  
13402 Marseille cedex 20 France*

3. 14:40 – 15:00. Th. Goursolle<sup>a</sup>, S. Dos Santos<sup>a</sup>, F. Vander Meulen<sup>a</sup>, L. Haumesser<sup>a</sup>, and O. Bou Matar<sup>b</sup>

### **Ultrasonic Parametric Imaging of Metallic and/or Composite Samples using Nonlinear Acoustics Measurements**

<sup>a</sup>*LUSSI-GIP Ultrasons---École d'Ingénieurs du Val de Loire, Rue de la Chocolaterie  
BP 3410, F-41034 BLOIS cedex, France*

<sup>b</sup>*Institut d'Electronique et de Micro-electronique du Nord (IEMN-DOAE-UMR CNRS 8520), Ecole  
Centrale de Lille, Villeneuve d'Acsq, France*

## **Coffee break: 15:00 – 15:30**

4. 15:30 – 15:50. I.N.Didenkulov<sup>1</sup>, L.M.Kustov<sup>2</sup>, N.V.Pronchatov-Rubtsov<sup>2</sup>, A.A.Stromkov<sup>1</sup>

### **Methods of the nonlinear acoustic vision of objects and defects**

<sup>1</sup>*Institute of Applied Physics 46 Ulyanov str., 603950, Nizhny Novgorod, Russia*

<sup>2</sup>*Nizhny Novgorod State University 23 Gagarin ave., 603950, Nizhny Novgorod, Russia*

5. 15:50 – 16:10. L. Haumesser<sup>a</sup>, O. Bou Matar<sup>b</sup>, S. Dos Santos<sup>a</sup> and F. VanderMeulen<sup>a</sup>

### **Transmission through and reflection from a fluid elastic layer : quasilinear approximation**

<sup>a</sup>*LUSSI-GIP Ultrasons---École d'Ingénieurs du Val de Loire, Rue de la Chocolaterie  
BP 3410, F-41034 BLOIS cedex, France*

<sup>b</sup>*Institut d'Electronique et de Micro-electronique du Nord (IEMN-DOAE-UMR CNRS 8520), Ecole  
Centrale de Lille, Villeneuve d'Acsq, France*

6. 16:10 – 16:40. S.N. Gurbatov, I.Yu. Demin, N.V.Pronchatov-Rubtsov

### **The Use of Bispectral Analysis for Nonlinear Diagnosis of Soft Tissues**

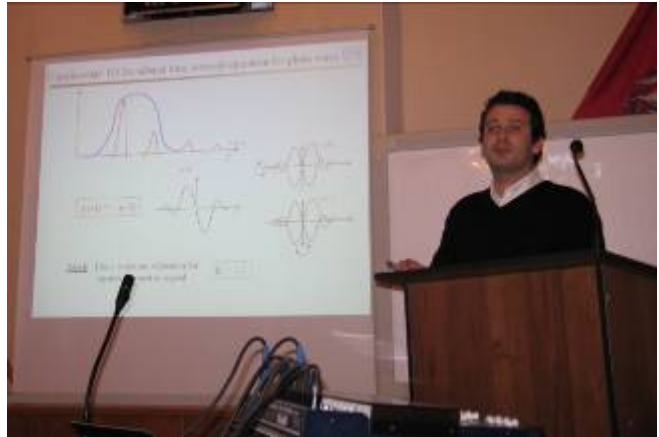
*Nizhny Novgorod State University 23 Gagarin ave., 603950, Nizhny Novgorod, Russia*

## MINUTES OF THE WORKSHOP

### Invited lectures



Dr. J.-Y. Chapelon (Lyon)



Dr. M. Tanter (Paris)



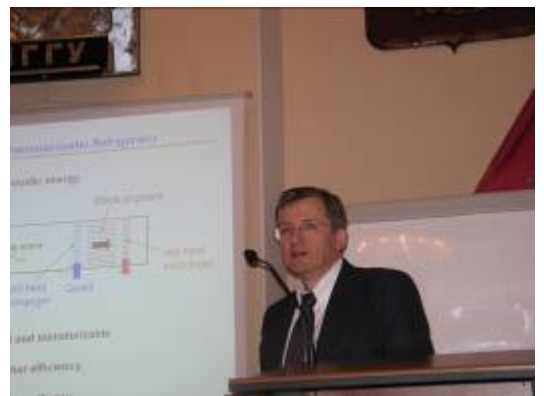
Dr. Sapozhnikov (Moscow)



Dr. Gavrilov (Moscow)



Prof. Preobrazhenski (Moscow/Lille)



Dr. Blanc-Benon (Lyon)



## During the sessions



V. Tournat



T. Goursole



Z. Fellah



P. Lasaygues and V. Zaytsev



I. Dudenkulov



O. Bou Matar



C. Lafon



V. Khokhlova



I. Dyomin and J.-Y. Chapelon

Coffee break





## Organizers and supporters of the workshop



From left to right: Prof. V.L. Shkuratnik (Organizer from the MSMU), Prof. N.A. Dubrovsky (President of RAS), Prof. E. Kuzmin (Vice-Rector of the MSMU); Dr. Ph. Blanc-Benon (President of SFA), Dr. V. Khokhlova (Organizer from the MSU), E.V. Yudina (Organizer from RAO)



Dr. Ph. Blanc-Benon and Dr. O. Sapozhnikov  
(Organizer from the MSU)



Opening ceremony: Prof. E. Kuzmin,  
Drs. V. Khokhlova and Ph. Blanc-Benon.



Visas and tech. support  
PhD student M. Averyanov



Registration. E. Yudina (in the middle)



Coffee breaks and tech. support  
PhD students A. Ponomaryov and  
M. Smagin (MSU)



Transportation: S. Tsisar,  
MS student (MSU)

Transportation: T. Krit (on the right),  
MS student (MSU)





# Banquet, Café Pushkin

