DR. OLEG KOLOSOV, STATEMENT OF TEACHING EXPERIENCE

TEACHING EXPERIENCE.

Undergraduate teaching

1. Lecture courses (3rd / 4th year undergraduates). Department of Materials, University of Oxford, UK. (Lectures, tutorials, tests and test markings).
   - **Advanced Microsctructural Characterization of Materials**. Advanced Option
   - **Electrical Polymers.**
2. Undergraduate projects (3rd year undergraduates). Department of Materials, University of Oxford, UK (project brief preparation, supervision, marking).
   - **Exploratory practical design - undegraduate research project (**Duration – one term).
3. Group tutorials (College teaching, 3rd and 4th undergraduates, University of Oxford, UK).

Graduate teaching and supervision

4. Graduate lectures. University of Oxford, UK.
   - **Acoustic methods for materials characterisation.** Department of Materials, University of Oxford.
   - **Acoustic Microsopy.** Interdepartmental Graduate Lectures in Science. Sub-faculty of Physical Sciences.
5. **Oxford D.Phil. supervision**, University of Oxford, UK.

Graduate student thesis topics:

- "Characterization of stiffening layers by acoustic microscopy and Brillouin spectroscopy"
- "Ultrasonic Force Microscopy: surface elastic properties mapping and stiffness evaluation at a nanoscale level"
- "The Use of SAW Methods in Probing Near-Surface Elastic Properties"

6. **European exchange Ph.D. programme** supervision at University of Oxford, UK. EPFL (Switzerland), Aalborg University (Denmark)

Graduate students thesis topics

- "Characterisation of mecahnical properties of SiC/Al2O3 nanocomposites by QAM"
- "Machining of Short Fibre Reinforces Thermoplastics".

7. **M.Sc.** supervision, Moscow Institute of Physics and Technology (Moscow PhysTech), Russia.

Graduate students thesis topics

- "Transmission Acoustic Microscopy of Biological Tissues".
- "Polymer Materials Investigations by Non-destructive Ultrasonic Technique.
- "Studies of Physico-Mechanical Properties of Biological Tissues by Acoustic Microscopy Techniques".
- "Development of Acoustic Microscopy Methods for Studies of Binary Polymer Blends".

Preferred teaching subjects

Material science

- Theory of Elasticity
- Materials Characterization Methods (mechanical, thermal, XRD, microscopies, spectrosopies)
- Polymer Physics
- Electrical Polymers
- Biopolymers
- Combinatorial Material Science and High throughput methods in materials development
- Nanoscale and mesoscale materials

Physics

- General and Theoretical Physics
- Optics (Geometrical and Wave Optics, Quantum Optics)
- Optical spectroscopy.
- Physical Acoustics

Special and advanced subjects

- Advanced Surface Science methods (scanned probe microscopies, XPS, EDS, ESCA, Electron Microscopies, RBS, SIMS)
- Biophysics and bio-characterization technologies
- Non-destructive Testing and Acoustic Imaging. Scanned Probe Microscopies

RESEARCH GRANTS AND FUNDING.

Year	Research project	Responsibility	Granting body	Resources
2005	Nano-combinatorial material science.	Co-proposer and designated researcher.	EPSRC	Requested 1.37 MM GBP
2001 - 2004	Combinatorial science technology transfer from Symyx Technologies to a North Dakota State University.	Technical contact and initiator at Symyx, technical liason, initial project supervisor at Symyx	EPScOR Grant to the Office of Naval research for NDSU	~ $10 MM
1998-1999	Determination of Hardness and Modulus of Thin Films and Coatings by Nanoindentation – "INDICOAT"	Principal investigator	CEC, SMT4-CT98-2249, **European Union**	~ $30 k
1998	Heterodyne Force Microscope	Principal investigator	Paul Instrument Fund, c/o The Royal Society, **UK**	~ $60 k
1998-1999	Micromechanical properties of polymer-ceramic food packaging nanocomposites	Project leader, PDRA supervisor	Toppan Oxford Centre, industry, **JAPAN**	~ $75 k 1 year PDRA
1997-2000	Ultrasonic Force Microscopy for materials studies	Co-investigator, RA supervisor	EPSRC, SPMI initiative, **UK**	~ $330 k, 3 yr. PDRA
1998	Development of the Optical Heterodyne Force Microscopy, high frequency UFM	Project leader	Japanese Society of Promotion of Science, **JAPAN**	Scientists exchange support
1997	Mapping of the mechanical properties of heterogeneous materials	Project leader	ERBFMBICT972289, **European Union**	~ $120 k 2 yr. PDRA
1997	Preparation and characterization of diamond like carbon and fullerene films	Project leader	British Council – JNICT, 423/RU, **PORTUGAL**	Scientists exchange support
1996-2001	Advanced EPSRC Fellowship – Heterodyne Force Microscopy	Grant recipient	EPSRC, B/96/AF/2232, **UK**	~ $300 k 5 years stipend + research expenses
1995	Development of Ultrasonic Force Microscope	Principal investigator	Paul Instrument Fund, c/o The Royal Society, **UK**	~ $120 k
1993	Atomic force spectroscopy at ultrasonic frequencies	Co-investigator	Nanotechnology programme AIST, **JAPAN**	~ $80 k
1991-1993	STA Research Fellowship – Microscale elastic properties of ceramics	Grant recipient	Science and Technology Agency, **JAPAN**	~ $ 120k 2 years stipend + research expenses

Teaching in the field of materials science can be both a very easy and difficult thing to do. Perhaps, a key to successful teaching in sciences is the depth and breadth of knowledge, as well as experience and expertise of the teacher well beyond the immediate area of a subject he or she teaches. That allows a basic doctrine of the subject to be naturally introduced using simple everyday examples. These will form robust, yet flexible images of underlying relationships of the surrounding nature in student's mind. There is abundance of material science, chemistry, physics and surface science knowledge in an ubiquitous CD / DVD player or an liquid crystal display. A small cell phone in our pocket (with its polymer metal ion rechargeable battery, electret or MEMS (micro electro-mechanical system) microphone, very large scale integration (VLSI) multilayer chip, non-volatile memory, electroluminescent display, quartz frequency standard, white phosphor LED (light emitting diode) and ceramic microwave antenna) could be a subject of a full term course in material science or applied physics.

The teaching process is most efficient when student is actively working on the subjects that catches his or her imagination and interest and, thereby, attention. To achieve this, I usually make my lectures interactive – with demonstrations and props, and combine different forms of visual information. I attempt to pace a presentation with the rate of absorption of information, eg. if the equation is to be derived during lecture, I would rather write it by hand on the OHP projector or the board (depending on the auditorium) step by step, and avoid flashing it on the screen at once. Another key prerequisite of successful course is to introduce to the students a feeling of their own "eureka" – and to leave something for them to invent during every lecture, tutorial or office hours. After "eureka" for the first time, such discovery spirit should be supported during every lecture, homework or practical work. Not insignificant, such "micro-discovery" should be tailored so even student with naturally various pace of understanding equally experience it.

If University curriculum allows, I strongly prefer to link my lectures with appropriate (by amount and level) practical studies, tutorials, and homework with, not necessarily comprehensive, but regular tests. Linking particular generic and special subjects (eg. physics and chemistry with crystallography and fracture mechanics) will strongly benefit students as they now can look at the same subject from different perspective - therefore adding more three dimensional view to the model of the nature they are building in their imagination. From my experience, the projects like at Oxford Materials Department teamwork design project for third year students (when students are given a practical problem (eg. "To find a new material and a concept for an automotive liquid hydrogen fuel tank") which they can elaborate on both theoretically and practically, can be an excellent platform involving literature study, theoretical analysis, practical experimentation and presentation skills.

Yet another vital trait of a successful teacher is connecting with students, and letting them to feel that teaching is not a one way communication from professor to students, but rather a joint walk towards better knowledge. Such approach helps to build proactive and responsible position of students during their subsequent study, research or employment. Being honest and open with students regarding what is required, is also very helpful in building a good working environment in the class. Perhaps, one of the best experiences in teaching a graduate students is a moment when he or she finally stands up to their professor (usually – during thesis write up) and challenges professor's understanding and defebding themselves with rather good arguments.

I equally enjoy teaching undergradates and graduate students as well as constantly learning from them, their attitudes, questions and the very fact that they are brought up in a different environment and have a younger mind. To me teaching is a constant learning – and even the paradigms of teaching I have expressed here, are different from the ones I had while teaching my first students, and I am certain they will constantly evolve during my teaching career.