INSTITUTE OF

EXPERIMENTAL PHYSICS

Faculty of Physics
Warsaw University

2001 - 2002

Warsaw 2003

Director:	Prof. dr hab. Andrzej Twardowski
E-mail:	Andrzej.Twardowski@fuw.edu.pl
Deputy director:	Dr hab. Tomasz Matulewicz, prof. UW
E-mail:	Tomasz.Matulewicz@fuw.edu.pl
Deputy director:	Dr hab. Aleksander F. Żarnecki
E-mail:	zarnecki@fuw.edu.pl
Address:	PL-00 681 Warszawa, ul. Hoża 69
Phones:	(+48 22) 621 38 10 secretariat
	(+48 22) 55 32 000 exchange
Fax:	(+48 22) 622 61 54

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PREFACE

Institute of Experimental Physics is a part of Faculty of Physics of Warsaw University and is one of the oldest and the largest Polish institutions involved in basic research in physics.

At present, the Institute employs 102 physicists (95 full positions), among them 42 professors. It has 75 PhD students who also assist in teaching. The technical and administration staff includes 72 persons (66 full positions). Of the ten divisions of the Institute, nine represent fields ranging from particle and nuclear physics, through condensed-matter physics and optics, to biophysics and medical physics, whereas one deals specifically with issues of teaching physics and training school teachers.

Thanks to years of efforts, the three divisions of condensed matter physics, and the divisions of optics and biophysics, accumulated equipment and experience which allow them to carry out most of their research in Warsaw. This is also true for two divisions of nuclear physics which started experiments at the cyclotron of the Warsaw University Heavy Ion Laboratory. The experimental work carried out in Warsaw, essential for training students and young researchers, is supplemented by active collaboration with foreign centres. The access to leading laboratories in Europe and elsewhere extends the research possibilities and allows us to realise many additional exciting projects. The particle physicists are in a special situation in that high energy physics experiments require very expensive equipment – accelerators and detectors. As a result they work in large international collaborative groups. Their experiments are carried out mainly at CERN (Geneva) and DESY (Hamburg). However, the analysis of data is performed in Warsaw as is the development of complex detector systems, for example for use in the future CERN Large Hadron Collider experiments. The division of medical physics, which has close links with hospitals and research laboratories in Poland and abroad, is involved mainly in the computer analysis of medical data and the modelling of biological processes important to medicine.

The present report covers the years 2001 and 2002. For most of this period the Institute was led by Jan Żylicz.

The report, edited by Izabela Sosnowska, begins with a general presentation of the teaching activities of the Institute by Tomasz Matulewicz. This is followed by some detailed information on individual divisions. Finally, there is a report on the Symposium organized in December 2002 by the team led by Maciej Geller.

Warszawa, 2003 Andrzej Twardowski

Teaching activities of the Institute (2001-2002)

Employees and Ph.D. students of the Institute of Experimental Physics participated in approximately 50% of the teaching activities of the whole Faculty of Physics. Among 102 persons of the scientific staff, 93 were involved in teaching, helped by 10 physicists of the technical staff (often holding a PhD in physics as well). 46 out of 75 graduate students contributed to students training.

The Institute provided, among others:

- two-year basic courses in experimental physics (Mechanics, Electrodynamics, Waves and Optics, Thermodynamics, Introduction to Contemporary Physics) organised for students of physics, astronomy and, separately, for the College of Physics Teachers. The lectures for the students of physics and astronomy were realised at two levels: intended for 3-years studies leading to bachelor's degree and, more advanced, intended for 5-years studies leading to the master degree. All the lectures were illustrated with experimental demonstrations and were accompanied by student classes;
- lectures which constituted some introductions to specialised education (destined for third-year students) – on atomic, molecular and solid state physics or elementary particles and nuclear physics, also illustrated with experimental demonstrations and accompanied by student classes;
- specialised lectures destined for those students who had chosen the specialisation in experimental physics. An important part of their further education took place in the individual divisions of the Institute - appropriate for chosen specialisation (Institute organises 11 different specialisations concerning optics, solid state physics, nuclear and elementary particle physics, biophysics, medical physics, physics of environment protection and physics education);
- monographic lectures organised for the fourth and fifth-year students as well as Ph.D. students;
- some lectures which were believed to broaden students' horizons or to raise their fascination of physics – like e.g. "History of Physics" or "Physical Experiment in Extreme Conditions";
- laboratory classes of the basic level of education – i.e. Introductory Laboratory of Electrical Measurements, First Student Laboratory, Student Laboratory of Electronics, Second Student Laboratory, Laboratory of Physics Teaching and Laboratory of the Physical Methods of Environmental Research;
- student laboratories of specialised studies – e.g. so called Third Student Laboratory which helped students to smoothly undertake experimental research activities or in the case of specialisation of biophysics - Laboratory of Biochemistry or Laboratory of Genetics;
- various seminars, some of which had more general character and served as an aid for students to choose the specialisation of their M.Sc. studies (like "Seminar of Contemporary Physics"), while others were thought to conduct students through very specialised and difficult subjects;
- supervision of M.Sc. theses as well as Ph.D. theses.

In 2001-2002 the teaching activities of the Institute were not limited to training students of the Faculty of Physics. Some lectures and classes were organised for students of other faculties of Warsaw University (Chemistry, Biology, Mathematics, Interdepartmental Studies of Environment Protection - MSOŚ and Interdepartmental Studies of Mathematical and Natural Science - MISMaP). We also contributed to the training of pupils and schoolteachers as well as we supervised some other educational activities - like workshops for exceptionally talented children.

In the Institute during that period of time 114 students made their M.Sc. theses, 18 got their B.Sc. degree (licentiate), 14 colleagues received their Ph.D. and 3 - the D.Sc. (habilitation).

Tomasz Matulewicz

DIVISION OF BIOPHYSICS

Head: Dr hab. Ryszard Stolarski (professor)
Address: Division of Biophysics, Institute of Experimental Physics, Warsaw University, 93 Żwirki & Wigury St., 02-089 Warszawa
Phone: (+48 22) 55 40770
Fax: (+48 22) 55 40771
E-mail: stolarsk@biogeo.uw.edu.pl
Senior Staff Members: prof. dr David Shugar, prof. dr hab. Bogdan Lesyng, dr hab. Ryszard Stolarski (professor), dr hab. Edward Darżynkiewicz (professor), dr hab. Jan Antosiewicz (professor), dr hab. Maciej Geller (associate professor), dr hab. Ewa Kulikowska (associate professor), dr hab. Janusz Stępiński (associate professor), dr. hab. Borys Kierdaszuk (associate professor), dr hab. Michał Dadlez (associate professor), dr hab. Agnieszka Bzowska, dr Elżbieta Bojarska (adiunkt), dr Tomasz Grycuk (adiunkt), dr Jacek Jemielity (adiunkt), dr Beata Wielgus-Kutrowska (adiunkt), dr Anna Modrak-Wójcik (adiunkt)
Scientific Staff (total): 16 persons
ETA (Engineers, Technicians, Administration) : 6 persons
Number of grants in 2001-2002: 12

SCIENTIFIC ACTIVITY

Areas of scientific activity:
Structure, dynamics and specific intermolecular interactions of proteins, nucleic acids and their components. Influence of physico-chemical properties of mutagenic, antivirial and antitumor agents on their biological activity. Physical basis of molecular mechanisms of gene expression and regulation: initiation of protein biosynthesis, intracellular transport, electron and proton transfer, enzymatic phosphorylation and phosphorolysis. Proteomics. Protein folding.

Methods:
Experimental: molecular spectroscopy (UV-VIS, steady state and time resolved and stopped-flow fluorescence, NMR, CD), X-ray diffraction, calorimetry, mass spectrometry, molecular photophysics, organic and physical chemistry, enzymology, genetic engineering. Theoretical: classical, Brownian, and quantum molecular dynamics, molecular (computer) modelling, quantum chemistry.

Main achievements:

1. Studies on the role of mRNA 5' terminus (cap) in translation (protein synthesis in the living cell) led to design and synthesis of a new series of "anti-reverse" cap analogues (ARCA). During *in vitro* transcription ARCAs are incorporated into mRNA transcripts exclusively in the proper orientation, *i.e.* with the 7-methylguanosine moiety at the 5' end. RNA transcripts thus obtained translate twice as efficiently as their counterparts capped with a "traditional" cap, m^7GpppG, and can serve as invaluable biochemical tools for molecular biology research. We employed emission spectroscopy and calorimetry to study interactions of various cap analogues, including ARCAs; with several eukaryotic protein translation factors eIF4Es. The fluorescence time synchronized titration (TST) method provided the precise values of the equilibrium association constants as well as the thermodynamic parameters for formation of the complexes of various specificity: Gibbs free energy changes parsed into various interaction modes (stacking, hydrogen bonding, salt bridges), enthalpy, entropy, and heat capacity changes. The fluorescence results were confirmed by isothermal calorimetry (ITC) titration. The data analyses resulted in molecular mechanism of the eIF4E-cap association during initiation of protein biosynthesis and gave some hints on cooperativity between the cap- and 4E-BP1/eIF4G-binding sites. Phosphorylation of the eukaryotic initiation factor eIF4E in response to various stimuli, *e. g*. cytokines, growth factors, is implicated in the regulation of the initiation step of translation. To address the problem, how the phosphorylation of eIF4E regulates translation, we applied a unique technique in protein engineering, intein-mediated protein ligation (IPL), to obtain eIF4E selectively phosphorylated at serine 209. Quantitative comparison of the cap affinity for phosphorylated *vs.* unphosphorylated eIF4E (fluorescence TST method) shoved that phosphorylation of eIF4E attenuates its interaction with mRNA 5’ cap by electrostatic repulsion.
2. A Langevin dynamics algorithm for simulation of protein conformational equilibrium at constant pH was developed. The computation procedure uses Langevin dynamics option for dynamics calculations available in the Molecular Dynamics software CHARMM, a procedure for evaluation of protonation probabilities of titratable residues in proteins, based on the Poisson-Boltzmann model of solute-solvent systems, and the Monte Carlo procedure for choosing actual protonation patterns for the protein's residues. The algorithm was used to compute average protonation of titratable groups in ovomucoid third domain, as a function of pH. The resulting data were basically equivalent to the pH dependence of the chemical shifts for the protein titratable residues obtained from multidimensional NMR spectroscopy. The pK_a values obtained from the simulation are in reasonable agreement with the experimental data. A method for extracting kinetic and optical parameters from the progress curves for protein-ligand association, obtained by stopped-flow experiments, was developed. The method is limited to one-step and two-step association kinetics, but it allows protein concentration and offset of the signals to be adjustable parameters during an interactive, non-linear least squares fitting procedure.

3. Purine nucleoside phosphorylase (PNP, EC.2.4.2.1) is a key enzyme involved in the metabolism of nucleic acid constituents, especially in the salvage pathway. PNP is present in every living cell. In the latest years phosphorylases from various sources have been intensively studied in many laboratories in hope of many potential practical applications. Using single crystal X-ray diffraction we have determined three-dimensional structures at atomic resolution of three purine nucleoside phosphorylases: hexameric *E. coli* PNP and the trimeric enzymes from calf spleen and *Cellulomonas*. Information gained from these structures, as well as from our parallel kinetic, spectroscopic and physico-chemical studies in solution, supported by results of other laboratories, enabled us to propose two hypotheses. The first one regards the molecular mechanism of catalysis, in particular the electric charge distribution in the transition state of substrate molecules and stabilization by the enzyme of a rare, energetically unfavourable form of the substrate. We posited that electric charge distribution on the purine base and mechanisms of its stabilization differ in the case of trimeric and hexameric PNPs. The second hypothesis explains the molecular basis of non-hyperbolic kinetics, which is observed for PNPs from all sources. Random binding of substrates in the case of trimeric enzymes and cooperativity between the enzyme subunits in the case of hexameric PNP were postulated to constitute the molecular mechanism leading to non-Michaelis kinetic behaviour of these enzymes.
4. Research carried out by the molecular modelling and bioinformatics research group was focused on development and applications of fast quantum generators of the potential energy function, in particular an Approximate Valence Bond Method, and its application in classical and quantum-classical molecular dynamics simulations of selected enzymatic processes. In parallel, bioinformatics methods have been applied in homology analysis and structure prediction of enzymes involved in phosphorylation processes. Phosphoryl transfer processes are of particular interest, and they are ongoing subject of advanced molecular modeling and bioinformatics studies.
5. Studies of enzyme - ligand binding with the aid of steady-state and time resolved emission spectroscopy resulted in showing that the enzyme-ligand interactions led to a remarkable increase of fluorescence and phosphorescence intensity of formycin A, a selective non-substrate inhibitor of E. coli purine nucleoside phosphorylase, accompanied by an increase of the mean lifetime of the ligand emission. Additionally, fluorescence resonance energy transfer (FRET) between tyrosine residues and the ligand moieties was observed. These enabled us to identify the tautomeric forms of formycin A and its N- methyl analogues preferred by the enzyme. Hence, the results obtained by emission spectroscopy of enzyme-ligand complexes in solution removed ambiguities of the X-ray studies in crystal. Significant progress has also been made in interpretation of the heterogenic fluorescence decays in proteins and protein-ligand complexes, using a new model derived from continuous distribution of the fluorescence lifetimes.

Equipment:
Time-resolved spectrofluorimeter System 5000 IBH Consultants Ltd, stopped-flow spectrometer SX.18MV Applied Photophysics Ltd., 3 spectrofluorimeters: LS50B Perkin Elmer, FluoroMax Spex, and Shimadzu RS5001, ITC calorimeter OMEGA MicroCal Inc., centrifuge Avanti J-20I Beckman-Coulter, 6 UV VIS and 2 IR spectrophotometers, 2 HPLC chromatography systems Waters, FPLC chromatography system Amersham-Pharmacia, CV-37 Voltammograph Bioanalytical Systems, 2 Silicon Graphics workstations and *ca*. 20 PC computers; open access to NMR spectrometer Varian UNITYplus 500 MHz, CD spectrometer Avis, MS spectrometer Q-Tof2 Micromass, and supercomputer CRAY.

B.Sc. (licentiate) thesis (2001-2002)

1. Wojciech Puławski, Opracowanie procedur wejścia-wyjścia dla programu symulacyjnego dynamiki molekularnej i Monte Carlo (Input-output procedures for molecular dynamics simulation and Monte Carlo programs), supervisor: dr Witold Rudnicki (Interdisciplinary Centre for Modelling, Warsaw University)

M.Sc. (magister) theses (2001-2002)

1. Ziemowit Klimonda, Jony metali w środowisku przyrodniczym - badanie oddziaływań z wybranymi chemicznymi modelami enzymów (Metal ions in natural environment - studies of interactions with selected chemical enzyme models), 2002, supervisor: dr Elżbieta Bojarska
2. Katarzyna Skupińska, Badanie oddziaływań wielopierścieniowych węglowodorów aromatycznych z albuminą (Studies of interactions of aromatic hydrocarbons with albumine), 2002, supervisor dr Elżbieta Bojarska
3. Marta Hallay, Badanie kwantowej dynamiki pary protonów w modelowym układzie molekularnym (Investigation of quantum dynamics of a proton pair in a model molecular system), 2002, supervisor prof. Bogdan Lesyng
4. Łukasz Walewski, Zastosowanie mieszanej klasyczno-kwantowej dynamiki DFT/MD do badania układów biomolekularnych (Application of classical-quantum dynamics DFT/MD to biomolecular systems), 2002 supervisors: dr hab. Piotr Bała (Interdisciplinary Centre for Modelling Warsaw University), prof. Bogdan Lesyng
5. Jędrzej Szymański, Wyznaczanie własności hydrofobowych analogów 5' końca mRNA kap metodą densymetryczną (Determination of hydrophobic features of mRNA 5' cap analogues by means of densymetry), 2002, supervisors: prof. Ryszard Stolarski, prof. Wojciech Zielenkiewicz (Institute of Chemical Physics PAN, Warszawa)
6. Aleksandra Walczak, Langevin dynamics of proteins at constant pH, 2002, supervisor: prof. Jan Antosiewicz
7. Agata Mrówka, Badania porównawcze metodami kinetycznymi i spektroskopowymi mechanizmu reakcji katalizowanej przez heksameryczne fosforylazy nukleozydów purynowych, mezofilną z *E. coli* i termofilną z *Sulfolobus solfataricus* (Comparative studies of the reaction catalized by two hexameric purine nucleoside phosphorylases, mesophilic from *E. coli* and thermophylic from *Sulfolobus solfataricus*, using spectroscopic and kinetic methods), 2002, supervisor: dr Agnieszka Bzowska
8. Katarzyna Oleksy, Wpływ mutacji na serynie 209 faktora eIF4E na jego oddziaływanie z analogami 5'-końca mRNA (Influence of mutations at serine 209 of the eIF4E protein factor on its interaction with some analogues of mRNA 5' terminus), 2002, supervisor: prof. Edward Darżynkiewicz

9. Maciej Długosz, Metody analizy eksperymentów na spektrometrze zatrzymanego przepływu (Methods of analysis of stopped-flow spectrometry experiments), 2002, supervisor: prof. Jan Antosiewicz
10. Katarzyna Zamłyńska, Badanie oddziaływań kinazy CK2 z ATP oraz GTP metodami molekularnego modelowania (Studies of interactions of CK2 kinase with ATP and GTP by means of molecular modelling), 2002, supervisor: prof. Bogdan Lesyng
11. Monika Iwanow, Oddziaływanie trimerycznej fosforylazy nukleozydów purynowych ze śledziony cielęcej z inhibitorem multisubstratowym, podwójnie modyfikowanym analogiem nukleotydu - badania metodami miareczkowania spektrofluorometrycznego i kinetyki reakcji enzymatycznej (Interaction of trimeric purine nucleoside phosphorylase from calf spleen with a multisubstrate inhibitor, a double modified nucleotide analogue; Investigations *via* spectrofluorimetric titration and enzymatic kinetics), 2002, supervisor: dr Agnieszka Bzowska
12. Katarzyna Filip-Błęcka, Badanie kinetyk enzymatycznych procesów utleniania katalizowanych przez oksydazę ksantynową i peroksydazę (Studies of enzymatic kinetics of the oxidation processes catalized by xantine oxydase and peroxydase), 2002, supervisor: dr Elżbieta Bojarska
13. Magdalena Gruziel, Mezoskopowy opis procesów solwatacyjnych (Mesoscopic description of solvation processes), 2002, supervisor: prof. B. Lesyng
14. Grzegorz Raszewski, Badanie oddziaływania fosforylazy nukleozydów purynowych z inhibitorami bisubstratowymi metodami dyfrakcji promieniowania X na kryształach białka (Study of interaction between purine nucleoside phosphorylase and bisubstrate inhibitors using X-ray diffraction on protein monocrystals), 2001, supervisor dr Agnieszka Bzowska
15. Agata Sobieraj, Rola izomerii w procesach tworzenia kompleksów z przeniesieniem ładunku (charge transfer) (Role of isomerism in formation of charge transer complexes), 2001, supervisors: prof. Jerzy Prochorow (Institute of Physics PAN, Warszawa), prof. Ryszard Stolarski
16. Kinga Sznee, Wpływ tlenu na fluorescencję indukowaną w tylakoidach izolowanych z liści grochu (Effect of oxygen on fluorescence induced in thylacoids from pea leaves), 2001, supervisor: dr hab. Borys Kierdaszuk
17. Izabela Rutkowska, Wpływ tlenu na własności absorpcyjno-emisyjne izolowanych tylakoidów grochu (Effect of oxygen on absorption and emission characteristics of thylacoids isolated from pea), 2001, supervisor: dr hab. Borys Kierdaszuk
18. Jakub Włodarczyk, Wpływ oddziaływania enzym-inhibitor na ich fluorescencję i fosforescencję (Influence of enzyme-inhibitor interaction on their fluorescence and phosphorescence), 2001, supervisor: dr. hab. Borys Kierdaszuk
19. Magdalena Orlińska, Fotoreaktywne halogenopochodne nukleozydów i zasad purynowych jako biodetektory promieniowania UV (Photoreactive halogen derivatives of purine nucleosides and bases as uv biodetectors), 2001, supervisor dr Elżbieta Bojarska
20. Paweł Brodacki, Modelowanie oddziaływań kinazy C z jej inhibitorami (Modelling of interactions between protein kinase C and its inhibitors), 2001, supervisor: prof. Bogdan Lesyng
21. Renata Rudzińska-Kulawińska, Badanie struktury peptydów, analogów pętli wiążącej kalmodulinę (Investigations of the peptide structures, the analogues of the calmoduline binding loop), 2001, supervisor: dr Jacek Wójcik (Institute of Biochemistry and Biophyscics PAN, Warszawa)
22. Katarzyna Kwapisz, Wygaszanie fluorescencji molekularnej w reakcjach z przeniesieniem ładunku (Quenching of molecular fluorescence in charge transfer reactions), 2001, supervisor: prof. Jerzy Prochorow (Institute of Physics PAN, Warszawa)

Ph. D. (doctor) theses (2001-2002)

1. Anna Modrak-Wójcik, Właściwości kompleksów enzymów (fosforylaz nukleozydów purynowych) z substratami i inhibitorami badane za pomocą spektroskopii emisyjnej i kinetyki (Properties of enzymatic complexes of purine nucleoside phosphorylases with substrates and inhibitors studied by emission spectroscopy and kinetics), 2001, supervisor: prof. David Shugar
2. Joanna Trylska, Computational modelling of protonation equilibria and reaction mechanism of HIV-1 protease, 2001, supervisor: dr hab. Maciej Geller
3. Krzysztof Ginalski, Modeling of three-dimensional (3D) structure and function of proteins, 2002, supervisor: prof. Bogdan Lesyng
4. Tomasz Grycuk, Simulations of protonation equilibria in biopolymers: A new concept of the model groups and its application to proteins and nucleic acids, 2002, supervisor prof. Jan Antosiewicz
5. Gierasim Stoichev, Oddziaływanie fosforylazy nukleozydów purynowych z substratami i inhibitorami przy pomocy metod spektroskopowych i kinetyki enzymatycznej (Interaction of purine nucleoside phosphorylase with substrates and inhibitors by means of spectroscopic methods and enzymatic kinetics), 2002, supervisor: dr hab. Borys Kierdaszuk

PUBLICATIONS (2001-2002)

1. M. Walczak, J. M. Antosiewicz, Langevin dynamics of proteins at constant pH, PHYSICAL REVIEW E 66 (2002) 1
2. A. Niedźwiecka et al., Biophysical studies of eIF4E cap-binding protein: Recognition of mRNA 5' cap structure and synthetic fragments of eIF4G and 4E-BP1 proteins, JOURNAL OF MOLECULAR BIOLOGY 319 (2002) 615, coauthors: J. Stępiński, E. Darżynkiewicz, R. Stolarski
3. A. Stachelska et al., Interaction of three Caenorhabditis elegans isoforms of translation initiation factor eIF4E with mono- and trimethylated mRNA 5' cap analogues, ACTA BIOCHIMICA POLONICA 49 (2002) 671, coauthors: K. Ruszczyńska, R. Stolarski, E. Darżynkiewicz
4. A. Niedźwiecka et al., Positive heat capacity change upon specific binding of translation initiation factor eIF4E to mRNA 5' cap, BIOCHEMISTRY USA 41 (2002) 12140, coauthors: J. Stępiński, E. Darżynkiewicz, R. Stolarski

5. M. Długosz et al., A procedure for analysis of stopped-flow transients for protein-ligand association, JOURNAL OF BIOCHEMICAL AND BIOPHYSICAL METHODS 51 (2002) 179, coauthors: E. Bojarska, J. M. Antosiewicz
6. T. Grycuk, Revision of the model system concept for the prediction of pKa's in proteins, JOURNAL OF PHYSICAL CHEMISTRY B 106 (2002)
7. H. Miyoshi et al., Discrimination between mono- and trimethylated cap structures by two isoforms of Caenorhabditis elegans eIF4E, EMBO JOURNAL 21 (2002) 4680, coauthor: E. Darżynkiewicz
8. S. Guil et al., Study of the 2719 mutant of the c-H-ras oncogene in a bi-intronic alternative splicing system, ONCOGENE 21 (2002) 5649, coauthor: E. Darżynkiewicz
9. J.L. Cartwright et al., The g5R (D250) Gene of African Swine Fever Virus Encodes a Nudix Hydrolase That Preferentially Degrades Diphosphoinositol Polyphosphates, JOURNAL OF VIROLOGY 76 (2002) 1415, coauthors:E. Darżynkiewicz, J. Stępiński
10. J. Stępiński et al., Catalytic efficiency of divalent metal salts in dinucleoside 5',5'-triphosphate bond formation, COLLECTION SYMPOSIUM SERIES (A. Holý and M. Hocek, eds.) 5 (2002) 154, coauthors: J. Jemielity, M. Lewdorowicz, E. Darżynkiewicz
11. J. Jemielity et al., Synthesis, physico - chemical and biochemical properties of the novel tri-, tetra- and pentaphosphate mRNA cap analogues, COLLECTION SYMPOSIUM SERIES (A. Holý and M. Hocek, eds.) 5 (2002) 159, coauthors: J. Żuberek, J. Stępiński, M. Lewdorowicz, A. Niedźwiecka, D. Haber, R. Stolarski, E. Darżynkiewicz
12. W.R. Forsyth et al., Empirical relationships between protein structure and carboxyl pKa values in proteins, PROTEINS: STRUCTURE, FUNCTION, GENETICS 48 (2002) 388, coauthor: J. M. Antosiewicz
13. J. Żuberek et al., Synthesis of tetraribonucleotide cap analogue m7Gppp-Am2'pUm2'pAm2' and its interaction with eukaryotic initiation factor eIF4E, COLLECTION SYMPOSIUM SERIES (A. Holý and M. Hocek, eds.) 5 (2002) 399, coauthors: J. Stępiński, A. Niedźwiecka, R. Stolarski, E. Darżynkiewicz
14. M. Długosz et al., Effects of pH in the kinetics of binding of mRNA-cap analogs by translation initiation factor eIF4E, EUROPEAN BIOPHYSICS JOURNAL, publication on line 31.10.2002, DOI 10.1007/s00249-002-0258-7 (C) EBSA, coauthors: E. Błachut-Okrasińska, E. Bojarska, E. Darżynkiewicz, J. M. Antosiewicz
15. K. Ginalski et al., DFT calculations and parametrization of the approximate valence bond method to describe the phosphoryl transfer reaction in a model system, JOURNAL OF QUANTUM CHEMISTRY 90 (2002) 1129, coauthors: B. Lesyng, D. Shugar.
16. J. Trylska et al., Molecular Dynamics Simulations of the First Steps of the Reaction Catalyzed by HIV-1 Protease, BIOPHYSICAL JOURNAL 83 (2002) 794, coauthor: M. Geller
17. G. Stoychev et al., Xanthosine and xanthine: Substrate properties with purine nucleoside phosphorylases, and relevance to other enzyme systems, EUROPEAN JOURNAL OF BIOCHEMISTRY 269 (2002) 4048, coauthors: B. Kierdaszuk, D. Shugar
18. B. Kierdaszuk: Emission spectroscopy of complex formation between Escherichia coli purine nucleoside phosphorylase (PNP) and identified tautomeric species of formycin inhibitors resolves ambiguities found in crystallographic studies, in: SPRINGER SERIES ON FLUORESCENCE, FLUORESCENCE SPECTROSCOPY, IMAGING AND PROBES. NEW TOOLS IN CHEMICAL, PHYSICAL AND LIFE (R. Kraayenhof, A.J.W.G. Visser, H.C. Gerritsen, eds.) 5 (2002) 277
19. G. Koellner et al., 'Open' and 'Closed' Conformations of the E. coli purine nucleoside phosphorylase active center and implications for catalytic mechanism, JOURNAL OF MOLECULAR BIOLOGY 315 (2002) 351, coauthors: A. Bzowska, B. Wielgus-Kutrowska, J. Stępiński
20. A. Bzowska, Calf spleen purine nucleoside phosphorylase: complex kinetic mechanism, hydrolysis of 7-methylguanosine, and oligomeric state in solution, BIOCHIMICA ET BIOPHYSICA ACTA 1596 (2002) 293
21. B. Wielgus-Kutrowska et al., Purine nucleoside phosphorylase from *Cellulomonas* sp.: physicochemical properties and binding of substrates determined by ligand-dependent enhancement of enzyme intrinsic fluorescence, and by protective effects of ligands on thermal inactivation of the enzyme, Biochimica et Biophysica Acta 1597 (2002) 320, coauthors: A. Bzowska, D. Shugar
22. J. Wierzchowski et al., Selective fluorescent and fluorogenic substrates for purine-nucleoside phosphorylases from various sources, and direct fluorimetric determination of enzyme levels in human and animal blood, Analytica Chimica Acta 472 (2002) 63, coauthor: D. Shugar
23. J. Trylska et al., Molecular dynamics simulations of the first steps of the reaction catalyzed by HIV-1 protease, BIOPHYSICAL JOURNAL 82 (2002) 794, coauthor: M. Geller
24. M. Wojciechowski et al., Prediction of protonation states of phosphotyrosine in short peptides and proteins, CELLULAR & MOLECULAR BIOLOGY LETTERS 6 (2001) 552, coauthors: T. Grycuk, J. Antosiewicz, B. Lesyng
25. G. Stoychev et al., Interaction of E. coli purine nucleoside phosphorylase (PNP) with the cationic and zwitterionic forms of the fluorescent substrate N(7)-methylguanosine, BIOCHIMICA ET BIOPHYSICA ACTA 1544 (2001) 74, coauthors: B. Kierdaszuk, D. Shugar
26. J. Trylska et al., Parametrization of the approximate Valence Bond (AVB) method to describe potential energy surface in the reaction catalyzed by HIV-1 Protease, INTERNATIONAL JOURNAL OF QUANTUM CHEMISTRY 82 (2001) 86, coauthors: P. Grochowski, M. Geller
27. M. Luic et al., Calf spleen purine nucleoside phosphorylase: structure of its ternary complex with N (7)-acycloguanosine inhibitor and a phosphate anion, ACTA CRYSTALLOGRAPHICA D57 (2001) 30, coauthors: D. Shugar, A. Bzowska
28. J. Poznański et al., 1H NMR conformational study of alpha anomers of C-5 substituted 2'-deoxyuridines: Comparison to their antiherpetic beta counterparts, BIOCHEMICAL AND BIOPHYSICAL RESEARCH COMMUNICATION 283 (2001) 1142, coauthor: M. Remin
29. M. Miller et al., Structural basis of oncogenic activation caused by point mutations in the kinase domain of the MET proto-oncogene: Modeling studies. PROTEINS 44 (2001) 32, coauthors: K. Ginalski, B. Lesyng
30. M. Remin: A code relating sequence to structure in nucleic acids, NUCLEOSIDES NUCLEOTIDES & NUCLEIC ACIDS 20 (2001) 841

31. J. Stępiński et al., Synthesis and properties of novel "anti-reverse" cap analogs 7-methyl (3'-O-methyl) GpppG and 7-methyl(3'-deoxy)GpppG, RNA 7 (2001) 1486, coauthors: R. Stolarski, E. Darżynkiewicz
32. P. Brodacki et al., Modelling the 3D structure of protein kinase Cgamma and its interaction with specific inhibitor, chelerythrine, CELLULAR & MOLECULAR BIOLOGY LETTERS 6 (2001) 548 coauthors: K. Ginalski, B. Lesyng
33. K. Ginalski et al., Quantum-Mechanical Calculations of the Potential Energy Function for the Phosphate Transfer in Model Systems, CELLULAR AND MOLECULAR BIOLOGY LETTERS 6 (2001) 549, coauthor: B. Lesyng
34. M. Miller et al., Oncogenic Activation caused by point mutations in the kinase domain of the met proto-oncogene: molecular modelling studies, CELLULAR & MOLECULAR BIOLOGY LETTERS 6 (2001) 550, coauthors: K. Ginalski, B. Lesyng,
35. A.-C. Gingras et al., Hierarchical phosphorylation of the translation inhibitor 4E-BP1, GENES & DEVELOPMENT 15 (2001) 2852, coauthor: A. Niedźwiecka
36. L. Kiczak et al., Selection of potent chymotrypsin and elastase inhibitors from M13 phage library of basic pancreatic trypsin inhibitor, (BPTI) BIOCHIMICA ET BIOPHYSICA ACTA 1550 (2001) 153, coauthor: M. Dadlez

INVITED TALKS (2001-2002)

1. J. Jemielity et al., Synthesis, physico-chemical and biochemical properties of the novel tri, tetra- and pentaphosphate mRNA cap analogues, XIIth Symposium on the Chemistry of Nucleic Acid Components, Špindlerův Mlýn, Czech Republic, September 2002, speaker E. Darżynkiewicz
2. J. Stępiński et al., Catalytic efficiency of divalent metal salts in dinucleoside 5',5'-triphosphate bond formation, XIIth Symposium on the Chemistry of Nucleic Acid Components, Špindlerův Mlýn, Czech Republic, September 2002.
3. J. Antosiewicz, Studies of pH-dependent properties of proteins by computer simulations and kinetic experiments, 2nd Fall Workshop, Complex processes modelling, simulation and optimisation, Będlewo/Poznań, October 2002.
4. B. Kierdaszuk, Emission spectroscopy of complex formation between enzymes and identified tautomeric and/or ionic species of ligands, sympozjum: Fundamental Events in Photobiology, Sariselka, Finland, April 2002
5. P. Bala et al., Grid solutions at ICM: A contribution to European resources and services, 4th Global Village Conference, Warszawa, October 2002, speaker B. Lesyng
6. B. Lesyng, Fast quantum-mechanical generators of the potential energy function for simulations of biomolecular and materials systems, Summer School on Parallel Computing in Biomolecular Simulations, Gdansk, August 2001
7. B. Kierdaszuk, Enzyme-ligand interactions probed by induced tautomeric shifts and enzyme-ligand FRET, 7th International Conference on Methods and Applications of Fluorescence, Fluorescence Spectroscopy, Imaging and Probes, Amsterdam, The Netherlands, September 2001
8. B. Kierdaszuk, Interaction of Escherichia coli purine nucleoside phosphorylase with formycin A (FA) probed by effect of induced tautomeric shifts and enzyme-ligand fluorescence resonance energy transfer on fluorescence and phosphorescence, 9th European Conference on the Spectroscopy of Biological Molecules, Prague, Czech Republic, September 2001

DIVISION OF NUCLEAR PHYSICS

Head: Prof. dr hab. Krystyna Siwek-Wilczyńska
Address: : Division Nuclear Physics, Institute of Experimental Physics, Warsaw University,
69 Hoża Street, 00-681 Warsaw
Phone: (+48 22) 6216727, 5532139
Fax: (+48 22) 625 14 96
E-mail: siwek@npdaxp.fuw.edu.pl or sekret@npdaxp.fuw.edu.pl
Senior Staff Members: Prof. dr Zdzisław Wilhelmi, dr hab. Chrystian Droste (professor), prof. dr hab. Marta Kicińska-Habior, dr hab. Mirosław Kozłowski (professor), dr hab. Tomasz Matulewicz (professor), dr hab. Tomasz Morek (associate professor), dr hab. Teresa Rząca-Urban (professor), prof. dr hab. Krystyna Siwek-Wilczyńska, dr hab. Zygmunt Szefliński (associate professor).
Scientific Staff - 14 persons
ETA (Engineers, Technicians, Administration) - 6 persons
Number of grants in 2001-2002 - 6

SCIENTIFIC ACTIVITY

Areas of scientific activity:
Mechanisms of nucleus-nucleus collisions at 10 MeV/nucleon - 2 GeV/nucleon.
Structure of transitional and superdeformed nuclei.
Statistical and nonstatistical gamma emissions in heavy-ion collisions and bremsstrahlung studies.

Main achievements:

1. Studies of the pp and pd reactions at energies bellow 1.3 GeV. Investigation of the double pions production as well as the eta mesons and its rare decay. Excited states of the nucleon as N*(1440) and Δ(1232) are also subjects of interest.
2. Completion of the upgrade of the FOPI detector and its first implementation. Registration of deep subthreshold S= -2 strange Ξ hyperons in the ^{58}Ni +^{58}N reaction at 1.93A GeV (work within the FOPI Collaboration).
3. Analysis of the intermittency signal in Au+Au experiment at 150-800A MeV and interpretation of its various components.
4. Indentification of neutral pions produced in 60A MeV (experiment at KVI Groningen) and 95A MeV (experiment at GANIL Caen) Ar-beam reactions on several targets. The spectra of neutral pions from 60A MeV measurements reveal a thermal shape independent on the total energy available in the system. The analysis of 95A MeV data is in progress.
5. Derivation of the „error function formula" for description of fusion excitation functions at near-barrier energies and analysis of available experimental data for many nuclear systems. Determination of the parameters describing individual distributions of the fusion barrier and construction of the systematics of these parameters that enables one to predict fusion cross sections for not yet studied reactions.
6. Identification of rotational bands with identical transition energies in nuclei around ^{174}Yb. The observed set of four bands is one of the most interesting examples of identical bands as bands are based on orbitals originating from different shells.
7. Study of magnetic rotation in $^{142\text{-}144}$Gd and ^{141}Eu nuclei. A transition from regular to irregular bands has been found when approaching N=82 demonstrating that this is a general phenomenon in nuclei near a double-shell closure.
8. Study of excited states in neutron-rich nuclei populated in the spontaneous fission of ^{248}Cm. The first observation of excited levels in the ^{139}I nucleus allows for systematic predictions of energies and spins of states in the ^{137}Sb nucleus, helping the future studies of the r-process nuclei at the Z=50 line.
9. New information concerning sub-picosecond lifetimes of the excited states in ^{131}La have been obtained using the Doppler Shift Attenuation method. The E2 transition probability for high spin collective levels based on the $h_{11/2}$ proton orbital change from 50 W.u. for the $43/2^-$ level to 120 W.u. for $23/2^-$ state. The diminishing value of B(E2) for I>27/2 suggests decrease of collectivity with increasing value of spin. This behaviour was qualitatively explained in the frame of the Core-Quasi-Particle coupling model. The experiment was conducted at the Warsaw Cyclotron using OSIRIS II array.
10. Experimental studies of the Giant Dipole Resonance (GDR) in highly excited ^{32}Se* and ^{31}P* nuclei by ^{20}Ne+^{12}C and ^{19}F+^{12}C reactions at about 5 MeV/u allowed to extract an isospin mixing coefficient for ^{32}S compound nuclei at excitation energy of 58 MeV, $\alpha^2 = 0.03 \pm 0.02$. Our result supports the predicted energy dependence of isospin mixing, with nearly pure isospin at high excitation.
11. Observed earlier experimental evidence for the Jacobi shape transition in ^{46}Ti* compound nuclei was confirmed by GDR excitation and decay in ^{18}O + ^{28}Si reaction at 105 MeV, with good identification of fusion-evaporation channel, studied with EUROBALL IV, HECTOR and EUCLIDES arrays.
12. Completion of the construction of the IGISOL (Ion Guide & Isotope Separator On Line) facility. This device is installed on the beam of the Warsaw Cyclotron. It is designed for production of radioactive beams and studies of short-lived isotopes, especially of refractory elements. First on line test experiments, which allowed to estimate the overall efficiency of the device as well as the evacuation time of the radioactive ions from the ion guide source have been performed. Recent tests with ^{223}Ra alpha sources allowed to estimate the overall efficiency to be of the order of 10^{-3} and the evacuation time as 5 msec.

Main experimental equipment:
Isotope separator UWIS, FOPI spectrometer at the SIS accelerator at GSI Darmstadt (common property of the FOPI Collaboration), detector WASA in Uppsala (common property of the WASA-PROMISE Collaboration), JANOSIK spectrometer for high-energy gamma detection (co-owned), OSIRIS Compton-suppression gamma-ray multi-detector (co-used), plunger for the recoil distance method, isotope separator on line of the heavy ion cyclotron (IGISOL).

B. Sc. (licentiate) thesis (2001-2002)

1. Maria Musiak, Max Planck i stulecie teorii kwantów (Max Planck and the centennial of quantum theory), 2001, supervisor: dr hab. Mirosław Kozłowski
2. Paweł Pęczkowski, Pomiar odległości astronomicznych (The measurement of astronomical distances), 2001, supervisor: dr hab. Mirosław Kozłowski
3. Marta Stambórska, Szachy jako pomoc w rozwijaniu myślenia logicznego u dzieci (Chess as an aid in the development of logical thinking of children), 2001, supervisor: dr hab. Mirosław Kozłowski
4. Agnieszka Stolarczyk, Czesław Białobrzeski – twórca warszawskiej szkoły fizyki teoretycznej (Czesław Białobrzeski – creator of the Warsaw school of theoretical physics), 2001, supervisor: dr hab. Mirosław Kozłowski
5. Iwona Zalewska, Karol Olszewski, Zygmunt Wróblewski i powstanie współczesnej kriogeniki (Karol Olszewski, Zygmunt Wróblewski and the creation of modern criogenics), 2001, supervisor: dr hab. Mirosław Kozłowski
6. Przemysław Gogolewski, Zjawisko tunelowania w mechanice klasycznej (The tunnelling phenomenon in classical mechanics), 2002, supervisor: dr hab. Mirosław Kozłowski
7. Anna Karolina Jagodnicka, Rola emisyjnej tomografii pozytonowej (PET) w diagnostyce medycznej (The role of positon emission tomography (PET) in medical diagnostics), 2002, supervisor: dr hab. Zygmunt Szefliński
8. Anna Karbowska, Henri Poincaré – prekursor szczególnej teorii względności (Henri Poincaré – forerunner of special relativity theory), 2002, supervisor: dr hab. Mirosław Kozłowski
9. Magdalena Pelc, Techniki datowania w badaniach archeologicznych (Dating techniques in archeology), 2002, supervisor: dr hab. Mirosław Kozłowski

M. Sc. (magister) thesis (2001-2002)

1. Sławomir Błoński, Energetyczna zdolność rozdzielcza detektorów scyntylacyjnych (Energy resolution of scintillator detectors), 2001, supervisors: dr hab. Chrystian Droste, dr Marcin Balcerzyk
2. Anna Małgorzata Kaczor, Badanie struktury neutrono-nadmiarowych jąder z obszaru zamkniętej powłoki N=50 (Study of neutron-rich nuclei from the region of a closed N=50 shell), 2001, supervisor: dr hab. Teresa Rząca-Urban
3. Katarzyna Kostrzewa, Rozkłady mas poprzecznych mezonów π^+, K^+ oraz protonów w reakcjach S+S, Pb+Pb przy pędzie wiązki ~ 200 A GeV/c (Distribution of transverse masses of π^+ mesons, K^+ mesons and protons in S+S, Pb+Pb reactions at ~ 200 A GeV/c beam momentum), 2001, supervisor: dr hab. Mirosław Kozłowski
4. Elżbieta Anna Siemaszko, Systematyka wysokości barier dla reakcji fuzji (The systematics of the barrier heights for fusion reactions), 2001, supervisor: prof. dr hab. Krystyna Siwek-Wilczyńska
5. Anna Utrata, Mezoskopowy model relatywistycznych reakcji ciężkojonowych (Mesoscopic relativistic model of heavy ion reactions), 2001, supervisor: dr hab. Mirosław Kozłowski
6. Elżbieta Wójcik, Gigantyczny rezonans dipolowy w jądrach A≈32 (Giant dipole resonance in nuclei with A≈32), 2001, supervisor: prof. dr hab. Marta Kicińska-Habior
7. Beata Brodowska, Studium do projektu ośrodka emisyjnej tomografii pozytonowej (Project study of a center for a positon emission tomography), 2002, supervisor: dr hab. Zygmunt Szefliński
8. Beata Czajkowska, Polaryzacja liniowa promieniowania γ (Linear polarisation of γ radiaton), 2002, supervisor: dr hab. Chrystian Droste
9. Ernest Grodner, Badanie czasów życia poziomów wzbudzonych ^{131}La (Lifetime measurements of excited levels in ^{131}La), 2002, supervisor: dr Julian Srebrny
10. Anna Smolińska, Procesy wymiany energii, masy i ładunku w środowisku człowieka (The energy, mass and charge exchange in human environment), 2002, supervisor: dr hab. Mirosław Kozłowski
11. Paweł Szymański, Badanie polaryzacji kwantów gamma w reakcji ^{99}Ru+^{48}Ti (Investigation of gamma ray polarisation in the ^{99}Ru+^{48}Ti reaction), 2002, supervisor: dr hab. Tomasz Morek
12. Adam Złomaniec, Poszukiwanie identycznych pasm rotacyjnych w jądrach atomowych z obszaru A≈170 (Search for identical rotational bands in atomic nuclei in the A≈170 mass region), 2002, supervisor: dr hab. Teresa Rząca-Urban
13. Maryla Aneta Zych, Badanie emisji cząstek naładowanych z reakcji ^{20}Ne+^{12}C na wiązce warszawskiego cyklotronu (Investigation of charged particle emission in the ^{20}Ne+^{12}C reaction on beam of the Warsaw cyclotrone), 2002, supervisor: prof. dr hab. Marta Kicińska-Habior

Ph. D. (doctor) thesis (2001-2002)

1. Zbigniew Trznadel, Badanie wysokoenergetycznego promieniowania γ ze zderzeń jonów ^{12}C o energiach 4-12 MeV/u z lekkimi jądrami (The study of high-energy γ-rays emitted from reactions induced by ^{12}C ions at energies 4-12 MeV/u on light nuclei), 2001, supervisor: prof. dr hab. Marta Kicińska-Habior

PUBLICATIONS (2001 – 2002)

1. A. Andronic et al., Differential directed flow in Au+Au collisions, PHYS. REV. C 64 (2001) 041604, coauthors: M. Kirejczyk, B. Sikora, K. Siwek-Wilczyńska
2. A. Andronic et al., Transition from in- plane to out-of-plane azimuthal enhancement in Au+Au collisions, NUCL. PHYS. A 679 (2001) 765, coauthors: M. Kirejczyk, B. Sikora, K. Siwek-Wilczyńska
3. L. Aphecetche et al., Hard photon and neutral pion production in cold nuclear matter, PHYS. LETT. B 519 (2001) 8, coauthor: T. Matulewicz
4. R. Bilger et al., Spectator tagging in quasi-free proton-neutron interactions in deuterium using an internal cluster-jet target at a storage ring, NUCL. INSTR. AND METH. IN PHYS. RES. A 457 (2001) 64, coauthors: A. Turowiecki, Z. Wilhelmi
5. R. Bilger et al., Cross sections of the pp → ppπ^0 reaction between 310 and 425 MeV, NUCL. PHYS. A 693 (2001) 633, coauthors: A. Turowiecki, Z. Wilhelmi
6. A.D. Efimov et al., Is the collective IBM space exhausted only by the valence shell?, ACTA PHYS. POL. B 32 (2001) 2591, coauthor: J. Srebrny
7. F. Ibrahim et al., Low-spin states of doubly odd ^{182}Au, EUR. PHYS. J. A 10 (2001) 139, coauthor: A. Wojtasiewicz
8. J. Iwanicki et al., Study of the K quantum number dependence on the deformation in ^{165}Ho nucleus, ACTA PHYS. POL. B 32 (2001) 787, coauthor: J. Srebrny
9. M. Kicińska-Habior et al., Giant dipole resonance studied in heavy-ion reactions at projectile energies 6-11 MeV/u, ACTA PHYS. POL. B 32 (2001) 825, coauthor: Z. Trznadel
10. O. Kijewska, M. Kicińska-Habior, High-energy γ-quanta emission in heavy-ion reaction ^{18}O + ^{27}Al at 8.3 MeV/u, ACTA PHYS. POL. B 32 (2001) 829
11. A. Korgul et al., First measurements of yrast excitations in ^{137}I and the missing 12^+ isomer in ^{136}Te, EUR. PHYS. J. A 12 (2001) 129, coauthor: T. Rząca-Urban
12. M. Kozłowski, J. Marciak-Kozłowska, Radius, velocity and acceleration of the space-time, IL NUOVO CIMENTO 116 B (2001) 821
13. M. Kozłowski, J. Marciak-Kozłowska, Z. Mucha, Laser light induced π-meson emission, LASERS IN ENGINEERING 11 (2001) 259
14. R.M. Lieder et al., Investigation of magic rotation around ^{142}Gd, Proceedings of the International Symposium. Nuclear Structure Physics. WORLD SCIENTIFIC (2001) 375, coauthors: T. Rząca-Urban, Z. Marcinkowska, T. Morek, Ch. Droste
15. A. Maj et al., Search for exotic shapes of hot nuclei at critical angular momenta, NUCL. PHYS. A 687 (2001) 192c, coauthor: M. Kicińska-Habior
16. A. Maj et al., Search for the Jacobi instability in rapidly rotating ^{46}Ti nuclei, ACTA PHYS. POL. B 32 (2001) 2433, coauthor: M. Kicińska-Habior
17. J. Marciak-Kozłowska, M. Kozłowski, Laser melting of nanoparticles with negative heat capacity, LASERS IN ENGINEERING 11 (2001) 209
18. J. Marciak-Kozłowska, M. Kozłowski, Z. Mucha, Thermal waves in two-dimensional heterogeneous materials, LASERS IN ENGINEERING 11 (2001) 189
19. T. Morek, Investigation of the $K^\pi = 8^-$ isomers in N=74 isotones on beam of the Warsaw Cyclotron, ACTA PHYS. POL. B 32 (2001) 2537
20. T. Morek et al., Investigation of the $K^\pi = 8^-$ isomer in ^{132}Ce, PHYS. REV. C 63 (2001) 034302, coauthors: J. Srebrny, Ch. Droste, M. Kowalczyk, T. Rząca-Urban, M. Kisieliński
21. P.J. Napiorkowski et al., Coulomb excitation of the $K^\pi = 8^-$ isomeric band in ^{178}Hf, ACTA PHYS. POL. B 32 (2001) 861, coauthor: J. Srebrny
22. P. Olbratowski et al., Coulomb excitation of an isomeric state in ^{181}Ta via intermediate states, ACTA PHYS. POL. B 32 (2001) 865, coauthor: J. Srebrny
23. A.A. Pasternak et al., Electromagnetic E2 transition probabilities in ^{120}Xe and ^{118}Te – N = 66 nuclei, ACTA PHYS. POL. B 32 (2001) 2719, coauthors: J. Srebrny, T. Morek, Ch. Droste
24. A.A. Pasternak et al., Lifetimes and structure of low-lying positive parity bands in ^{120}Xe and ^{118}Te. Proceedings of the International Symposium. Nuclear Structure Physics. WORLD SCIENTIFIC (2001) 279, coauthors: J. Srebrny, T. Morek, Ch. Droste
25. A.A. Pasternak, J. Srebrny, Ch. Droste, T. Morek: New approach to doppler lifetime measurements, ACTA PHYS. HUNGARICA NEW SERIES – HEAVY ION PHYSICS 13 (2001) 193
26. S.G. Rohoziński et al., Collective states of transitional nuclei, YADERNAYA FIZYKA 64 (2001) 1081, coauthors: Ch. Droste, J. Srebrny
27. T. Rząca-Urban, Search for magnetic rotation in the A ≈ 140 region, ACTA PHYS. POL. B 32 (2001) 2645
28. Ch. Schlegel et al., Depopulation of the $J^\pi = 9^-$ isomer in ^{180}Ta to the $J^\pi = 1^+$ ground state by Coulomb excitation, EUR. PHYS. J. A 10 (2001) 135, coauthor: J. Srebrny
29. K. Siwek-Wilczyńska, J. Wilczyński, Nucleus-nucleus fusion energy thresholds and the adiabatic fusion potential, PHYS. REV. C 64 (2001) 024611
30. J. Srebrny et al., Transition probabilities in negative parity bands of the ^{119}I nucleus, NUCL. PHYS. A 683 (2001) 21, coauthors: Ch. Droste, T. Morek
31. Z. Trznadel et al., Giant dipole resonance in hot Se nuclei and bremsstrahlung emission in ^{12}C + ^{58,64}Ni experiments at 6-11 MeV/u, NUCL. PHYS. A 687 (2001) 198c, coauthor: M. Kicińska-Habior
32. W. Urban et al., Medium-spin structure of ^{96,97}Sr and ^{98,99}Zr nuclei and the onset of deformation in the A~100 region, NUCL. PHYS. A 689 (2001) 605, coauthor: T. Rząca-Urban

33. J. Wilczyński, K. Siwek-Wilczyńska, Fusion energy thresholds predicted with an adiabatic nucleus-nucleus potential. Proceedings of the conference: Bologna 2000. Structure of the nucleus at the dawn of the century. Nuclear-nucleus collisions, WORLD SCIENTIFIC (2001) 435
34. Z. Wilhelmi, The Dancing Socrates. Zdzisław Szymański Remembered, ACTA PHYS. POL. B 32 (2001) 2331
35. K. Zając et al., Collective quadrupole excited states in actinide and transuranic nuclei, ACTA PHYS. POL. B 32 (2001) 681, coauthor: J.Srebrny
36. R. Bilger et al., Measurement of the pd $\rightarrow$ ^{3}He η cross section between 930 and 1100 MeV, PHYS. REV. C 65 (2002) 044608, coauthors: A. Turowiecki, Z. Wilhelmi
37. W. Brodowski et al., Exclusive measurement of the pp $\rightarrow$ pp$\pi^+\pi^-$ reaction near threshold, PHYS. REV. LETT. 88 (2002) 192301, coauthors: A. Turowiecki, Z. Wilhelmi
38. W. Brodowski et al., Search for narrow NNπ resonances in exclusive pp $\rightarrow$ pp$\pi^+\pi^-$ measurements, PHYS. LETT. B 550 (2002) 147, coauthors: A. Turowiecki, Z. Wilhelmi
39. J. Greiff et al., Quasifree bremsstrahlung in the dp $\rightarrow$ dp γ reaction above the pion production threshold, PHYS. REV. C 65 (2002) 034009, coauthor: A. Turowiecki
40. A.B. Hayes et al., Coulomb excitation paths of high-K isomer bands in ^{178}Hf, PHYS. REV. LETT. 89 (2002) 242501, coauthor: J. Srebrny
41. B. Hong et al., Proton and deuteron rapidity distributions and nuclear stopping in ^{96}Ru(^{96}Zr) +^{96}Ru(^{96}Zr) collisions at 400A MeV, PHYS. REV. C 66 (2002) 034901, coauthors: M. Kirejczyk, B. Sikora, K. Siwek-Wilczyńska, K. Wiśniewski
42. M. Kicińska-Habior, T. Trznadel, O. Kijewska, E. Wójcik, Energetic photons from heavy-ion reactions at 4-12 MeV/u, ACTA PHYS. POL. B 33 (2002) 949
43. M. Kirejczyk, Study of thermal equilibrium in heavy ion collisions via the Ma coincidence method – test of applicability, ACTA PHYS. Pol. B 33 (2002) 377
44. A. Korgul et al., The neutron and proton two-particle nucleus ^{134}Sb: New low-spin states observed in the decay of ^{134}Sn and an estimate of the energy of the 7^- isomer, EUR. PHYS. J. A 15 (2002) 181, coauthor: T. Rząca-Urban
45. M. Kozłowski, J. Marciak-Kozłowska, Possible thermal waves generation by femtosecond TESLA free electron laser (FEL), LASERS IN ENGINEERING 12 (2002) 95
46. M. Kozłowski, J. Marciak-Kozłowska, Zero point field (ZPF) effects in the interaction of the ultra-short laser pulses with matter, LASERS IN ENGINEERING 12 (2002) 281
47. R.M. Lieder et al., Development of magnetic rotation in light Gd nuclei; study of ^{142}Gd, EUR. PHYS. J. A 13 (2002) 297, coauthors: T. Rząca-Urban, Z. Marcinkowska, T. Morek, Ch. Droste, P. Szymański
48. J. Marciak-Kozłowska, M. Kozłowski, Attophysics and technology with ultra short laser pulses, LASERS IN ENGINEERING 12 (2002) 17
49. J. Marciak-Kozłowska, M. Kozłowski, Causal heat transport induced by zeptosecond laser pulses, LASERS IN ENGINEERING 12 (2002) 201
50. J. Marciak-Kozłowska, M. Kozłowski, Modified Schrödinger equation for attosecond laser pulse interaction with matter, LASERS IN ENGINEERING 12 (2002) 53
51. J. Marciak-Kozłowska, M. Kozłowski, Z. Mucha, Time and energy scales for the thermal properties of nanoparicles, MATERIALS SCIENCE FORUM 384-385 (2002) 75
52. J. Marciak-Kozłowska, M. Kozłowski, Spintronics at the nanostructure level, MATERIALS SCIENCE FORUM 384-385 (2002) 71
53. P. Olbratowski et al., The shears mechanism in ^{142}Gd in the Skyrme-Hartree-Fock method with the tilted-axis cranking, ACTA PHYS. POL. B 33 (2002) 389, coauthors: T. Rząca-Urban, Z. Marcinkowska
54. A.A. Pasternak et al., Lifetimes in the ground-state band and the structure of ^{118}Te, EUR. PHYS. J. A 13 (2002) 435, coauthors: J. Srebrny, Ch. Droste, T. Morek
55. E. Piasecki et al., Barrier distributions in ^{16}O +^{116,119}Sn quasielastic scattering, PHYS. REV. C 65 (2002) 054611, coauthors: M. Kowalczyk, K. Piasecki, J. Srebrny, M. Kisieliński
56. K. Piasecki, K. Tymińska, T. Matulewicz, D. d'Enterria, Neutral pions produced in 60A MeV Ar+C, Ni, Ag, Au reactions, ACTA PHYS. POL. B 33 (2002) 973
57. L. Próchniak et al., Collective quadrupole excitations in transuranic nuclei, ACTA PHYS. POL. B 33 (2002) 405, coauthor: J. Srebrny
58. B. Roussière et al., Release properties of UC_x and molten U targets, NUCL. INSTR. AND METH. IN PHYS. RES. B 194 (2002) 151, coauthor: A. Wojtasiewicz
59. K. Siwek-Wilczyńska, Pre- and post-scission neutron evaporation from superheavy composite systems, ACTA PHYS. POL. B 33 (2002) 445
60. K. Siwek-Wilczyńska, Statistical decay of the heavy nucleus-nucleus systems. Proceedings of the International Conference: Lipari (Messina), Italy 21-24 May 2001. Nuclear Physics at Border Lines. WORLD SCIENTIFIC (2002) 310
61. K. Siwek-Wilczyńska, E. Siemaszko, J. Wilczyński, Can we predict capture and fusion excitation functions?, ACTA PHYS. POL. B 33 (2002) 451
62. M.M. Smolarkiewicz et al., Intermittency analysis in momentum space in Au+Au reactions at 150-800 AMeV, ACTA PHYS. POL. B 33 (2002) 457, coauthors: M. Kirejczyk, B. Sikora, K. Siwek-Wilczyńska, I.J. Soliwoda
63. K. Starosta et al., Role of chirality in angular momentum coupling for A~130 odd-odd triaxial nuclei: ^{132}La, PHYS. REV. C 65 (2002) 044328, coauthors: Ch. Droste, T. Morek, J. Srebrny
64. L. Stuttgé et al., Backtraced neutron multiplicities and capture dynamics in the superheavy region. Proceedings of the International Conference: Lipari (Messina), Italy 21-24 May 2001. Nuclear Physics at Border Lines. WORLD SCIENTIFIC (2002) 326, coauthor: K. Siwek-Wilczyńska
65. K. Tymińska, T. Matulewicz, K. Piasecki, Pion reabsorption in the nuclear matter a simple model, ACTA PHYS. POL. B 33 (2002) 981

66. W. Urban et al., Near-yrast structure of neutron-rich, N=85 isotones, PHYS. REV. C 66 (2002) 044302, coauthor: T. Rząca-Urban
67. W. Urban et al., First observation of excited states in ^{139}I, PHYS. REV. C 65 (2002) 024307, coauthor: T. Rząca-Urban
68. J. Wilczyński, K. Siwek-Wilczyńska, Pre - fusion capture cross sections for heavy nucleus-nucleus systems. Proceedings of the International Conference: Lipari (Messina), Italy 21-24 May 2001. Nuclear Physics at Border Lines. WORLD SCIENTIFIC (2002) 354
69. J. Złomańczuk et al., Measurement and analysis of the pd $\rightarrow$ ^{3}He η reaction between 930 and 1100 MeV, ACTA PHYS. POL. B 33 (2002) 883, coauthors: A. Turowiecki, Z. Wilhelmi

INVITED TALKS (2001-2002)

1. Dr hab. Teresa Rząca-Urban, Search for magnetic rotation in the A=140 region, Invited talk presented at the High Spin Physics 2001 NATO Advanced Research Workshop, Warsaw, Poland, 6-10.02.2001
2. Dr hab. Tomasz Matulewicz, Particle production in proton and nucleus induced reactions around 200A MeV, Anke workshop „ρ^{o} production and properties" Mądralin, Poland, 22-23.05. 2002
3. Mgr Andrzej Wojtasiewicz, „La Technique HIGISOL et les études des noyaux exotiques", „French-Polish Symposium", Lyon, France, 30.09-2.10.2002

INTERNATIONAL CONFERENCES ORGANIZED BY THE DIVISION (2001-2002)

1. XXVII Mazurian Lakes School of Physics, Growth Points Of Nuclear Physics A.D. 2001, Krzyże, Poland, September 2-9, 2001, chairman: Ziemowid Sujkowski, co-organized by the Andrzej Sołtan Institute for Nuclear Studies and Warsaw University.
2. VI TAPS Workshop, Particle Production In Nuclear Medium, Krzyże, Poland, September 9-13, 2001, chairman: Tomasz Matulewicz, co-organized by the Andrzej Sołtan Institute for Nuclear Studies and Warsaw University.

DIVISION OF NUCLEAR SPECTROSCOPY

Head: Dr hab. Andrzej Płochocki
Address: **:** Division of Nuclear Spectroscopy, Institute of Experimental Physics, Warsaw University, 7 Pasteura St., 02-093 Warsaw
Phone: (+48 22) 823-18-96, 55-46-846
Fax: (+48 22) 823-76-47
E-mail: plohocki@mimuw.edu.pl
Senior staff members: Prof. dr hab. Jan Żylicz, prof. dr hab. Wiktor Kurcewicz, prof. dr hab. Andrzej Płochocki, dr hab. Ernest Piasecki (associate professor), dr hab. Waldemar Urban (associate professor)
Scientific staff - 10 persons
PhD Students - 3 persons
ETA (Engineers, Technicians, Administration) - 6 persons (3 on 5-th EU grants)
Number of grants in 2001 - 2002: 7

SCIENTIFIC ACTIVITY

Areas of scientific activity:
Properties of the very exotic, far from stability nuclei, isomerism of exotic nuclei. Properties of N = Z nuclei. Investigation of ways of their decay including:- ground state proton, beta, beta delayed proton and alpha decay, isomeric transitions. Nuclear structure close to the doubly- magic systems: ^{56}Ni, ^{78}Ni, ^{100}Sn, ^{132}Sn and ^{208}Pb. Nuclear structure close to "r" path. Nuclear deformation (e.g. octupole deformed nuclei). Properties of nuclear barriers.

Collaboration links:
Experiments at the nuclear- research centres in Caen (GANIL), Darmstadt (GSI), Geneva (CERN/ISOLDE), Catania (INF), Madrid (IEM CSIC) and Oak Ridge (ORNL) as well as at the university laboratories in Jyväskylä, Louvain-la-Neuve, Strasbourg, Manchester and Uppsala (INF Studsvik). First experiments at the Warsaw cyclotron.

Methods applied:
Investigated nuclei produced via fusion or fragmentation in heavy-ion reactions and via a spontaneous or induced fission. Reaction products selected in isotope-, recoil- or fragment- separators. Advanced nuclear spectroscopy tools, e.g. EUROGAM 2 (array of anti-Compton spectrometers), TAS (The Total Absorption Spectrometer) or a set-up for measurements of subnanosecond life- times.

Main achievements:
In very neutron deficient and N = Z area:
1. For the first time the two - proton radioactivity were observed in experiments in GSI and GANIL.
2. In laboratories of GSI, GANIL and ORNL, using mass and fragment separators, a broad study of exotic nuclei with N = Z and from proton drip line were performed. New data on ^{39,40}Ti, ^{42,43}Cr, ^{46}Mn, ^{45,46,47}Fe, ^{48,49}Ni, ^{55,56,57}Zn, ^{56,58}Cu, ^{62}Ga, ^{66}As, ^{78}Y and ^{94}Ag were obtained.
3. In a long term study of the beta strength done in GSI-Darmstadt, the β decay of the neutron-deficient indium (A = 100 – 107), silver (A= 97,98) and barium (A = 117,119) isotopes have been investigated by using total absorption γ-ray spectrometry (TAS) and complementary (for In and Ag isotopes) an array of Euroball-Cluster germanium detectors was used on mass separated sources. The experimental Gamow-Teller strength distributions were compared with shell-model calculations.
4. Experimental investigation of the beta decay of $^{101-105}$Sn isotopes with use of germanium array, TAS spectrometer and delayed proton counters were done due the development of the chemically selected ion source on GSI mass separator.

In neutron rich area:
1. Heavy, exotic, neutron rich Pb, Bi and Po isotopes in isobaric chains A = 215,216,217 and 218, produced by proton induced spallation at the PS Booster- ISOLDE mass separator facility in CERN Geneve, were investigated by β-$\gamma\gamma$ and α-γ coincidence measurements. New isotopes and isomers and new data about excited states were found and their properties discussed in terms of shell-model configurations.
2. The introduction of the fast timing $\beta\gamma\gamma$(t) method at ISOLDE (CERN) has opened the heavy actinide region to lifetime measurements, providing a direct experimental means of measuring the E1 rates. Recently, this method has been successfully applied to ^{231}Ra to study the effect of octupole correlations.
3. In the neutron rich lanthanides an octupol correlations were studying in the N = 85 isotones. Also octupol effects were tested at high spins.
4. In the region of shell-model nuclei around ^{132}Sn the knowledge about the single-particle $i_{13/2}$ neutron orbital was improved by studying in detail the $(\pi g_{7/2} \nu i_{13/2})_{10+}$ multiplet in the ^{134}Sb nucleus. The half-life of the ^{135}Sn, a nucleus on the path of the astrophysical *r - process*, was determined.

5. A γ-prompt studies of neutron rich nuclei in the mass A = 100 region were performed in order to study the mechanism producing strong quadrupole deformation.

Investigations on Warsaw cyclotron:

1. Study of the barrier distribution in quasielastic scattering of heavy ions were performed for several combinations projectile - target.
2. Several tests of the IGISOL facility with ^{14}N beam and with alpha recoil products of ^{227}Ac decay were done. An efficiency dependence upon the He pressure and position of source in chamber were measured.

Equipment in Warsaw:

On-line mass-separator at the HI cyclotron (in collaboration with Division of Nuclear Physics), He-Jet, several Ge detectors, "mini-orange" electron spectrometer, setup for subnanosecond life - time measurements, multi-dimensional acquisition system. Also: 3 DEC - Alpha work stations, 3 SUN - Micro Sparc work stations, ≈20 PC (Pentium, NT, 2000,XP, LINUX) + some other.

M.Sc. (magister) theses (2001-2002)

1. Jan Kurcewicz, Badanie radiacyjnego wychwytu elektronów w ^{204}Ta (Investigation of the radiative capture of electrons in ^{204}Ta), 2001, supervisor: dr Marek Pfützner
2. Iwona Miernicka, Badanie rozpadu ^{147}Ba - ^{147}La (Study of the ^{147}Ba - ^{147}La decay), 2001, supervisor: prof. dr hab. Wiktor Kurcewicz
3. Łukasz Świderski, Badanie rozkładu barier na fuzję przy użyciu cyklotronu (Investigation of the barrier distribution with use of the cyclotron), 2001, supervisor: dr hab. Ernest Piasecki

Ph.D. (doctor) theses (2001-2002)

1. Agnieszka Korgul, Energie jednocząstkowe w okolicy podwójnie magicznego jądra ^{132}Sn (Single-particles energies in the vicinity of the doubly-magic ^{132}Sn nucleus), 2002, supervisor: dr hab. Waldemar Urban

D.Sc (dr hab., habilitation) theses (2001-2002)

1. Waldemar Urban, Experimental Studies of Octupole Correlations in Lanthanide Nuclei, (2002)

PUBLICATIONS (2001-2002)

1. J. Giovinazzo et al., Decay of proton-rich nuclei between ^{39}Ti and ^{49}Ni, EUR. PHYS. J. A 10 (2001) 73, coauthors: R. Grzywacz, Z. Janas, M. Pfützner
2. M. Lewitowicz et al., Nuclear structure studies by means of short-lived isomers at intermediate energies NUCL.PHYS. A 682 (2001) 175c, coauthors: R. Grzywacz, M. Pfützner, K. Rykaczewski
3. L.M. Fraile et al., Persistence of octupole correlations in ^{231}Ra, NUCL. PHYS. A 686 (2001) 71, coauthors: K. Gulda, W. Kurcewicz
4. K.P. Rykaczewski et al., Towards digital spectroscopy of proton emitters, NUCL. PHYS. A 682 (2001) 270c, coauthors: R.K. Grzywacz, M. Karny, Z. Janas
5. R.K. Grzywacz et al., In-beam study of the N=Z nucleus $^{66}As_{33}$ using the decay tagging technique, NUCL. PHYS. A 682 (2001) 41c, coauthors: Z. Janas, K.P. Rykaczewski
6. K.P. Rykaczewski et al., Fine studies of proton radioactivity with digital signal processing, ACTA PHYS. POL. B 32 (2001) 971, coauthors: R.K. Grzywacz, Z. Janas, M. Karny
7. M. Caamano et al., Isomeric decays in ^{200}Pt, ACTA PHYS. POL. B 32 (2001) 763, coauthor: M. Pfützner
8. R. Kaczarowski et al., Total routhian surface calculations for neutron-rich ^{149}Ce, ACTA PHYS. POL. B 32 (2001) 2485, coauthors: A. Syntfeld, W. Kurcewicz
9. A. Pagano et al., Physics with the Chimera detector at LNS in Catania: The REVERSE experiment, NUCL. PHYS. A 681 (2001) 331c, coauthor: E. Piasecki
10. W. Urban et al., Medium-spin structure of ^{96,97}Sr and ^{98,99}Zr nuclei and the onset of deformation in the A=100 region, NUCL. PHYS. A 689 (2001) 605
11. A. Bauchet et al., First identification of rotational bands in ^{103}Tc: Evolution of intrinsic proton states of the $^{97\text{-}105}$Tc isotopes, EUR. PHYS. J. A 10 (2001) 145, coauthors: W. Urban, A. Nowak, E. Piasecki
12. M.N. Mineva et al., A new μs isomer in ^{136}Sb produced in the projectile fission of ^{238}U, EUR. PHYS. J. A 11 (2001) 9, coauthors: M. Pfützner, R. Grzywacz, Z. Janas, A. Korgul, J. Kurcewicz
13. A. Korgul et al., Structure information of the r-process nucleus ^{135}Sn, PHYS. REV. C 64 (2001) 021302-1 (R), coauthors: W. Urban, W. Kurcewicz
14. M.J.G. Borge et al., Octupole correlations beyond the island of deformation centered at A=225, NUCL. PHYS. A 690 (2001) 227c, coauthor: W. Kurcewicz
15. J. Giovinazzo et al., First observation of ^{55,56}Zn, EUR. PHYS. J A 11 (2001) 247, coauthors: R. Grzywacz, Z. Janas, M. Pfützner
16. T. Morek et al., Investigation of the $K^{\Pi} = 8^-$ isomer in ^{132}Ce, PHYS. REV. C 63 (2001) 024302-1, coauthor: W. Urban

17. A. Trzcińska et al., Information on antiprotonic atoms and nuclear periphery from the PS209 experiment, NUCL. PHYS. A 692 (2001) 176c, coauthors: K. Gulda, W. Kurcewicz
18. W. Urban et al., Fast nuclear rotation and octupole deformation, ACTA PHYS. POL. B 32 (2001) 2527
19. M. Karny et al., Determination of the Gamow-Teller strength function for the neutron-deficient isotopes $^{104-107}$In, NUCL. PHYS. A 690 (2001) 367, coauthors: R. Grzywacz, Z. Janas, A. Płochocki, K. Rykaczewski
20. A. Korgul et al., First measurements of yrast excitations in ^{137}I and the missing 12^+ isomer in ^{136}Te, EUR. PHYS. J. A 12 (2001) 129, coauthor: W. Urban
21. M. Pfützner et al., Population of high spin states in relativistic fragmentation, ACTA PHYS. POL. B 32 (2001) 2507
22. A. Ozawa et al., Measurements of interaction cross sections for light neutron-rich nuclei at relativistic energies and determination of effective matter radii, NUCL. PHYS. A 691 (2001) 599, coauthor: M. Pfützner
23. P. Bhattacharyya et al., Yrast excitations in N=81 nuclei ^{132}Sb and ^{133}Te from Cm fission, PHYS. REV. C 64 (2001) 054312-1, coauthor: W. Urban
24. A. Gizon et al., The ^{130}Nd $\rightarrow$^{130}Pr $\rightarrow$ ^{130}Cd $\rightarrow$ ^{130}Ce decay chain revisited, EUR. PHYS. J A 12 (2001) 309, coauthor: A. Płochocki
25. R. Borcea et al., Beta-decay of ^{56}Cu, NUCL. PHYS. A 695 (2001) 68, coauthors: M. Gierlik, Z. Janas, M. Karny, A. Płochocki, M. Sawicka
26. Z. Janas et al., Total absorption spectroscopy of ^{58}Cu decay, EUR. PHYS. J. A 12 (2001) 143, coauthors: M. Karny, M. Gierlik, A. Płochocki
27. S. Mandal et al., Gamma-ray spectroscopy with relativistic exotic heavy-ions, Proc.of the Int. Workshop held at Saha Inst. of Nucl. Physics, Kolkata, Nov. 8-10, 2000, ed. Binay Dasmahapatra, Indian Academy of Sciences, PRAMANA JOURNAL of PHYSICS 57 (2001) 161, coauthor: Z. Janas
28. A. Bauchet et al., High-spin structures of odd-A $^{97-105}$Tc isotopes, Proc. of the Int. Symp. On Exotic Nuclear Structures, Part II, 15-20 May, Debrecen, Hungary, ACTA PHYS. HUNG. N.S. 13 (2001) 189, coauthors: A. Nowak, E. Piasecki, W. Urban
29. K. Pachucki et al., Nuclear spin mixing oscillation in ^{229}Th^{89+}, PHYS. REV. C 64 (2001) 064301-1, coauthors: J. Żylicz, M. Pfützner
30. Liu Wei-Ping et al., Precise determination of ^{40}Ti mass by measuring the ^{40}Sc isospin analogue state, CHIN. PHYS. LETT. Vol. 18, No. 11 (2001) 1449, coauthor: M. Pfützner
31. M. Caamano et al., Nuclear Structure of heavy neutron rich systems: Fragmentation spectroscopy with a 1 GeV per nucleon ^{208}Pb beam, NUCL. PHYS. A 682 (2001) 223c, coauthor: M. Pfützner
32. J. Giovinazzo et al., Observation of ^{48}Ni and decay of very exotic nuclei in this region, NUCL. PHYS. A 685 (2001) 127c, coauthors: R. Grzywacz, Z. Janas, M. Pfützner
33. K. -H. Schmidt et al., New results on structure effects in nuclear fission, NUCL. PHYS. A 685 (2001) 60c, coauthor: M. Pfützner
34. K. Markenroth et al., ^{8}He – ^{6}He: a comparative study of nuclear fragmentation reactions, NUCL. PHYS. A 679 (2001) 462, coauthor: M. Pfützner
35. G. Georgiev et al., Measurement of the *g* factors of isomers near the proposed N > 40 subshell closure, YAD. FIZ. 64, no 7 (2001) 1258; PHYS. ATOMIC NUCLEI 64 (2001) 1181, coauthors: R. Grzywacz, M. Pfützner, K. Rykaczewski, M. Sawicka
36. C. Mazzocchi et al., First measurement of beta-decay properties of the drip=line nucleus ^{60}Ga, EUR. PHYS. J. A 12 (2001) 269, coauthors: Z. Janas, J. Kurcewicz
37. W. Urban et al., First observation of excited states in ^{139}I, PHYS. REV. C 65 (2002) 024307-1, coauthor: A. Korgul
38. K. Gulda et al., The nuclear structure of ^{229}Th, NUCL. PHYS. A 703 (2002) 45, coauthor: W. Kurcewicz
39. F.J. Hartmann et al., Nucleon density in the nuclear periphery determined with antiprotonic X rays: Calcium isotopes, PHYS. REV. C 65 (2002) 014306-1, coauthors: K. Gulda, W. Kurcewicz
40. M. Meister et al., ^{8}He- ^{6}He: a comparative study of electromagnetic fragmentation reactions, NUCL. PHYS. A 700 (2002) 3, coauthor: M. Pfützner
41. E. Piasecki et al., Barrier distributions in ^{16}O + ^{116,119}Sn quasielastic scattering, PHYS. REV. C 65 (2002) 054611-1, coauthors: Ł. Świderski, M. Witecki
42. E. Piasecki et al., Barrier distribution in ^{16}O + ^{116,119}Sn, ACTA PHYS. POL. 33 (2002) 397, coauthors: Ł. Świderski, M. Witecki
43. J. Kurpeta et al., Decay of the neutron-rich isotope ^{113}Ru to ^{113}Rh, EUR. PHYS. J. A 13 (2002) 449, coauthor: A. Płochocki
44. A.N. Andreyev et al., Nuclear spins, magnetic moment and α-decay spectroscopy of long-lived isomeric states in ^{185}Pb, EUR. PHYS. J. A 14 (2002) 63, coauthors: Z. Janas, W. Kurcewicz. J. Kurpeta, A. Płochocki
45. M. Pfützner et al., Angular momentum population in the fragmentation of ^{208}Pb at 1 GeV/nucleon, PHYS. REV. C 65 (2002) 064604-1, coauthors: R. Grzywacz, M. Sawicka
46. C. Mazzocchi et al., Alpha decay of ^{114}Ba, PHYS. LETT. B 532 (2002) 29, coauthors: Z. Janas, M. Gierlik, J. Żylicz
47. Y. Fujita et al., Gamow-Teller transitions from ^{58}Ni to discrete states of ^{58}Cu, EUR. PHYS. J. A 13 (2002) 411, coauthor: Z. Janas
48. M. Chartier et al., Discovery of doubly- magic ^{48}Ni at GANIL, NUCL. PHYS. A 701 (2002) 433c, coauthors: R. Grzywacz, Z. Janas, M. Pfützner
49. G. Neyens et al., g-factors of isomers around N ≈ 40, Z ≈ 28 from time-dependent Larmor precession on spin-aligned projectile-like fragments, NUCL. PHYS. A 701 (2002) 403c, coauthors: R. Grzywacz, M. Pfützner, K. Rykaczewski, M. Sawicka
50. C. Foin et al., Excited states of ^{154}Tm, EUR. PHYS. J. A 14 (2002) 7, coauthor: A. Płochocki
51. K. Schmidt et al., Recent developments at the GSI online mass separator, NUCL. PHYS. A 701 (2002) 272c, coauthor: Z. Janas

52. M. Pfützner et al., First evidence for the two-proton decay of ^{45}Fe, EUR. PHYS. J. A 14 (2002) 279, coauthors: R. Grzywacz, Z. Janas, J. Kurcewicz, K.P. Rykaczewski
53. J. Giovinazzo et al., Two-proton radioactivity of ^{45}Fe, PHYS. REV. LETT. 89 (2002) 102501-1, coauthors: R. Grzywacz, M. Pfützner
54. A. Jokinen et al., Beta decay of ^{57}Zn, EUR. PHYS. J. direct A 3 (2002) 1, coauthors: M. Gierlik, M. Karny, Z. Janas, A. Płochocki, M. Sawicka
55. M. La Commara et al., Beta decay of medium and high spin isomers in ^{94}Ag, NUCL. PHYS. A 708 (2002) 167, coauthor: Z. Janas
56. M. Alderighi et al., Particle identification method in the CsI (Tl) scintillator used for the CHIMERA 4Π detector, NUCL. INSTR. METH. A 489 (2002) 257, coauthor: E. Piasecki
57. W. Urban et al., Near-Yrast structure of neutron-rich, *N = 85* isotones, PHYS. REV. C 66 (2002) 044302-1, coauthors: J. Rękawek, A. Korgul
58. N. Le Neindre et al., Mass and charge identifiaction of the Chimera silicon-CsI (Tl) telescopes, NUCL. INSTR. METH. A 490 (2002) 251, coauthors: E. Piasecki
59. A. Korgul et al., The neutron and proton two-particle nucleus ^{134}Sb: New low-spin states observed in the decay of ^{134}Sn and an estimate of the energy of the 7^- isomer, EUR. PHYS. J. A 15 (2002) 181, coauthors: W. Urban, W. Kurcewicz
60. A. Syntfeld et al., Study of ^{149}Ce levels populated in the β^- decay of ^{149}La and signature splitting of the neutron $i_{13/2}$ band, NUCL. PHYS. A 710 (2002) 221, coauthors: W. Kurcewicz, W. Urban
61. P. Lubiński et al., Gold fragmentation induced by stopped antiprotons, PHYS. REV. C 66 (2002) 044616-1, coauthors: K. Gulda W. Kurcewicz
62. M. Pfützner et al., Charged - particle spectroscopy in the microsecond range following projectile fragmentation, NUCL. INSTR. METH. A 493 (2002) 155, coauthors: R. Grzywacz, Z. Janas, J. Kurcewicz, K.P. Rykaczewski
63. K.P. Rykaczewski, New experimental results in proton radioactivity, EUR. PHYS. J. A 15 (2002) 81
64. C. Plettner et al., ß-decay of ^{100}In, PHYS. REV. C 66 (2002) 044319-1, coauthors: Z. Janas, M. Karny
65. W. Królas et al., First observation of the drip line nucleus ^{140}Dy: Identification of a 7 μs *K* isomer populating the ground state band, PHYS. REV. C 65 (2002) 031303-1, coauthors: R. Grzywacz, K.P. Rykaczewski
66. R.M. Lieder et al., Development of magnetic rotation in light Gd nuclei; study of ^{142} Gd, EUR. PHYS. J. A 13 (2002) 297, coauthor: W.Urban

INVITED TALKS (2001 - 2002)

1. W. Urban, Fast Nuclear Rotation and Octupole Deformation, High Spin Physics 2001 NATO Advanced Research Workshop, 6 - 10 Feb. 2001, Warsaw, Poland
2. M. Pfützner, Population of High Spin States in Relativistic Fragmentation, High Spin Physics 2001 NATO Advanced Research Workshop, 6 - 10 Feb. 2001, Warsaw, Poland,
3. K. Rykaczewski, New Experimental results in proton radioactivity, Exotic Nuclei and Atomic Masses, ENAM 2001, 2-7 July 2001, Proc. of the Third Intern. Conf. on Exotic Nuclei and Masses, Springer-Verlag, Berlin Heidelberg New York, p. 127
4. K. Rykaczewski, Fine Structure in Proton Emission from Triaxial ^{141}Ho, XXXVII Zakopane School of Physics, Zakopane, Poland, 3-10 Sept. 2002
5. M. Pfützner, Discovery of the Two-Proton Decay of ^{45}Fe, XXXVII Zakopane School of Physics, Zakopane, Poland, 3-10 Sept. 2002
6. M. Pfützner, Isomer Spectroscopy of Heavy Neutron-Rich Nuclei Produced in Relativistic Fragmentation, Third Intern. Conf. on Fission and Properties of Neutron-Rich Nuclei, 3 - 9 Nov. 2002, Sanibel Island, Florida, USA

INTERNATIONAL CONFERENCES ORGANIZED BY THE DIVISION (2001 - 2002)

1. Workshop "Decay of Exotic Nuclei", Warsaw, 18-21 April 2002, chairman: dr Zenon Janas
2. Workshop "Decay Studies of Exotic Nuclei", Warsaw, 15-17 November 2002, chairman: dr Marek Pfützner

DIVISION OF OPTICS

Head: Prof. dr hab. Tadeusz Stacewicz (since 2003, previously prof. dr hab.Krzysztof Ernst)
Address: Division of Optics, Institute of Experimental Physics, Warsaw University, Hoża 69 St., 00-681 Warsaw
Phone: (+48 22) 621 09 85,
Fax: (+48 22) 6256406
e-mail: ernst@fuw.edu.pl
Senior Staff Members: Prof. dr hab. Krzysztof Ernst), prof. dr hab. Paweł Kowalczyk, prof. dr hab. Czesław Radzewicz, dr hab. Aleksandra Leliwa-Kopystyńska (professor), prof. dr hab. Tadeusz Stacewicz, dr hab. Teresa Grycuk (associate professor), dr hab. Marianna Kraińska-Miszczak (associate professor), dr hab. Marek Trippenbach (associate professor)
Scientific Staff (total): - 10 persons
ETA (Engineering, Technicians, Administration) : 5 persons
Number of grants in 2001 – 2002: 6

SCIENTIFIC ACTIVITY

Areas of scientific activity:
Structure of diatomic alkali metal molecules. Electron impact induced transitions between excited atomic states. Trapping of resonance radiation. Hyperfine structure of high lying D states of alkali metal atoms. Laser spectroscopy of radioactive atoms. Electronic structure of van der Waal's molecules – long range interatomic interactions. Femtosecond dynamics in condensed media. Ultrashort pulse propagation. Nonlinear optics. Bose-Einstein condensation. Spectroscopic studies of fullerenes C_{60} and their complexes. Atmospheric studies and pollution measurements by means of various lidar techniques.

Methods:
Doppler - free polarization spectroscopy, polarization labelling spectroscopy technique. Time – dependent photon counting. Langmuir probe methods. Quantum beat spectroscopy. Atomic beam off line technique adapted to radioactive atoms. Investigation of spectral line wing profiles. Quantum calculations of the thermally averaged translational rovibronic spectra. Ultrafast laser techniques. Theoretical and experimental studies of supercontinuum transitions. Time-resolved absorption and fluorescence of laser excited media. Laser photoelectric measurements in high vacuum. Investigations of weak absorption by Cavity Ring-Down Spectroscopy (CRDS). LIDAR and DIAL techniques.

Main achievements:
Observation and characterization of numerous highly excited electronic states in K_2, Na_2, Li_2, NaK and KLi molecules. Development of numerical methods for analysis of molecular states with double minimum potentials. Theoretical description and experimental verification of radiation trapping in strongly excited optical media. Measurements of rate constants for collisions between electrons and excited Na atoms. Explanation of mechanisms of the laser generation induced in atomic gases by laser pulses tuned to high lying levels. Observation of the isotope shift between radioactive ^{22}Na and stable ^{23}Na. Determination of interaction potentials for the X, A and B molecular states of Hg – rare gas and Cd – rare gas. First complete analysis of the excitation spectrum of Li*He. Observation and analysis of the absorption and photoluminescence spectra of C_{60} and their complexes with Hg and Ni. Determination of the work function for C_{60}+Ni and C_{60}+Pd films. A novel scheme for Frequency Resolved Optical Grating (FROG) measurements. Experimental evidence for existence of quasi-crystalline structures in molecular liquids. Theory of four wave mixing of matter waves. Direct measurement of the Wigner function for a light mode. New methods of elaboration of lidar signal.

Equipment:
Pulsed Nd: YAG laser, Ar^+ laser Innova 400, tunable dye lasers, Ti: Sapphire femtosecond system consisting of an oscillator, regenerative amplifier and LBO optical parametric generator, atomic beam apparatus, high sensivity gated ICCD camera, high-resolution concave grating (R = 6 m) Rowland type spectrometer, fast digital oscilloscopes, mobile DIAL (differential absorption lidar) system.

M.Sc. (magister) theses (2001 - 2002)

1. Olga Krajewska, Badania pracy wyjścia elektronów z warstw C_{60}+Hg, (Investigation of electron work-function for C60 + Hg), 2001, supervisor: dr Elżbieta Czerwosz
2. Grażyna Jabłońska, Wyznaczanie parametrów jądrowych z pomiarów struktury nadsubtelnej w izotopie ^{24}Na, 2001, (Determination of nuclear parameters by measurement at hyper-fine structurein ^{24}Na isotope), supervisor: prof. Aleksandra Leliwa-Kopystyńska
3. Pawel Ziń, Wpływ chmury termicznej na czas życia kondensatu Bosego Einsteina, (Modification of the Bose-Eistein condensate lifetime by thermal atoms), 2001, supervisor: dr hab. Marek Trippenbach
4. Anna Grochola, Badania zderzeń elektronów z atomami wzbudzonymi (Investigation of collisions of electrons with excited atoms), 2001, supervisor: prof. Tadeusz Stacewicz
5. Małgorzata Kmieciak, Pomiary absorpcji składników atmosfery metodą CRDS (Measurement of the atmosphere absorption by means of CRDS), 2001, supervisor: prof. Tadeusz Stacewicz
6. Grzegorz Flisiak, Komputerowy model lidaru (Computer model of LIDAR), 2002, supervisor: prof. Tadeusz Stacewicz
7. Paweł Kruk, Badanie zderzeń elektronów ze wzbudzonymi do stanu 4p atomami potasu, (Investigation of electron – K(4P) atom collision), 2002, supervisor: prof. Tadeusz Stacewicz

8. Agnieszka Szulc, Spektroskopia cząsteczki zderzeniowej Cd-Xe, (Spectroscopy of the collisional molecule Cd-Xe), 2002, supervisor: dr hab. Teresa Grycuk
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D.Sc. (dr hab., habilitation) theses (2001-2002)

1. Elżbieta Czerwosz, Emisja elektronów z warstw nano-struktur węglowych z domieszka niklu i palladu, 2002

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1. A. Czyżewski, et al.., Cavity ring-down spectrography, OPTICS COMMUNICATION 191 (2001) 271, coauthors: S. Chudzyński, K. Ernst, G. Karasiński, Ł. Kilianek A.Pietruczuk, W. Skubiszak, T. Stacewicz, K. Stelmaszczyk
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4. E. Czerwosz, P. Dłużewski, T. Grycuk, Optical and structural properties of nanostructured C_{60}-Hg films, ITG-FACHBERICHT, VDE VERLAG, vol.165 (2001) 425
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16. T. Grycuk, M. Michalicka, J. Rogaczewski, Long-range interactions for the $A^3 1_u$ and $B^3 0^+_u$ states of Cd_2, ACTA PHYS. POL. A 101 (2002) 825
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28. M. Trippenbach et al., Bose Einstein condensates in time dependent light potentials: Adiabatic and nonadiabatic behaviour of nonlinear wave equation, PHYS. REV. A 65 (2002) 053602
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31. E. Czerwosz, P. Dłużewski, M. Kozłowski et al., Phototelectric work function determination for nanostructural carbonaceous films, VACUUM 72 (2002), coauthor: T.Stacewicz
32. A. Czyżewski, K. Ernst, G. Karasiński et al., Cavity Ring-Down Spectroscopy for trace gas analysis, ACTA PHYSICA POLONICA B 33 (2002) 2255, coauthors: W. Skubiszak, T. Stacewicz
33. S. Chudzyński, A. Czyżewski, K. Ernst et al., Multiwavelength lidar for measurements of atmospheric aerosol, OPTICS AND LASERS IN ENINEERING 37 (2002) 91, coauthors: G. Karasiński, K. Kołacz, A. Pietruczuk, W. Skubiszak, T. Stacewicz, K. Stelmaszczyk , A. Szymański

INVITED TALKS (2001-2002)

1. T. Stacewicz, Lidar measurements of size distribution of aerosol particles - Workshop on Environmental Physics, Warsaw 2001 (ed. T. Szoplik and A. Wörman).
2. T. Stacewicz. Multiwavelength lidar for measurements of atmospheric aerosol – International Worshop on Optical Methods in Earth Sciences, Bacoli, Napoli, Italy, March 21-24, 2001.
3. T. Stacewicz Badania aerozolu atmosferycznego przy pomocy lidaru – XXXIV Zjazd Fizyków Polskich, Toruń, 17 – 20 września 2001 r.
4. T. Stacewicz Investigation of electron - excited atom collisions, First Workshop on Plasma Physics and Laser Induced Plasma Spectroscopy and Applications, Tunis, Tunisia 11-13 January 2002.
5. T. Stacewicz Cavity Ring – Down Spectroscopy (CRDS) for trace gas analysis, Atoms, Photons and All, Kraków, 31.05 – 2.06 2002.
6. T. Stacewicz Studies of physical processes in the Earth's atmosphere, 2nd Conference on Elementary Processes in Atomic Systems, CEPAS 2002, Gdańsk, 2-4 września 2002.
7. T. Stacewicz Measurement of low absorption with CRDS, Polish - French Seminar, Lyon 2002.
8. T. Stacewicz, Analysis of lidar signals: methods for improvement of lidar results, 286 WE-Heraeus Seminar „Optical Methods in Environmental Analysis", Bad Honnef, Niemcy, 14 – 18 October 2002.

DIVISION OF PARTICLES AND FUNDAMENTAL INTERACTIONS

Head: Dr hab. Krzysztof Doroba (professor)
Address: Division of Particles and Fundamental Interactions, Institute of Experimental Physics, Warsaw University, Hoża 69 St., 00-681Warsaw
Phone: (+48 22) 621 47 71
Fax: (+48 22) 629 43 09
E-mail: doroba@fuw.edu.pl
Senior Staff Members: Prof. dr hab. Barbara Badełek, prof. dr hab. Jacek Ciborowski, prof. dr hab. Jan Królikowski, prof. dr hab. Ewa Skrzypczak, prof. dr hab. Andrzej K. Wróblewski, prof. dr hab. Janusz Zakrzewski, dr hab. Krzysztof Doroba (professor), dr hab. Wojciech Dominik (professor), dr hab. Danuta Kiełczewska (professor), dr hab. Teresa Tymieniecka (associate professor), dr hab. Aleksander F. Żarnecki (associate professor)
Scientific Staff (total) - 25 persons
ETA (Engineers, Technicians, Administration) - 12 persons
Number of grants in 2001-2002 - 8

SCIENTIFIC ACTIVITY

Main scientific activities are centered around experiments in European Laboratory for Particle Physics CERN in Geneva and Deutsches Elektronen Synchrotron DESY in Hamburg.

We participate in following experiments (the experiments' names are given in brackets):
1. Muon and hadron scattering experiments at CERN Super Proton Synchrotron (NMC, SMC, COMPASS),
2. Electron-positron annihilation at LEP in CERN (DELPHI),
3. Fixed target heavy ion experiments at CERN SPS (NA35, NA49),
4. Electron- proton scattering at HERA in DESY (ZEUS)
5. Cosmic ray physics with ZEUS detector
6. Preparation of the proton-proton experiment at the forthcoming CERN Large Hadron Collider (CMS),
7. Neutrinos and search for proton decay (SuperKamiokande, K2K, ICARUS)
8. Development of radiation detectors for high energy physics experiments and other fields. Physics of radiation detection. Preparation for experiments at future Linear Collider and Photon Collider (TESLA).

In most of these activities we work in close collaboration with the experimental high energy group from the Sołtan Institute for Nuclear Studies in Świerk near Warsaw.
We are also engaged in a phenomenological analysis of all deep inelastic scattering results (in collaboration with the Niewodniczański Institute of Nuclear Physics in Cracow).

The scientific scope of our activities covers precision tests of the standard model (including CP violation), neutrino oscillations, baryon number violation, two photon physics, deep inelastic scattering and photoproduction (QCD, nuclear effects in structure functions, low x physics, photon structure functions, spin structure functions) and relativistic heavy ion physics.

The group is involved in data analysis and simulation, as well as software development and detector studies, with the particular emphasis on the gaseous detectors and fast trigger electronics. We have well equipped detector and electronics laboratory with experienced and well qualified technical staff, and a computer cluster of more than ten modern workstations. In the past, we have contributed significantly to the experimental hardware in DELPHI (construction of the large part of the electromagnetic calorimeter HPC) and ZEUS (design and construction of the BAC calorimeter and its electronics). Currently our main responsibility is the first level muon trigger in the CMS experiment at the CERN LHC.

Most important results in the last two years include:
- prototype processor construction for the first level muon trigger in the CM experiment
- implementation of the hit readout in the Backing Calorimeter (ZEUS detector)
- observation of neutrino oscillations in Super-Kamiokande
- successful development of the new type of RPC chamber for high radiation environment
- final results of accurate measurement of spin averaged and spin dependent nucleon structure function.

Presently we have eleven graduate students.

M.Sc. (magister) theses (2001-2002)

1. Olga Stawarz, Rola cząstki wiodącej w oddziaływaniach proton-proton, proton-ołów, π^+-proton i π^+-ołów przy energii 158 GeV/c (The leading particle role in proton-proton, proton-lead, π^+-proton and π^+-lead interactions at energy 158 GeV/c), 2001, supervisor: doc. dr hab. H. Białkowska
2. Karol Buńkowski, Testowanie prototypu PAC2 (Testing PAC2 prototype), 2001, supervisor: prof. dr hab. J. Królikowski

3. Anna Nurzyńska, Produkcja mezonów π^0 w oddziaływaniach e^+e^- w LEP-ie (π^0 meson production in e^+e^- interactions at LEP), 2001, supervisor: prof. dr hab. K. Doroba
4. Dorota Milewska, Produkcja K^{0*} (896) i D^0 (1864) w oddziaływaniach e^+e^- w LEP-ie (K^{0*}(890) and D^0(1864) production in e^+e^- interactions at LEP), 2001, supervisor: prof. dr hab. K. Doroba
5. Monika Szydłowska, Miony z dużym pędem poprzecznym w oddziaływaniach e^+e^- w LEP-ie (High transverse momentum muons in e^+e^- interactions at LEP), 2001, supervisor: prof. dr hab. K. Doroba
6. Iwona Kowalik, Detekcja mionów z otoczki wiązki protonowej w kalorymetrze BAC (eksperyment ZEUS przy akceleratorze HERA) (Hallo muons detection in BAC calorimeter (Zeus experiment at HERA accelerator)), 2001, supervisor: prof. dr hab. J. Ciborowski
7. Piotr Traczyk, Szukanie wielowymiarowych grawitonów w eksperymencie CMS (Search for multidimensional gravitons in CMS experiment), 2001, supervisor: dr hab. G. Wrochna
8. Artur Moryc, Poszukiwanie rozpadu $n \rightarrow \nu K^0$ w detektorze Super-Kamiokande (Search for $n \rightarrow \nu K^0$ decay in Super-Kamiokande detector), 2001, supervisors: prof. dr hab. D. Kiełczewska, dr hab. E. Rondio
9. Milena Barańska, Poszukiwanie neutrin wyprodukowanych przez promienie kosmiczne w słońcu (Search for neutrinos produced in the Sun by cosmic rays), 2001, supervisors: prof. dr hab. D. Kiełczewska, dr hab. E. Rondio
10. Katarzyna Cieślak, Ocena dokładności średniej długości oscylacji neutrin atmosferycznych w Super-Kamiokande (Error determination on the atmospheric neutrino mean oscillation length in Super Kamiokande), 2001, supervisors: prof. dr hab. D. Kiełczewska, dr hab. E. Rondio
11. Krzysztof Syryczyński, Inkluzywna produkcja J/ψ w oddziaływaniach foton-foton w detektorze DELPHI (Inclusive J/ψ production in photon-photon interactions in DELPHI detector), 2001, supervisor: dr K. Grzelak
12. Paweł Przewłocki, Poszukiwanie sygnału neutrin taonowych w detektorze Super-Kamiokande (Search for τ neutrino signal in Super Kamiokande detector), 2002, supervisors: prof. dr hab. D. Kiełczewska, dr hab. E. Rondio
13. Daria Rytter, Badanie charakterystyk oddziaływań neutrin mionowych, elektronowych i taonowych w detektorze Super-Kamiokande (Studies of characteristics of muon, electron and taon neutrino interactions in Super Kamiokande detector), 2002, supervisors: prof. dr hab. D. Kiełczewska, dr hab. E. Rondio
14. Agnieszka Witkowska, Identyfikacja ładunku rozproszonego kwarku w głęboko nieelastycznym oddziaływaniu elektronu z protonem (Charge identification of scattered quark in deep inelastic electron proton interaction), 2002, supervisor: dr hab. T. Tymieniecka
15. Monika Sedlin, Detekcja mionów kosmicznych w kalorymetrze BAC (eksperyment ZEUS przy akceleratorze HERA) (Cosmic muon detection in BAC calorimeter (ZEUS experiment at HERA detector)), 2002, supervisor: prof. dr hab. J. Ciborowski
16. Artur Kalinowski, Optymalizacja algorytmu trygera mionowego detektora CMS w obecności szumów komór RPC (CMS detector muon trigger algorithm in presence of RPC noise), 2002, supervisor: dr hab. G. Wrochna
17. Marcin Stolarski, Symulacje wielociałowych rozpadów mezonów D w doświadczeniu COMPASS w CERN (Simulations of multibody decays of D mesons in COMPASS experiment at CERN), 2002, supervisor: prof. dr hab. B. Badełek

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10. S. Chekanov et al., Measurement of the neutral current cross section and F_2 structure function for deep inelastic e^+p scattering at HERA, ZEUS Collaboration, EUROPEAN PHYSICAL JOURNAL C 21 3 (2001) 443, coauthors: J. Ciborowski, R. Ciesielski, G. Grzelak, R.J. Nowak, J.M. Pawlak, R. Pawlak, B. Smalska, T. Tymieniecka, A.K. Wróblewski, J.A. Zakrzewski, A.F. Żarnecki.

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13. P. Abreu et al., Measurement of V(CB) from the decay process anti-$B^0 \rightarrow D^{*+}$ lepton-anti-neutrino, DELPHI Collaboration, PHYSICS LETTERS B 510 (2001) 55, coauthors: K. Doroba, K. Grzelak, P. Nieżurawski, M. Trochimczuk
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15. P. Abreu et al., Search for a fermiophobic Higgs at LEP-2, DELPHI Collaboration, PHYSICS LETTERS B 507 (2001) 89, coauthors: K. Doroba, K. Grzelak, P. Nieżurawski, M. Trochimczuk
16. P. Abreu et al., Search for neutralino pair production at $\sqrt{s}$ = 189 GeV, DELPHI Collaboration, EUROPEAN PHYSICAL JOURNAL C 19 (2001) 201, coauthors: K. Doroba, K. Grzelak, P. Nieżurawski, M. Trochimczuk
17. P. Abreu et al., Search for R-parity violation with a anti-U anti-D anti-D coupling at $\sqrt{s}$ = 189 GeV, DELPHI Collaboration, PHYSICS LETTERS B 500 (2001) 22, coauthors: K. Doroba, K. Grzelak, P. Nieżurawski, M. Trochimczuk
18. P. Abreu et al., Search for sleptons in e^+e^- collisions at $\sqrt{s}$ = 183 GeV to 189 GeV, DELPHI Collaboration, EUROPEAN PHYSICAL JOURNAL C 19 (2001) 29, coauthors: K. Doroba, K. Grzelak, P. Nieżurawski, M. Trochimczuk
19. P. Abreu et al., Search for spontaneous R-parity violation at $\sqrt{s}$ = 183 GeV and 189 GeV, DELPHI Collaboration, PHYSICS LETTERS B 502(2001) 24, coauthors: K. Doroba, K. Grzelak, P. Nieżurawski, M. Trochimczuk
20. J. Abdallah et al., Search for technicolor with DELPHI, DELPHI Collaboration, EUROPEAN PHYSICAL JOURNAL C 22 (2001) 17, coauthors: K. Doroba, K. Grzelak, P. Nieżurawski, M. Trochimczuk
21. P. Abreu et al., Single intermediate vector boson production in e^+e^- collisions at $\sqrt{s}$ = 183 GeV and 189 GeV, DELPHI Collaboration, PHYSICS LETTERS B 515 (2001) 238, coauthors: K. Doroba, K. Grzelak, P. Nieżurawski, M. Trochimczuk
22. P. Abreu et al., Study of dimuon production in photon-photon collisions and measurement of QED photon structure functions at LEP, DELPHI Collaboration, EUROPEAN PHYSICAL JOURNAL C 19 (2001) 15, coauthors: K. Doroba, K. Grzelak, P. Nieżurawski, M. Trochimczuk
23. S. Chekanov et al., Study of the effective transverse momentum of partons in the proton using prompt photons in photoproduction at HERA, ZEUS Collaboration, PHYSICS LETTERS B 511 (2001) 19, coauthors: J. Ciborowski, R. Ciesielski, G. Grzelak, R.J. Nowak, J.M. Pawlak, R. Pawlak, B. Smalska, T. Tymieniecka, A.K. Wróblewski, J.A. Zakrzewski, A.F. Żarnecki
24. S. Chekanov et al., Three-jet production in diffractive deep inelastic scattering at HERA, ZEUS Collaboration, PHYSICS LETTERS B 516 3-4 (2001) 273, coauthors: J. Ciborowski, R. Ciesielski, G. Grzelak, R.J. Nowak, J.M. Pawlak, R. Pawlak, B. Smalska, T. Tymieniecka, A.K. Wróblewski, J.A. Zakrzewski, A.F. Żarnecki.
25. P. Abreu et al., Update of the search for supersymmetric particles in scenarios with gravitino LSP and sleptons NLSP, DELPHI Collaboration, PHYSICS LETTERS B 503 (2001) 34, coauthors: K. Doroba, K. Grzelak, P. Nieżurawski, M. Trochimczuk
26. A. Żarnecki, Leptoquarks and contact interactions from a global analysis, Proceedings of the 8th International Workshop on Deep Inelastic Scattering, World Scientific (2001) 454
27. A. Żarnecki, Leptoquark signal from global analysis, Proceedings of the 30th International Conference on High Energy Physics, World Scientific Publishing (2001) 1216
28. S. Afanasev et al., Cascade and anti-cascade production in central Pb+Pb collisions at 158 GeV per nucleon, PHYSICS LETTERS B 538 (2002) 275, coauthors: K. Perl, W. Retyk, E. Skrzypczak
29. S. Afanasev et al., Cascade production in p+p, p+A and A+A interactions at 158 GeV, NUCLEAR PHYSICS A 698 (2002) 491, coauthors: K. Perl, W. Retyk, E. Skrzypczak
30. S. Afanasev et al., Energy dependence of kaon production in central Pb+Pb collisions, JOURNAL OF PHYSICS G-NUCLEAR AND PARTICLE PHYSICS 28 (2002) 1689, coauthors: K. Perl, W. Retyk, E. Skrzypczak
31. S. Afanasev et al., New results from NA49, NUCLEAR PHYSICS A 698 (2002) 104, coauthors: K. Perl, W. Retyk, E. Skrzypczak
32. S. Afanasev et al., Production of strange resonances in C+C and C+C collisions at 158 GeV, NUCLEAR PHYSICS A 698 (2002) 487, coauthors: K. Perl, W. Retyk, E. Skrzypczak
33. B. Badełek, J. Kwieciński, B. Ziaja, Spin structure function g_1 (x,Q^2) and DHGHY integral $I(Q^2)$ at low Q^2: predictions from the GVMD model, EUROPEAN PHYSICS JOURNAL C 26 (2002) 45
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38. J. Abdallah et al., Searches for neutral Higgs boson in e^+e^- collisions from $\sqrt{s}$ = 191.6 GeV to 201.7 GeV, DELPHI Collaboration, EUROPEAN PHYSICS JOURNAL C 23 (2002) 409, coauthors: K. Doroba, K. Grzelak, P. Nieżurawski, M. Trochimczuk

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40. K. Buńkowski et al., The RPC Muon Trigger System for CMS Experiment on LHC Collider, KWARTALNIK ELEKTRONIKI I TELEKOMUNIKACJI 48 (2002) 309, coathors: M. Ćwiok, M. Kazana, A. Kalinowski, K. Kierzkowski, J. Królikowski, I.M. Kudła, T. Nakielski, P. Zych.
41. S. Fukuda et al., Determination of solar neutrino oscillation parameters using 1496 days of Super-Kamiokande-I data, PHYSICS LETTERS B 539 (2002) 179, coathor: D. Kiełczewska
42. S. Fukuda et al., Search for neutrinos from Gamma-Ray Bursts using Super-Kamiokande, ASTROPHYSICS JOURNAL 578 (2002) 317, coathor: D. Kiełczewska
43. J. Ciborowski, Exclusive vector meson production in ep collisions, NUCLEAR PHYSICS A 711 (2002) 181
44. S. Chekanov et al., Inclusive jet cross-sections in the breit frame in neutral current deep inelastic scattering at HERA and determination of α_s, ZEUS Collaboration, PHYSICS LETTERS B 547 (2002) 164, coauthors: J. Ciborowski, R. Ciesielski, R.J. Nowak, J.M. Pawlak, B. Smalska, J. Sztuk, T. Tymieniecka, A. Ukleja, J. Ukleja, A.F. Żarnecki
45. S. Chekanov et al., Measurement of diffracive production of $D^{*+-}(2010)$ mesons in deep inelasic scattering at HERA, ZEUS Collaboration, PHYSICS LETTERS B 545 (2002) 244, coauthors: J. Ciborowski, R. Ciesielski, R.J. Nowak, J.M. Pawlak, B. Smalska, J. Sztuk, T. Tymieniecka, A. Ukleja, J. Ukleja, , A.F. Żarnecki
46. S. Chekanov et al., Leading neutron production in e^+p collisions at HERA, ZEUS Collaboration, NUCLEAR PHYSICS B 637 (2002) 3, coauthors: J. Ciborowski, R. Ciesielski, R.J. Nowak, J.M. Pawlak, B. Smalska, J. Sztuk, T. Tymieniecka, A. Ukleja, J. Ukleja, A.F. Żarnecki
47. S. Chekanov et al., Measurement of the Q^2 and energy dependence of diffracive interactions at HERA, ZEUS Collaboration, EUROPEAN PHYSICS JOURNAL C 25 (2002) 169, coauthors: J. Ciborowski, R. Ciesielski, R.J. Nowak, J.M. Pawlak, B. Smalska, J. Sztuk, T. Tymieniecka, A. Ukleja, J. Ukleja, A.F. Żarnecki
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49. S. Chekanov et al., Search for lepton flavor violation in e^+p collisions at HERA, ZEUS Collaboration, PHYSICAL REVIEW D 65 (2002) 092004, coauthors: J. Ciborowski, R. Ciesielski, R.J. Nowak, J.M. Pawlak, B. Smalska, J. Sztuk, T. Tymieniecka, A. Ukleja, J. Ukleja, A.F. Żarnecki
50. A. Żarnecki, Contact interactions, large extra dimensions and leptoquarks at HERA, ACTA PHYSICA POLONICA B 33 2 (2002) 619
51. S. Chekanov et al., Dijet photoproduction at HERA and the structure of the photon, ZEUS Collaboration, EUROPEAN PHYSICAL JOURNAL C 23 (2002) 615, coauthors: J. Ciborowski, R. Ciesielski, R.J. Nowak, J.M. Pawlak, B. Smalska, J. Sztuk, T. Tymieniecka, A. Ukleja, J. Ukleja, A.F. Żarnecki
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53. S. Chekanov et al., High mass dijet cross-sections in photoproduction at HERA, ZEUS Collaboration, PHYSICS LETTERS B 531 (2002) 9 , coauthors: J. Ciborowski, R. Ciesielski, R.J. Nowak, J.M. Pawlak, B. Smalska, J. Sztuk, T. Tymieniecka, A. Ukleja, J. Ukleja, A.F. Żarnecki
54. S. Chekanov et al., Measurement of high Q^2 charged current cross-sections in e-p deep inelastic scattering at HERA, ZEUS Collaboration, PHYSICS LETTERS B 539 (2002) 197, coauthors: J. Ciborowski, R. Ciesielski, R.J. Nowak, J.M. Pawlak, B. Smalska, J. Sztuk, T. Tymieniecka, A. Ukleja, J. Ukleja, A.F. Żarnecki
55. S. Chekanov et al., Measurement of photon proton total cross-section at a center of mass energy of 209 GeV at HERA, ZEUS Collaboration, NUCLEAR PHYSICS B 627 (2002) 3, coauthors: J. Ciborowski, R. Ciesielski, R.J. Nowak, J.M. Pawlak, B. Smalska, J. Sztuk, T. Tymieniecka, A. Ukleja, J. Ukleja, A.F. Żarnecki
56. A. Żarnecki, G. Moortgat-Pick, S. Rolli, Physics at large p_t^2 and Q^2: summary, ACTA PHYSICA POLONICA B 33 (2002) 3955
57. S. Chekanov et al., Properties of hadronic final states in diffractive deep inelastic ep scattering at HERA, ZEUS Collaboration, PHYSICAL REVIEW D 65 (2002) 1, coauthors: J. Ciborowski, R. Ciesielski, R.J. Nowak, J.M. Pawlak, B. Smalska, J. Sztuk, T. Tymieniecka, A. Ukleja, J. Ukleja, A.F. Żarnecki
58. S. Chekanov et al., Searches for excited fermions in ep collisions at HERA, ZEUS Collaboration, PHYSICS LETTERS B 549 (2002) 32, coauthors: J. Ciborowski, R. Ciesielski, R.J. Nowak, J.M. Pawlak, B. Smalska, J.S ztuk, T. Tymieniecka, A. Ukleja, J. Ukleja, A.F. Żarnecki
59. M. Krawczyk, P. Nieżurawski, A.Żarnecki, Study of the Higgs boson decays into W^+W^- and ZZ at the photon collider, JOURNAL OF HIGH ENERGY PHYSICS 11 (2002) 034 / 1126-1167

DIVISION OF PHYSICS EDUCATION

Head: Dr Magdalena Staszel (since March 2001, previously dr hab. Tadeusz Pniewski)
Adress: Division of Physics Education, Institute of Experimental Physics, Warsaw University, 5/7 Smyczkowa St., 02-678 Warsaw
Phone: (+48 22) 853 59 79, 847 09 82, 55 33 215
Fax : (+48 22) 847 09 82
E-mail: staszel@fuw.edu.pl, fabro@box.ids.pl
Senior Staff Members: Prof. dr hab. Jerzy Ginter, dr hab. Tadeusz Pniewski (docent),
dr hab.Ryszard Kutner (professor), dr hab. Andrzej Majhofer (professor)
Scientific Staff (total): 7 persons
ETA (Engineers, Technicians, Administration) : 6 persons
Number of grants in 2001-2002: 1

SCIENTIFIC ACTIVITY

Main activities:

1. Preparation of curricula, textbooks and teaching materials for the reformed school system
    a. curricula, textbooks, teacher's guides and other teaching materials for physics in lower secondary (gymnasium) and upper secondary (lycee) school
    b. curriculum, textbooks, teachers' guides and teaching materials for elementary science (primary school).
2. Development of new educational aids and demonstrations for lower and upper secondary school, with emphasis on low-cost experiments.
3. Introduction of computer aided experiments into secondary school physics curricula. Preparation of an interactive, multimedia program for teaching physics at secondary school level.
4. Developing methods and techniques for the promotion of physics in public media.
5. Investigation of pupils' knowledge and understanding of physical phenomena prior to secondary school education (after recent school system reform).
6. Algorithmization and visualization of physics: application of computer experiments or numerical modelling for high school, university and advanced levels.
7. Preparation of an educational portal containing teaching materials including movies with audio, animations and simulations.
8. Developing of a new branch of science – econophysics: application of models and theories used in physics into economy, particularly to analysis of the dynamics of financial markets as the prominent example of complex systems

M.Sc. (magister) theses (2001-2002)

1. Wojciech Pękalski, Wprowadzenie niektórych wielkości fizycznych w szkole średniej z wykorzystaniem pojęć: funkcji, granicy funkcji i pochodnej funkcji (Introducing physical quantities in upper secondary school using the concepts of function, its limit and derivative), 2001, supervisor: dr Anna Kaczorowska
2. Anna Mazurkiewicz, „Zielone" zadania z fizyki – wybrane problemy z fizyki w kontekście ekologicznym („Green" physics problems – selected problems in physics in the environmental context), 2001, supervisor: dr Magdalena Staszel
3. Witold Kuran, Realizacja wybranych doświadczeń z termodynamiki z wykorzystaniem konsoli pomiarowej COACHLab II (Some experiments in thermodynamics with the use of COACHLab II System), 2002, supervisor: dr hab. Andrzej Majhofer
4. Maria Pogorzelska – Szumowska, Elementy fizyki w nauczaniu przyrody (Elements of physics in primary school science education), 2002, supervisor: dr Stefania Elbanowska
5. Maria Specjalska, Zadania z fizyki w gimnazjum: stopniowanie trudności (Physics problems for lower secondary school), 2002, supervisor: dr Magdalena Staszel
6. Arkadiusz Rzeszotarski, Zasady fizyki w niektórych zabawkach (Physics laws in selected toys), 2002, supervisor: prof. dr hab. Andrzej Hennel, red. Wiktor Niedzicki

B.Sc. (licenciate) theses (2001-2002)

18 bachelor theses supervised by dr hab. Ryszard Kutner, dr hab. Andrzej Majhofer, dr Stefania Elbanowska, dr Anna Kaczorowska and dr Magdalena Staszel

PUBLICATIONS (2001-2002)

1. M. Krawczyk et al., Survey of present data on photon structure functions and resolved photon processes, PHYSICS REPORTS 342, no.5-6 (2001) 265, coauthor: M. Staszel
2. M. Kessler et al., Monte Carlo simulation of subsurface ordering kinetics in an fcc alloy model, PHYS. REV. B 64 (2001) 125412 , coauthor: A. Majhofer

3. K. Tabaszewski, Słońce – nasza szczęśliwa gwiazda (The Sun – our lucky star), NOWA ERA W SZKOLE no.3 (11//2001) 33
4. K. Tabaszewski, Uwagi do artykułu Mariana Krakowskiego (Some remarks on the paper by Marian Krakowski), FIZYKA W SZKOLE 47, no.4 (2001)223, WSiP, Warszawa
5. S. Elbanowska, Eksperymenty w nauczaniu fizyki w gimnazjum (School experiments in physics teaching in lower secondary school), PROC. of the 7th TEACHERS' IDEAS FAIR, Charles University, Prague, 2002, p.134
6. R. Kutner, Extreme events as foundation of Levy walks with varying velocity, CHEMICAL PHYSICS 284 (2002) 481, Special Issue "Strange Kinetics", eds. R. Hilfer, R. Metzler, A. Blumen, J. Klafter
7. R. Kutner, Stock market context of the Levy walks with varying velocity, PHYSICA A 314 (2002) 201
8. A. Galant et al., Symulacje numeryczne w nauczaniu fizyki – laboratorium numeryczne w szkole (Numetical simulations in physics education – numerical laboratory in the school), FIZYKA W SZKOLE (Internet,Multimedia) October 2002, http://www.wsip.com.pl/serwisy/czasfiz/strony/internet.htm
coauthors: R. Kutner, A. Majerowski
9. A. Majhofer, M. Staszel, P. Olasek., Living organisms in the eye of a physicist, Proc. of the XIX GIREP Conf. "Physics in new fields and modern applications", http://pinf.fysik.lu.se/abstracts/sesShow.asp, No.309
10. J. Stepaniak et al., Dilepton pair production: phenomenology and experiment, PHYSICA SCRIPTA T99 (2002) 133, coauthor: M. Staszel
11. M. Staszel et al., Nauczanie o energii w Europie (Teaching about energy across Europe), PROC. of the 7th TEACHERS' IDEAS FAIR, Charles University, Prague, 2002, p.128
12. M. Staszel et al., Baza danych EURENERG – przykład współpracy nauczycieli przedmiotów przyrodniczych dotyczącej nauczania o energii (EURENERG – an example of international collaboration of science teachers on energy topic). W: Społeczne znaczenie wiedzy przyrodniczej, red. R.M.Janiuk, wyd. UMCS Lublin, 2002, p.125
13. M. Staszel et al., Zastosowanie bazy danych EURENERG w nauczaniu (Application of data base EURENERG in teaching), NAUCZANIE PRZEDMIOTÓW PRZYRODNICZYCH 6 (2002) 34

Curricula, textbooks and other teaching materials for primary and secondary schools

1. S. Elbanowska et al., Fizyka i astronomia – podręcznik dla klasy II gimnazjum (Physics and astronomy textbook for grade II of gymnasium), JUKA 2001
2. S. Elbanowska et al., Zeszyt ćwiczeń do podręcznika dla uczniów klasy II (Activities in physics for grade II of gymnasium), JUKA 2001
3. S. Elbanowska et al., Przewodnik metodyczny dla nauczycieli fizyki (Teacher's guide - physics) JUKA 2001
4. S. Elbanowska et al., Od cząsteczki do wszechświata" - podręcznik przyrody dla klasy VI (From molecule to universe – science textbook for grade VI of primary school), JUKA, 2001
5. S. Elbanowska et al., Zeszyt ćwiczeń do podręcznika przyrody dla uczniów klasy VI (Science activities for grade VI), JUKA 2001
6. S. Elbanowska et al., Przewodnik metodyczny dla nauczycieli przyrody (Teacher's guide - science), JUKA 2001
7. A. Kaczorowska., Fizyka i astronomia – podręcznik dla klasy III gimnazjum (Physics and astronomy textbook for grade III of gymnasium), WYD.EDUKACYJNE „Żak", 2001
8. A. Kaczorowska, Scenariusze lekcji do II klasy gimnazjum (Lesson scenarios for grade II of gymnasium), WYD.EDUKACYJNE „Żak" 2001
9. S. Elbanowska et al., Fizyka i astronomia - podręcznik dla klasy III gimnazjum (Physics and astronomy - textbook for grade III of gymnasium), JUKA 2002
10. S. Elbanowska et al., Zeszyt ćwiczeń do podręcznika dla uczniów klasy III (Activities in physics for grade III of gymnasium), JUKA, 2002
11. S. Elbanowska et al., Przewodnik metodyczny dla nauczycieli fizyki, gimnazjum 2 (Teacher's guide - physics, grade II), JUKA, 2002
12. S. Elbanowska et al., Przewodnik metodyczny dla nauczycieli fizyki, gimnazjum 3 (Teacher's guide - physics, grade III), JUKA, 2002
13. A. Kaczorowska, Fizyka i astronomia – podręcznik dla liceum ogólnokształcącego, zakres rozszerzony, część I (Physics and astronomy – textbook for upper secondary school , extended version, part I) WYD.EDUKACYJNE „Żak" 2002
14. A. Kaczorowska, Fizyka i astronomia – podręcznik dla liceum i technikum, zakres podstawowy, część I (Physics and astronomy – textbook for upper secondary school, basic version, part I) WYD.EDUKACYJNE „Żak" 2002
15. A. Kaczorowska, Program Nauczania Fizyki i Astronomii, do podręcznika dla liceum i technikum, zakres podstawowy, część I (Physics and astronomy – curriculum for upper secondary school, basic version, part I) WYD.EDUKACYJNE „Żak" 2002
16. A. Kaczorowska, Program Nauczania Fizyki i Astronomii, do podręcznika dla liceum ogólnokształcącego, zakres rozszerzony, część I (Physics and astronomy – curriculum for upper secondary school, extended version, part I), WYD.EDUKACYJNE „Żak" 2002

INVITED TALKS (2001-2001)

1. R. Kutner, Higher-order Analysis of Stochastic Time Series, Int. Discussion Meeting on Stochastic Dynamics in Complex Systems, Konstanz 2002
2. A. Majhofer, Kinetics of ordering in the vicinity of crystal surface, Int. Discussion Meeting on Stochastic Dynamics in Complex Systems, Konstanz 2002

DIVISION OF SOLID STATE PHYSICS

Head: prof. dr hab. Michał Baj (since 2003, previously prof. dr hab. Marian Grynberg)
Address: Division of Solid State Physics, Institute of Experimental Physics, Warsaw University, Hoża 69 St., 00-681 Warsaw
Phone: (+48 22) 628 76 49 Fax: (+48 22) 621 97 12
E-mail: sek-zfcs@fuw.edu.pl
Senior Staff Members: prof. dr hab. Michał Baj, prof. dr hab. Jacek Baranowski, prof. dr hab. Jan Gaj, prof. dr hab. Marian Grynberg, prof. dr hab. Maria Kamińska, prof. dr hab. Roman Stępniewski, prof. dr hab. Andrzej Twardowski, dr hab. Michał Nawrocki (professor), dr hab. Andrzej Golnik (associate professor), dr hab. Dariusz Wasik (associate professor), dr hab. Andrzej Witowski (associate professor)
Scientific Staff – 20 persons + 12 Ph.D. students
ETA (Engineers, Technicians, Administration) – 7 persons
Number of grants in 2001-2002: 26

SCIENTIFIC ACTIVITY

Areas of scientific activity:

- Growth and characterization of III-V semiconductor materials (mainly nitrides) and their heterostructures
- Properties of quasi-two-dimensional electron gas in semiconductor heterostructures under external fields (e.g. magnetic field, hydrostatic pressure, uniaxial stress)
- Interaction between spins of charge carriers (electrons and holes) and magnetic moments of paramagnetic ions in diluted magnetic semiconductors (bulk materials and semiconductor heterostructures)
- Magnetic properties of diluted magnetic semiconductors and their heterostructures
- Impurities and defects in semiconductors and their heterostructures
- Low energy excitations (in particular – within shallow donors)
- Electronic transport in semiconductor heterostructures, including resonant tunnelling

Methods:

- MOCVD, AMMONO and Czochralski crystal growth techniques
- Standard characterization techniques: Hall effect, DLTS, electrochemical CV profiling, atomic force microscope (AFM)
- Infrared, visible and UV optical and magnetooptical spectroscopy (in some cases including time-resolved measurements): absorption, reflectance, electroreflectance, photoreflectance, photoconductivity, photoluminescence, photoluminescence excitation
- Magnetization measurements
- Far infrared spectroscopy – absorption, reflectance and photoconductivity
- Magnetotransport measurements: conductivity tensor at magnetic fields, I-V and C-V (differential capacitance – voltage) in lateral and vertical transport experiments
- External fields: magnetic fields up to 10 T (higher magnetic fields available in cooperation with e.g. High Magnetic Field Laboratory in Grenoble), low temperatures down to 1.3 K, uniaxial and hydrostatic pressures (up to 1.5 GPa)

Main achievements:

- In p-type CdMnTe quantum wells low-temperature ferromagnetism has unambigously been demonstrated. In this system magnetic ordering can be light-controlled via light-induced change of hole concentration
- Relatively high Curie temperatures (up to T_C>100K) have been observed experimentally in GaMnAs and InGaMnAs materials
- Important results have been obtained for GaMnN, for which theoretical predictions forsee carrier-induced ferromagnetism at room temperature. From magnetization experiments performed on GaN:Mn samples the influence of precipitates of some extrinsic phase or impurities on magnetic properties has been demonstrated. On the other hand optical and EPR experiments have shed some light on the problem whether it is possible to have simultaneously large hole concentration and an appropriate Mn charge state
- The electro- and photoreflectance methods of investigation of GaN-based heterostructures have been developed. It has been demonstrated that these methods, used to map the whole heterostructures, can be succesfully applied to investigate both spontaneous and piezoelectric fields present in wurzite semiconductors
- There has been completed the experimental setup for investigations of time resolved absorption and luminescence. Investigations of excitons and trions in II-VI diluted magnetic semiconductors have been performed
- Very interesting single dot-like emission induced by magnetic fields has been observed for the first time in III-V materials
- Spin-dependent tunneling of excitons between two coupled quantum wells in heterostructures containing diluted magnetic semiconductors has been observed and investigated
- Optical anisotropy related to interfaces between various II-VI semiconductor heterostructures containing diluted magnetic semiconductors has been demonstrated at high magnetic fields

- In resonant tunnelling experiments performed on GaAs/AlAs/GaAs devices tunnelling via individual donor states in AlAs layer has been demonstrated
- It has been proved that so called two-electron transitions observed for the first time in GaN in luminescence experiments enable to perform intra-donor spectroscopy by means of near band-edge optical investigations

Equipment:

- High pressure system for crystal growth using the Czochralski method
- MOCVD system for growing III-V layers and nanostructures
- AMONO thermal method for nitride growth
- Optical and magnetooptical systems for spectroscopic investigations in the UV visible, near-infrared and far-infrared spectral ranges (up to 10T)
- SQUID magnetometer
- Helium liquefier
- Atomic Force Microscopy
- Fourier Transform Spectrometer
- Equipment for TEM preparation

M.Sc. (magister) thesis (2001-2002)

1. Zdzisław Romanowski, Badania magnetospektroskopowe związków III-V w dalekiej podczerwieni (Far-infrared magnetospectroscopic investigations of III-V compounds), 2001, supervisor: dr Krzysztof Karpierz
2. Marcin Byszewski, Otrzymywanie azotku galu domieszkowanego żelazem metodą ammonotermalną. Charakterystyka strukturalna, optyczna i magnetyczna (Obtaining of Fe-doped gallium nitride by means of ammono method. Structural, optical and magnetic characterization), 2001, supervisor: prof. Maria Kamińska
3. Agnieszka Szepielow, Wpływ wygrzewania na niskotemperaturowe struktury półprzewodnikowe InAs/GaAs (Heat-treatment influence on low-temperature InAs/GaAs semiconductor structures), 2001, supervisor: dr Adam Babiński
4. Konrad Dziatkowski, Optyczne własności niskotemperaturowego arsenku galu (Optical properties of low-temperature gallium arsenide), 2002, supervisor: prof. Andrzej Twardowski
5. Katarzyna Kowalik, Optyczna anizotropia w płaszczyźnie parabolicznych i półparabolicznych studni kwantowych z CdTe/$Cd_{1-x}Mn_xTe$ (Optical anisotropy in parabolic and semi-parabolic quantum wells of CdTe/$Cd_{1-x}Mn_xTe$), 2002, supervisor: prof. Jan Gaj
6. Jan Suffczyński, Badanie polaryzacji ekscytonów w układzie dwóch studni kwantowych sprzężonych poprzez barierę półmagnetyczną (Polarisation of excitons in the systems with two quantum wells coupled via semimagnetic barrier), 2002, supervisor: prof. Michał Nawrocki
7. Zbigniew Adamus, Badania zjawiska degradacji w niskowymiarowych heterostrukturach CdTe/CdMgTe na podłożu GaAs (Investigations of degradation process in low-dimensional CdTe/CdMgTe heterostructures grown on GaAs substrates), 2002, supervisor: dr hab. Dariusz Wasik
8. Piotr Wojnar, Wpływ efektu związanego polaronu magnetycznego na luminescencję i rozpraszanie Ramana w $Cd_{1-x}Mn_xTe$ (Influence of bound-magnetic-polaron effect on luminescence and Raman scattering in $Cd_{1-x}Mn_xTe$), 2002, supervisor: dr hab. Andrzej Golnik

B.Sc. (licentiate) thesis (2001-2002)

1. Paweł Sułecki, Badania efektu Halla w cienkich warstwach CdTe domieszkowanych jodem (Investigations of Hall effect in thin, iodine-doped layers of CdTe), 2001, supervisor: dr Krzysztof Karpierz
2. Piotr Caban, Wzrost warstw półprzewodnikowych metodą MOCVD (MOCVD growth of semiconductor layers), 2001, supervisor: prof. Jacek Baranowski
3. Konrad Surdy, Badanie własności fotoelektrycznych warstw półprzewodnikowych (Investigations of photoelectric properties of semiconductor layers), 2001, supervisor: prof. Roman Stępniewski
4. Marek Rafałowicz, Opracowanie programu do analizy wyników urządzenia pomiarowego SQUID (Elaboration of a computer program dedicated for the analysis of SQUID magnetometer experimental data), 2001, supervisor: prof. Andrzej Twardowski
5. Jarosław Wierzchowski, Badnia luminescencji heterostruktur półprzewodników II-VI (Investigations of luminescence in II-VI semiconductor heterostructures), 2001, supervisor: prof. Michał Baj
6. Michał Kozubal, Fotoprąd wzbudzony w strukturach AlGaN/GaN (Photocurrent in AlGaN/GaN structures), 2001, supervisor: dr Krzysztof Korona
7. Adam Cybulski, Efekt Halla w cienkich warstwach (Hall effect in thin layers), 2001, supervisor: dr Jerzy Łusakowski
8. Tomasz Adamus, Polaryzacja światła i optyczne właściwości półprzewodników (Light polarisation and optical properties of semiconductors), 2001, supervisor: dr Jerzy Łusakowski
9. Marzena Kencler, Badania arsenku galu domieszkowanego manganem (GaAs:Mn) przy pomocy rezonansu spinowego i absorpcji optycznej (Investigations of manganese-doped gallium arsenide by means of spin resonance and optical absorption), 2002 supervisor: prof. Maria Kamińska

10. Marcin Sawicki, Morfologia a rozkład potencjału mierzony na powierzchni warstw półprzewodnikowych (Morphology versus surface potential distribution of semiconductor layers), 2002, supervisors: prof. Jacek Baranowski, mgr Rafał Bożek
11. Małgorzata Jaworek, Badanie podwójnej studni CdTe/CdMnTe ze schodkową szerokością studni CdTe (Investigtions of CdTe/CdMnTe double-well structure with step-like width of the CdTe well), 2002, supervisor: prof. Michał Nawrocki
12. Hubert Żołnierowicz, Badanie nanokryształów azotku galu metodą rezonansu paramagnetycznego (EPR investigations of nanocrystalline gallium nitride), 2002, supervisors: prof. Maria Kamińska, dr Maria Palczewska

Physics Teachers College

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2. Anna Włosek, Badanie powierzchni półprzewodników za pomocą mikroskopu sił atomowych (Investigations of semiconductor surfaces by means of atomic force microscope), 2001, supervisor: prof. Jacek Baranowski
3. Aneta Izdebska, Wpływ domieszkowania berylem na koncentrację defektu antystrukturalnego w niskotemperaturowym GaAs (Influence of beryllium doping on antisite defect concentration in low-temperature GaAs), 2001, supervisor: prof. Maria Kamińska
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5. Jacek Izdebski, Praktyczna realizacja sterowania aparaturą pomiarową przez interfejs IEEE-488 (Practical implementation of an experiment controlled by a computer via IEEE-488 interface), 2002, supervisor: prof. Andrzej Twardowski
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8. Agnieszka Antosik, Zwierciadła przełączalne wodorem jako wskaźniki dyfuzji wodoru w metalach przejściowych (Hydrogen-controlled switchable mirrors as an indicator of hydrogen diffusion in transition metals), 2002, supervisor: dr hab. Andrzej Golnik

PhD. (doctor) thesis (2001-2002)

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3. P. Kossacki, J. Cibert, M.Kutrowski, A. Arnoult, A.Wasiela, S. Tatarenko, T. Wojtowicz, J. A. Gaj, Magnetooptic study of charged excitons in II-VI based quantum wells, Mini Workshop on Trion Physics, Humboldt-University Berlin Germany, April 6 -7, 2001
4. P. Kossacki, J.A. Gaj, H. Boukari, M. Bertolini, J. Cibert, S. Tatarenko, D. Ferrand, A. Wasiela, . T. Dietl, Light controlled and probed ferromagnetism of (Cd,Mn)Te quantum wells, Polsko-Holenderska Szkola Fizyki Materii Skondensowanej, Duszniki 7-10 luty 2002
5. P. Kossacki, Optical studies of ferromagnetism in (Cd,Mn)Te quantum wells, NATO Advanced Research Workshop "Optical Properties of 2D systems with interacting electrons", St. Petersburg, Russia, June 2002
6. P. Kossacki, Optical studies of charged excitons in II-VI semiconductor quantum wells, 26th International Conference on the Physics of Semiconductors to be held in Edinburgh UK, July 29 - August 2, 2002
7. T. Słupiński, E. Zielińska-Rohozińska, X-Ray Evidence of Impurity Atoms Self-Organization in Heavily Doped Annealed GaAs:Te, 10th International Conference on Shallow-Level Centers in Semiconductors, Warsaw, Poland, July 24-27, 2002
8. A. Wysmołek, Selective Magneto-luminescence Spectroscopy of Donor-acceptor Pairs in n-GaAs, 10th International Conference on Shallow-Level Centers in Semiconductors, Warsaw, Poland, July 24-27, 2002
9. M. Kaminska, A. Twardowski, LT GaMnAs and GaMnN - prospect materials for spintronics, 12th Semiconducting and Insulating Materials Conference, Smolenice, Slovakia 2002,
10. K.P. Korona, Exciton dynamics in homoepitaxial GaN in the picosecond regime, "Photonic West, Ultrafast Phenomena in Semiconductors V", San Jose 2001
11. T. Słupiński, MBE Growth and Properties of Ferromagnetic InGaMnAs alloys, XXXI Int. School on Physics of Semicond. Comp., Jaszowiec Poland, June 7-14, 2002
12. V. Mosser, D. Adam, M. Lee, M. Konczykowski, M. Ocio, D. Bloyet, C. Dolabdjian.,Y. Haddab., J. Przybytek, G. Boero, S. Contreras, Heterostructures III-V: nouvelles applications en micromagnetometrie, JNMO (Journees Nationales Microelectroniques et Optoelectroniques) 2002, St-Aygulf
13. R. Stępniewski, A. Wysmołek, M. Potemski , Magnetooptics of Gallium Nitride, XXX Int. Conf. on Physics of Semiconducting Compounds, Jaszowiec 2001
14. J.A. Gaj, Elektrony i dziury, ekscytony i triony, XXXVI Zjazd Fizyków Polskich, Toruń 2001
15. J. M. Baranowski, Magneto-optical studies of nitrides, International Worshop on Nitride Semiconductors 22-25 lipca 2002 Aachen, Niemcy

INTERNATIONAL CONFERENCES ORGANIZED BY THE DIVISION (2001-2002)

1. 10^{th} International Conference on Shallow Level Centers in Semiconductors (SLCS-10) Warsaw, Poland , 24-27 July 2002, chairmen: prof. Roman Stępniewski, dr hab. Andrzej Witowski
2. XXX International School on the Physics of Semiconducting Compounds “Jaszowiec 2001” Ustroń-Jaszowiec, Poland June, 2001, chairman prof. Michał Nawrocki
3. XXXI International School on the Physics of Semiconducting Compounds “Jaszowiec’02” Ustroń-Jaszowiec, Poland June, 2002 chairman: prof. Tadeusz Suski

DIVISION OF STRUCTURE RESEARCH

Head: Dr hab. Jerzy Gronkowski (professor)
Address: Division of Structure Research, Institute of Experimental Physics, Warsaw University, 69 Hoża St., 00-681 Warsaw
Phone: (+48 22) 55 32 270
Fax: (+48 22) 629 42 29
E-mail: Jerzy.Gronkowski@fuw.edu.pl
Senior Staff Members: Dr hab. Jerzy Gronkowski (professor), dr hab. Maria Lefeld-Sosnowska (professor), dr hab. Grzegorz Kowalski (associate professor), dr hab. Elżbieta Zielińska-Rohozińska (associate professor)
Scientific Staff (total): 7 persons
ETA (Engineers, Technicians, Administration) : 3 persons
Number of grants in 2001–2002: 4

SCIENTIFIC ACTIVITY

Areas of scientific activity:
Investigation of defects and deformations of single-crystal lattices and semiconductor thin layers systems (especially AIII–BV compounds and nitrides).
Investigation of magnetic structure and interlayer correlations in semiconductor superlattices (EuTe/PbTe, EuS/PbS, EuS/YbSe, GaMnAs/GaAs).

Methods:
X-ray high-resolution diffractometry. X-ray section, projection, and plane wave topography. X-ray reflectometry. X-ray powder diffractometry. Simulation techniques for reciprocal space maps and topographs. Elastic and inelastic thermal neutron scattering. Neutron reflectometry and wide-angle neutron diffraction.

Main achievements:
1. A parabolic curvature of the crystallization front of Si: Ge single crystals has been revealed and studied by x-ray section topography with synchrotron radiation.
2. Dislocations in $GdCa_4O(BO_3)_3$ single crystals grown by Czochralski method have been revealed by x-ray diffraction topography.
3. The microstructure of AlGaN MOCVD layers grown at low pressure has been studied by high-resolution x-ray diffractometry.
4. The weak (pseudo-forbidden) reflections have been used to study Be impurities in GaAs layers and a theoretical model of Be atom locations in the crystal lattice has been proposed.
5. Antiferromagnetic coupling between ferromagnetic layers has been observed for the first time in an all-semiconductor superlattice structure EuS/PbS by neutron scattering and reflectivity measurements.
6. In another ferromagnetic semiconductor system, GaMnAs/GaAs, neutron reflectivity experiments revealed a long range ferromagnetic order despite the fact that Mn moments are diluted and located randomly. A ferromagnetic interlayer exchange coupling in GaMnAs/GaAs superlattices has been found by means of polarized neutron reflectivity measurements.

Equipment:
X-ray generators (7 pcs), topographic cameras (8 pcs), high-resolution multi-crystal X-ray diffractometers (3 pcs), powder diffractometer (1 pc), triple-axis neutron spectrometer.

M.Sc. (magister) theses (2001-2002)

1. Teresa Bednarz, Badania kryształów fotonicznych BGO i BSO (A study of photonic BGO and BSO crystals), 2001, supervisor: dr hab. Jerzy Gronkowski
2. Aneta Urbańska, Wyznaczanie orientacji monokryształów (GaAs, GaN, Al_2O_3) metodami: zdjęć wstecznych Lauego oraz dyfraktometryczną (Orienting GaAs, GaN and Al_2O_3 crystals using the back-reflection Laue method and x-ray diffractometry), 2001, supervisor: dr hab. Elżbieta Zielińska-Rohozińska
3. Krzysztof Golachowski, Otrzymywanie map rozpraszania dyfuzyjnego z wykorzystaniem dwuodbiciowego monochromatora i dwuodbiciowego analizatora (Acquisition of diffuse-scattering intensity maps using a two-reflection monochromator and a two-reflection analyser), 2002, supervisor: dr hab. Jerzy Gronkowski
4. Aneta Jeziorska, Rentgenowskie badania strukturalne niskotemperaturowych warstw arsenku galu domieszkowanego berylem (X-ray structural study of layers of low-temperature gallium arsenide doped with beryllium), 2002, supervisor: dr hab. Grzegorz Kowalski
5. Małgorzata Majer, Charakteryzacja struktur warstwowych azotków III grupy metodą wysokorozdzielczej dyfraktometrii rentgenowskiej (Characterization of layers of group-3 nitrides by high-resolution x-ray diffractometry), 2002, supervisor: dr hab. Elżbieta Zielińska-Rohozińska

6. Agnieszka Malinowska, Badanie własności strukturalnych proszkowych azotków galu metodą dyfraktometrii rentgenowskiej (A structural study of gallium nitride powders with x-ray diffractometry), 2002, supervisor: dr hab. Maria Lefeld-Sosnowska
7. Edyta Olszyńska, Badanie realnej struktury monokryształów tlenoboranów gadolinowo-wapniowych (A real-structure study of gadolinum-calcium oxoborates single crystals), 2002, supervisor: dr hab. Maria Lefeld-Sosnowska
8. Sylwia Pachocka, Reflektometryczne pomiary supersieci materiałów półprzewodnikowych CdTe i MnTe (Reflectometric measurements of semiconductor CdTe and MnTe superlattices), 2002, supervisor: dr Maciej Szymański

PUBLICATIONS (2001–2002)

1. J. Borowski et al., Orthorhombic microdefects in Si crystals, J. PHYS. D: APPL. PHYS. 34 (2001) 1540
2. J. Borowski, J. Gronkowski, X-ray diffraction pictures for Fourier-transformed narrow incident beams, J. ALLOYS AND COMPOUNDS 328 (2001) 213
3. J. Borowski, J. Gronkowski, X-ray section topographs under various coherence properties of the primary beam, J. PHYS. D: APPL. PHYS. 34 (2001) 3496
4. T.M. Giebultowicz et al., Neutron diffraction and reflectivity studies of interlayer correlations in magnetic semiconductor superlattices, PHYSICA E 10 (2001) 411, coauthor: H. Kępa
5. S. Gierlotka et al., Aluminium nitride compressibility and thermal expansion under pressure, MATERIALS SCIENCE FORUM 378–381 (2001) 529, coauthor: E. Grzanka
6. J. Gronkowski, J. Borowski, X-ray High-Resolution Diffractometry for Studies of Diffuse Scattering in Semiconductor Materials, CRYST. RES. TECHNOL. 36 (2001) 815
7. H. Kepa, J. Kutner-Pielaszek et al., Interlayer correlations in ferromagnetic semiconductor superlattices EuS/PbS, J. MAGN. MAGN. MATER. 226–230 (2001) 1795
8. H. Kepa, J. Kutner-Pielaszek et al., Ferromagnetism of GaMnAs studied by polarized neutron reflectometry, PHYS. REV. B 64 (2001) 121302(R)
9. H. Kepa, J. Kutner-Pielaszek et al., Antiferromagnetic Interlayer Coupling in Ferromagnetic Semiconductor EuS/PbS(001) Superlattices, EUROPHYS. LETT. 56 (2001) 54
10. D. Klinger, M. Lefeld-Sosnowska et al., Extended defect structure induced by pulsed laser annealing in Ge implanted Si crystal, J. ALLOYS AND COMPOUNDS 328 (2001) 242
11. M. Lefeld-Sosnowska et al., Topography and lattice parameter of Si:Ge bulk crystals, J. PHYS. D: APPL. PHYS. 34 (2001) A144
12. M. Lefeld-Sosnowska, I. Frymark, Extended defects in GaN single crystals, J. PHYS. D: APPL. PHYS. 34 (2001) A148
13. M. Mrozowicz, J. Gronkowski, X-ray diffraction study of structural quality of photorefractive BGO and BSO crystals, OPTO-ELECTR. REV. 9 (2001) 344
14. B. Murphy et al., SRS station 16.3: high resolution applications, NUCL. INSTRUM. METH. PHYS. RES. A 467–468 (2001) 1014, coauthor: G. Kowalski
15. B. Pałosz et al., Distribution of strain in GaN and SiC nanocrystals under extreme pressures, MATERIALS SCIENCE FORUM 378–381 (2001) 735, coauthors: E. Grzanka, R. Pielaszek
16. D. Wasik et al., Effect of hydrostatic pressure on degradation of CdTe/CdMgTe heterostructures grown by molecular beam epitaxy on GaAs substrates, J. APPL. PHYS. 89 (2001) 5025, coauthor: J. Gronkowski
17. M. Zajac et al., Magnetic and optical properties of GaMnN magnetic semiconductor, APPLIED PHYS. LETT. 78 (2001) 1276, coauthor: M. Lefeld-Sosnowska
18. E. Zielińska-Rohozińska, J. Gronkowski et al., Strain relaxation in $Ga_{1-x}In_xN$ thin layers grown on GaN sublayers, J. ALLOYS AND COMPOUNDS 328 (2001) 199, coauthor: M. Regulska
19. E. Zielińska-Rohozińska, J. Gronkowski et al., X-ray Diffraction Study of Composition Inhomogeneities in $Ga_{1-x}In_xN$ Layers, CRYST. RES. TECHNOL. 36 (2001) 903, coauthor: M. Regulska
20. J. Borowski, Klein–Gordon Formulation of X-ray Diffraction in the Laue Case, ACTA PHYS. POLON. A 101 (2002) 767
21. E. Grzanka et al., Generation and relaxation of strain in GaN nanocrystals under extreme pressure, ACTA PHYS. POLON. A 102 (2002) 167, coauthor: R. Pielaszek
22. H. Kępa, Neutron reflectometry studies of interlayer coupling in ferromagnetic semiconductor superlattices, BULL. AM. PHYS. SOC. 47 (2002) 889
23. H. Kępa, T.M. Giebultowicz, Studies of interlayer magnetic coupling in all-semiconductor superlattices by means of neutron scattering techniques, ACTA PHYS. POLON. A 102 (2002) 21
24. H. Kępa, J. Kutner-Pielaszek et al., Polarized neutron reflectometry studies of GaMnAs/GaAs superlattices, APPLIED PHYSICS A 74 (2002) S1526
25. D. Klinger et al., Study of Si-implanted and thermally annealed layers of silicon by using X-ray grazing incidence methods, ACTA PHYS. POLON. A 101 (2002) 795, coauthor: M. Lefeld-Sosnowska
26. G. Kowalski, I. Frymark et al., On the properties of the Be-doped low temperature MBE GaAs layers, MATERIALS SCIENCE AND ENGINEERING B 91–92 (2002) 449
27. B. Pałosz et al., Difraction studies of nanocrystals: theory and experiment, ACTA PHYS. POLON. 102 (2002) 57, coauthors: E. Grzanka, R. Pielaszek
28. R. Pielaszek et al., Influence of high pressure on the polytype structure of nanocrystalline GaN, DIFFUSION AND DEFECT FORUM 208–209 (2002) 189, coauthor: E. Grzanka
29. R. Pielaszek et al., X-ray characterization of nanostructured materials, DIFFUSION AND DEFECT FORUM 208–209 (2002) 267, coauthor: E. Grzanka
30. K. Wieteska et al., Studies of Growth Bands in Si:Ge Crystals, MATERIALS SCIENCE AND ENGINEERING B 91–92 (2002) 462, coauthors: M. Lefeld-Sosnowska, M. Regulska

31. K. Wieteska et al., Interference Fringes in the Plane Wave Topographic Images of Growth Bands in Si:Ge, ACTA PHYSICA POLONICA A 101 (2002) 729, coauthors: M. Lefeld-Sosnowska, M. Regulska
32. E. Zielińska-Rohozińska et al., High resolution x-ray diffraction defect structure characterization in Si-doped and undoped GaN films, MATERIALS SCIENCE AND ENGINEERING B 91–92 (2002) 441, coauthors: M. Regulska, J. Borowski

INVITED TALKS (2001–2002)

1. J. Gronkowski, X-ray high-resolution diffractometry for studies of semiconductor materials, VI Polish Conference On Crystal Growth PCCG-VI, 20–23 May 2001, Poznań
2. J. Gronkowski, Coherence properties of X-ray beams, 20th European Crystallographic Meeting ECM20, 25–31 August, 2001, Kraków
3. H. Kępa, Polarized neutron reflectometry studies of GaMnAs/GaAs superlattices, International Conference on Neutron Scattering ICNS 2001, 9–13 September 2001, Munich, Germany
4. H. Kępa, Studies of interlayer magnetic coupling in all-semiconductor superlattices by means of neutron scattering techniques, 4th International School and Symposium on Physics in Materials Science IV ISSPMS'01, 23–29 September 2001, Jaszowiec
5. H. Kępa, Neutron reflectometry studies of interlayer coupling in ferromagnetic semiconductor superlattices, American Physical Society March Meeting 2002, 18–22 March, Indianapolis, USA
6. H. Kępa, Neutron reflectometry studies of interlayer coupling in all-semiconductor ferromagnetic superlattices, American Conference on Neutron Scattering, 23–27 June 2002, Knoxville, USA
7. H. Kępa, Polarized neutron reflectivity studies of magnetic semiconductor superlattices, International Workshop on Polarized Neutrons in Condensed Matter Investigations, PNCMI 2002, 16–19 September 2002, Jülich, Germany

LABORATORY OF MEDICAL PHYSICS

Head: Prof. dr hab. Katarzyna Blinowska
Address: Laboratoty of Medical Physics**,** Institute of Experimental Physics, Warsaw University, 69 Hoża St., 00-681 Warsaw
Phone: (+48 22) 625 45 35, (+48 22) 55 32 144
Fax: (+48 22) 55 32 320
E-mail: kjbli@fuw.edu.pl
Senior Staff Members: Prof. dr hab. Katrzyna Blinowska
Scientific Staff: 5 persons
ETA (Engineers, Technicians, Administration): 2 persons
Number of grants in 2001-2002: 1

SCIENTIFIC ACTIVITY

Areas of scientific activity:
Mechanisms of oscillatory electrical activity of neural populations during different behavioral states. Information extraction from noisy biological time series. Time - frequency structure of EEG. Brain electric activity during planning of movement. Information flow of brain electric activity connected with information processing. Generation of epileptic discharges, their evolution and bifurcation patterns.

Methods:
- High-resolution time-frequency methods of signal analysis: wavelet transform and its generalization – Matching Pursuit (MP).
- Vector autoregressive parametric model for multichannel time series – determination of propagation of EEG activity and coherence between signals.
- Computational modeling of brain electric activity – extended lumped neural population models.
- Artificial Neural Networks for classification and identification purposes. Independent Component Analysis.

Main achievements:
- The first method of statistical significance assessment of signal energy density changes in time-frequency space was designed.
- The EEG correlates of the imaginary movement planning were found as a topographically dependent interrelation between gamma and beta rhythms.
- Introduction of adaptive time-frequency parameterization in pharmaco EEG, leading to improved assessment of the drug influence on brain.
- The extension of the Granger causality concept to the multichannel processes, implicating the determination of the time relationships between the channels of the process.

Apparatus
System for measurement of multichannel EEG time-series, comprising shielding from external fields.

M.Sc. (magister) theses: (2001-2002)

1. Iwona Andryszczak, Badanie metodą DTF oddziaływań między strukturami mózgu zaangażowanymi w generację ruchu (Investigation the interactions between brain structures during movement by means of DTF method), 2001, supervisor: doc. dr hab. Stefan Kasicki
2. Krzysztof Grudziński, Analiza bifurkacyjna modelu sieci wzgórzowo-korowej (Bifurcation analysis of neuronal thalamocortical network model – written in English), 2001, supervisor: dr Piotr Suffczyński
3. Sławomir Jabłonowski, Wpływ nowego bodźca awersyjnego na analizę widmową lokalnych potencjałów polowych (LEP) w korze czuciowej szczura (The influence of a new aversive stimulus on the spectral characteristics of local field potentials in the rat cortex) 2001, supervisor: prof. dr hab. Andrzej Wróbel
4. Wiesław Jędrzejczak, Analiza odpowiedzi EEG na bodźce mechaniczne przy użyciu Analizy Składowych Niezależnych Dopasowania Kroczącego i FFT (Analysis of event related potentials evoked by mechanical stimulus, by means of Independent Component Analysis, Matching Pursuit and FFT), 2001, supervisor: dr Piotr J. Durka
5. Michał Król, Liniowy problem odwrotny elektroencefalografii (Linear inverse problem in electroencephalography), 2001, supervisor: prof. dr hab. Katarzyna Cieślak-Blinowska
6. Marek Matysiak, Zastosowanie algorytmu genetycznego do estymacji parametrów stochastycznych równań różniczkowych (An Application of Genetic Algorithm to Estimate Parameters of Stochastic Differential Equations, - written in English), 2001, supervisor: dr Piotr Suffczyński
7. Witold Sktrzyński, Pomiary i weryfikacja parametrów fizycznych tomografu CT dla potrzeb planowania teleradioterapii (Measurement and verification of physical parameters of CT tomograph for the radiotherapy planning), 2001, supervisor: prof. dr hab. Jerzy Tołwiński

8. Artur Spasiński, Segmentacja obrazów medycznych (Segmentation of the medical images), 2001, supervisor: dr Piotr J. Durka
9. Agnieszka Stańczyk, Pomiary parametrów stanowiska do kalibracji dawkomierzy mammograficznych wraz z ich kontrolą dozymetryczną, z uwzględnieniem międzynarodowych zaleceń dla wzorców wtórnych (Measurement of the mammographic dosemeters calibration parameters, including international standards), 2001, supervisor: prof. dr hab. Jerzy Tołwiński
10. Wojciech Zbijewski, Propagacja pola elektrycznego mózgu w strukturach warstwowych (Propagation of brain electric fields in brain layers), 2001, supervisor: prof. dr hab. Katarzyna Cieślak-Blinowska
11. Małgorzata Zienkiewicz, Analiza wpływu typu synaps na generację czynności rytmicznej – badania modelowe (Analysis of the influence of the synaps kind on the generation of rhythmic activity – modeling study), 2001, supervisor: doc. dr hab. Stefan Kasicki
12. Mateusz Bocianowski, Zastosowanie sieci neuronowych do kwalifikacji sygnału EEG towarzyszącego czynności motorycznej (Application of neural networks to the quantification of EEG signal connected with motor action), 2002, supervisor: prof. dr hab. Katarzyna Cieślak-Blinowska
13. Michał Dobaczewski, Modułowy system analizy EEG snu (Modular system of sleep EEG analysis), 2002, supervisor: dr Piotr J. Durka
14. Rafał Kuś, Badanie rozprzestrzeniania się czynności EEG w strukturach mózgu zwierząt doświadczalnych, w trakcie kontrolowanej uwagi, przy pomocy krótkoczasowej funkcji przejścia (SDTF) (Investigation of the EEG activity propagation in brain structures during controlled attention, by means of Short-time Directed Transfer Function (SDTF)), 2002, supervisor: dr Maciej Kamiński
15. Anna Zawadzka, Dozymetria wiązek promieniowania X formowanych przez kalimator wielolistkowy (Dosimetry of X rays beams formed by the multi-leaf collimator), 2002, supervisor: dr Wojciech Bulski

PUBLICATIONS (2001-2002)

1. P. J. Durka. D. Ircha, K.J. Blinowska, Stochastic Time-Frequency Dictionaries for Matching Pursuit, IEEE TRANSACTIONS ON SIGNAL PROCESSING 49 (2001) 507
2. P. J. Durka, D. Ircha et al., Time-frequency microstructure of event-related EEG desynchronization (ERD) and synchronization (ERS), MED. & BIOL. ENG. AND COMPUTING 39 (2001) 315, coauthors: C. Neuper, G. Pfurtscheller,
3. J. Żygierewicz, K.J. Blinowska, P. Suffczyński, A model of sleep spindle generation, NEUROCOMPUTING 38-40 (2001) 1619
4. J. Ginter Jr., M. Kamiński, K.J. Blinowska, Determination of EEG activity propagation during voluntary finger movement, ESEM, Belfast. TECHNOLOGY AND HEALTH CARE 9 (2001) 169
5. P.J. Durka, K.J. Blinowska, Unbiased high resolution method of EEG analysis in time-frequency space, ACTA NEUROBIOLOGIAE EXPERIMENTALIS 61 (2001) 157
6. J. Ginter Jr., K.J. Blinowska, M. Kamiński et al., Phase and amplitude analysis in time-frequency space – application to voluntary finger movement, J NEUROSCI. METHODS 110 (2001) 113, coauthor: P.J. Durka
7. M. Kamiński et al., Evolution casual relations in neural systems: Granger Casuality, Directed Transfer Function (DTF) and Statistical Assessment of Significance Inverse Problems of the Electric Fields of the Brain, BIOL. CYBERN. 85 (2001) 145
8. P. Suffczyński et al., Computational model of thalamo-cortical networks: dynamical control of alpha rhythms in relation to focal attention, INTERNATIONAL JOURNAL OF PSYCHOPHYSIOLOGY 43 (2001) 25, coauthors: S. Kalitzin, G. Pfurtscheller, FH. Lopes da Silva
9. P.J. Durka, K.J. Blinowska, A Unified Time-Frequency Parameterization of EEGs, IEEE ENGINEERING IN MEDICINE AND BIOLOGY MAGAZINE, Special Issue: EEG ANALYSIS AND MODELLING FOR DETECTION AND CLASSIFICATION OF NEURAL PATTERNS 20 (2001) 47
10. P.J. Durka, W. Szelenberger, K.J. Blinowska et al., Adaptive time-frequency parameterization in pharmaco EEG, JOURNAL OF NEUROSCIENCE METHODS, 117 (2002) 65, coauthors: W. Androsiuk, M. Myszka

INVITED TALKS (2001-2002)

1. K.J. Blinowska, Methods of Time-Frequency Analysis of Brain Electrical Activity, PROC. OF WORLD CONGRESS NEUROINFORMATICS, Vienna, 09.2001
2. K.J. Blinowska, Time-Frequency Methods in a Study of Voluntary Movements, 23rd INTERNATIONAL CONFERENCE OF THE IEEE, Istanbul, X, 2001

LABORATORY OF STRUCTURE AND LATTICE DYNAMICS

Head: Prof. dr hab. Izabela Sosnowska
Address: Laboratory of Structure and Lattice Dynamics**,** Institute of Experimental Physics, Warsaw University, 69 Hoża St., 00-681 Warsaw
Phone: (+48 22) 628 72 52
Fax: (+48 22) 628 72 52
E-mail: izabela@fuw.edu.pl
Senior Staff Members: Prof. dr hab. Izabela Sosnowska, dr hab. Ryszard Kutner (associate professor) (until 28 February 2002)
Scientific Staff (total): 3 persons
ETA (Engineers, Technicians, Administration) : 1 person
Number of grants in 2001-2002: 3

SCIENTIFIC ACTIVITY

Areas of scientific activity:
Static and dynamic properties of condensed matter. Crystal and magnetic structure of materials such as: magnetic materials disordered systems, ferroelectrics-antiferromagnets and protonic conductors. Interactions in condensed matter. Static and dynamical properties of lattice gases. Non-Gaussian stochastic processes particulary the Lévy ones.

Methods:
Scattering of neutrons, X-rays and synchrotron radiation in solids. Computer simulation techniques.

Main achievements:
1. The magnetic ordering of nanocrystalline Cr (n-Cr) was studied by neutron diffraction [1]. These studies have shown that n-Cr has a spin density wave modulated magnetic ordering characteristic for single crystals of Cr. However the magnetic phase transitions observed in n-Cr occur at different temperatures as compared with Cr single crystals.
2. The magnetic ordering of the magnetic moments of Mn^{3+} and Mn^{4+} ions in the mixed valence system $CaCu_xMn_{7-x}O_{12}$ was studied by neutron diffraction. The system without Cu doping (x=0) shows a behaviour characteristic for 3-dimensional Ising systems [2]. The system with small Cu doping (x=0.3) shows a modulated magnetic ordering with a reduced coherence length [3].
3. The crystallographic phase transition in $CaMn_7O_{12}$ was studied by high resolution neutron and synchrotron radiation diffraction at ILL and ESRF Grenoble. The studies have shown an unusual phase coexistence of large domains of the high and low temperature phases at temperatures from 410 K to 450 K [4]
4. Newton diffraction studies have shown that the modulation of magnetic structure of $BiFeO_3$ changes drastically when a part of the iron ions are replaced by manganese ions. [5,6].
5. The crystal microstructure of electrodeposited n-Ni, n-Co [7] and n-Cr [8] was studied by small angle neutron scattering. All these nanocrystalline materials show a fractal-like density autocorrelation function. This specific microstructure is probably due to the electrochemical preparation method.
6. The principal role of rare and extreme events present in the frame of Lévy processes were studied within the Continuous-time Random Walk formalism by using Weierstrass hierarchical pausing-time distribution which involves the spatial-temporal coupling. Moreover, scaling and breaking of scaling were analysed and higher-order analysis (e.g., by using kurtosis and non-linear autocorrelations) was developed [9-11].

Equipment:
X-ray diffractometer SEIFERT ID-3003 with a diffractometer HZG-4 and triple axis neutron spectrometer TKSN-420 (used together with the Division of Structure Research). Experiments were performed also at the ISIS neutron spallation source, at Berlin Neutron Scattering Center, at Jülich Research Center, at Institute Laue-Langevin (ILL) and at European Synchrotron Radiation Facility (ESRF), Grenoble, using neutron scattering and synchrotron radiation diffractometers.

B.Sc. (licentiate) theses (2001-2002)

1. Elżbieta Janowicz, Symulacja Monte Carlo statystyki Maxwella-Boltzmanna pod Javą w Internecie (Monte Carlo simulation of Maxwell-Boltzmann statistics under the Java in Internet), 2001, supervisor: dr hab. Ryszard Kutner

M.Sc. (magister) theses (2001-2002)

1. Andrzej Palewicz, Badanie wymiaru fraktalnego materiałów porowatych o strukturze fraktalnej na przykładzie dywanu i gąbki Sierpińskiego, 2001, supervisor: dr hab. Ryszard Kutner

PUBLICATIONS (2001-2002)

1. I. Sosnowska, W. Schäfer, W. Kockelmann et al., Neutron Diffraction Studies of the Crystal and Magnetic Structures of $BiMn_xFe_{1-X}O_3$ Solid Solutions, MATERIALS SCIENCE FORUM, 378-381 (2001) 616, coauthor: I. O. Troyanchuk
2. R. Przeniosło, R. Winter, H. Natter et al., W. Wagner Fractal pore distribution and magnetic microstructure of pulse-electrodeposited nanocrystalline Ni and Co, PHYS. REV. B 63 (2001), 054408, coauthors: M. Schmelzer, R. Hempelmann
3. R. Przeniosło, J. Wagner, H. Natter, R. Hempelmann, W. Wagner, Studies of the fractal microstructure of amorphous and nanocrystalline chromium obtained by electrodeposition, J. ALLOYS and COMP., J. ALLOYS and COMP. 328 (2001) 259
4. R. Kutner (translator): Dynamika chaotyczna a geneza praw statystycznych (Chaotic dynamics and the origin of statistical laws, G.M. Zaslavsky, PHYSICS TODAY 52, no.8 (1999) 39), POSTĘPY FIZYKI 52, zeszyt 3 (2001) 113
5. R. Przeniosło, I. Sosnowska, G. Rousse et al., Magnetic Ordering in Electrodeposited Nanocrystalline Chromium Particles, PHYS. REV. B 66 (2002) 014404, coauthor: R. Hempelmann
6. R. Przeniosło, I. Sosnowska, E. Suard et al., Magnetic Order Parameter in the Perovskite System $CaMn_7O_{12}$, APPLIED PHYSICS A74 (2002) S1731, coauthor: T. Hansen
7. R. Przeniosło, M. Regulski, I. Sosnowska et al., Modulated Magnetic Ordering in the Cu-doped Pseudoperovskite System $CaCu_xMn_{7-x}O_{12}$, J. PHYS.: CONDENS. MATTER 14 (2002) 1061, coauthor: R. Schneider
8. R. Przeniosło, I. Sosnowska, E. Suard et al., Phase Coexistence in the Charge Ordering Transition in $CaMn_7O_{12}$, J. PHYS.: CONDENS. MATTER 14 (2002) 5747, coauthors: A. Hewat, A.N. Fitch
9. I. Sosnowska, W. Schäfer, W. Kockelmann et al., Crystal Structure and Spiral Magnetic Ordering of $BiFeO_3$ Doped with Manganese, APPLIED PHYSICS A74 (2002) S1040, coauthors: K.H. Andersen, I.O. Troyanchuk
10. R. Kutner, Extreme events as foundation of Lévy walks with varying velocity, CHEM. PHYS. 284 (2002) 481, Special Issue entitled: Strange Kinetics, eds. R. Hilfer, R. Metzler, A. Blumen, J. Klafter
11. R. Kutner, Higher-order analysis within Weierstrass hierarchical walks, COMP. PHYS. COMM. 147 (2002) 565
12. R. Kutner, Chaos deterministyczny, (Deterministic Chaos) Dyfuzja (Diffusion), Dyfuzja anomalna (Anomalous Diffusion) – articles in Wielka Encyklopedia PWN (PWN Great Encyclopaedia) Vol.7, PWN SA, Warszawa 2002; also articles and entries in Encyklopedia Nauki I Techniki Vol. 1 I 2 (extended version of the Concise Encyclopaedia of Science and Technology, McGraw-Hill, 1998), Prószyński I S-ka S.A., Warszawa 2002

INVITED TALKS (2001-2002)

1. R. Kutner, Non-Gaussian Processes in Non-Linear Dynamics, European Interdisciplinary School on Nonlinear Dynamics for System and Signal Analysis, EUROATTRACTOR 2001, Warsaw 2001
2. R. Kutner, Non-Gaussian stochastic processes and thermalized stochastic time series, Intern. Workshop on Complex Systems in Natural and Social SciencesCSNSS'01, Toruń 2001
3. R. Kutner, Toward Stochastic Forecasting of Stock Market Indices, Intern. Conf. On Horizons in Complex Systems, in Honor of Gene Stanley's 60 Birthday, Messina 2001
4. R. Kutner, Non-Gaussian stochastic processes and thermalized stochastic time series, Int. Workshop on Complex Systems in Natural and Social Sciences (CSNSS'01), Toruń 2001 (LSLD)
5. R. Kutner, Toward Stochastic Forecasting of Stock Market Indices, International Conf. On Horizons in Complex Systems, in Honor of Gene Stanley's 60. Birthday, Messina 2001 (LSLD)
6. R. Kutner, International Conference on Computational Physics CCP 2001, Aachen 2001 (LSLD)
7. R. Przeniosło et al., Phase separation and anisotropic lattice expansion in manganites $CaCu_xMn_{7-x}O_{12}$, International School and Symposium on Synchrotron Radiation in Natural Sciences, Jaszowiec, Poland , 17-22 June 2002
8. R. Przeniosło, Magnetic ordering in electrodeposited nanocrystalline Chromium particles". Seminar on Nanotechnology for Fabrication of Hybrid Materials, Toyama, Japan, 6-8 November 2002
9. R. Przeniosło, Phase separation in $CaMn_7O_{12}$, Workshop on Highly Correlated Electron Systems, ESRF Grenoble, 11-12 Feb. 2002

INTERNATIONAL CONFERENCES ORGANIZED BY LABORATORY (2001-2002)

1. I. Sosnowska, member of International Programme and Organizing Committee of the 5^{th} International School and Symposium on Synchrotron Radiation in Natural Science, 17-23 June 2002, Jaszowiec, Poland

Scientific Symposium IEP 2002 – a short summary

The purpose of these Symposia, held every two years (the first one in December 1994), is to inform members of the Institute of Experimental Physics about the scientific activities of the various research groups. The Institute is quite diversified scientifically, and subjects range from particle physics to biophysics. Members from different divisions may thus gain some insight into the scientific activities and achievements of their colleagues from neighbouring laboratories. Undergraduate students, who, during their seventh semester, must select the field for their M. Sc. thesis, also have an opportunity to learn more about activities and personalities in different divisions of the Institute. The Organizing Committee, consisting of nine members of the Institute (J. Ciborowski, E. Czerwosz, J. Gaj, M. Geller, P. Kowalczyk, W. Kurcewicz, T. Matulewicz, I. Sosnowska & M. Staszel), was formed in the spring of 2002.

The duration of the Symposium was fixed to two days, which enables presentation of major achievements of all divisions of the Institute during the 2000-2002 period. The Organizing Committee also invited colleagues from the Institute of Geophysics to present their studies. Additional information was presented at a poster session organized by Paweł Kowalczyk. A special jury (Michał Baj, Krzysztof Doroba, Paweł Kowalczyk, Marianna Kraińska-Miszczak, and Teresa Rząca-Urban) awarded prizes for poster presented by Łukasz Świderski.

During the Symposium, the Dean of the Faculty awarded Dr Andrzej Wysmołek the Stefan Pieńkowski prize, and dr hab. Aleksander F. Żarnecki – The Grzegorz Białkowski prize. Another jury (M. Kicińska-Habior, M. Baj, and J. Kamiński) presented the results of student evaluation of lectures and laboratory for both semesters of the academic year 2001/2002. Prizes were awarded to dr Rafał Fruboes, dr. Agnieszka Jaroń, dr Krzysztof Korona, dr hab. Tomasz Matulewicz, dr hab. Andrzej Witowski, and prof. Andrzej Kajetan Wróblewski.

Furthermore, as during the previous Symposium, laboratory demonstrations, selected by competition, were presented by students. The purpose of these demonstrations was to present in a simple and elegant form some physical phenomenon in a manner intelligible to the public. The first prize went to Piotr Nieżurawski and the second went to Grzegorz Kubalski (Jury members: Jan Bartelski, Jan Gaj, Andrzej Gołębiewski, Michał Nawrocki, and Filip Żarnecki). This type of competition will be continued at future Symposia.

Lectures, poster sessions, and lab demonstrations were well attended by both staff and students.

On behalf of
the Organizing Committee
Maciej Geller

SYMPOZJUM IFD 2002
13 -14 grudnia 2002

Piątek : 13 XII **9:00 – 9:15** **9:15 – 9:45**	**Otwarcie sympozjum** **Dziekan : prof. Jan Bartelski** **Dyrektor IFD : prof. Andrzej Twardowski** **Wręczenie nagród:** • **im. Rektorów:** • **Stefana Pieńkowskiego i Grzegorza Białkowskiego** • **dydaktycznych - Dziekana Wydziału Fizyki** • **Dziekanów Wydziałów: Matematyki, Informatyki i Mechaniki oraz** • **Fizyki dla autora roku czasopisma „Delta”**	
Przerwa 9:45 – 9:50		
Przewodniczący: prof. Andrzej Kajetan Wróblewski		
9:50 – 10:25	**Katarzyna Perl**	**W poszukiwaniu sygnałów plazmy kwarkowo-gluonowej**
10:25 – 11:00	**Piotr Wasylczyk**	**Krótkich światła impulsów przypadki nieliniowe**
11:00 – 11:35	**Radosław Przeniosło**	**Niezwykłe właściwości nanokryształów chromu**
11:35 – 12:05	**kawa i herbata**	
Przewodniczący: prof. Janusz Zakrzewski		
12:05 – 12:40	**Roman Walczak**	**Warszawska grupa w DESY – historia i teraźniejszość; Dyfrakcja w świecie kwarków**
12:40 – 13:15	**Teresa Rząca-Urban**	**Wirujące dipole magnetyczne w jądrach atomowych**
13:15 – 14:45	**Kanapki + sesja plakatowa**	
	Konkurs pokazów fizycznych	
Przewodniczący : prof. David Shugar		
15:15 – 15:50	**Józef Ginter**	**Czy można z EEG odczytać myśl? – ku „Brain Computer Interface”**
15:50 – 16:25	**Borys Kierdaszuk**	**Spektroskopia emisyjna poznaje kompleksy cząsteczek: enzym-substrat-inhibitor**
16:25 – 17:00	**Konkurs pokazów fizycznych (c.d.)**	
17:00 – 18:00	**Sesja plakatowa**	

Sobota 14.XII.2002		
Przewodniczący: prof. Jan Żylicz		
9:00 – 9:35	**Marek Pfützner**	**Odkrycie promieniotwórczości dwuprotonowej**
9:35 – 10:00	**Ernest Grodner**	**Pikosekundowe czasy życia poziomów jądrowych mierzone w warszawskim cyklotronie**
10:00 – 10:35	**Ewa Grzanka**	**Dyfrakcyjne badania powierzchni nanokryształów**
10:35 – 11:05	**kawa i herbata**	
Przewodnicząca: prof. Ewa Skrzypczak		
11:05 – 11:40	**Ryszard Kutner**	**Termalizacja i relaksacja w doświadczeniach numerycznych - pokazy**
11:40 – 12:15	**Andrzej Wysmołek**	**Spektroskopia domieszkowa w silnych polach magnetycznych**
12:15 – 12:50	**Marta Gryglas**	**Rezonansowe tunelowanie przez pojedyncze domieszki**
12:50 – 13:25	**Mirosław Andrejczuk**	**Numeryczne modelowanie turbulencji**
13:25 – 13:45	**Ogłoszenie wyników konkursu pokazów fizycznych Ogłoszenie wyników konkursu plakatów IFD'2002**	
13:45 – 14:00	**Podsumowanie sympozjum: prof. Andrzej Twardowski**	

- **Skład Jury Konkursu Pokazów: Jan Bartelski, Jan Gaj, Andrzej Gołębiewski, Michał Nawrocki, Filip Żarnecki**
- **Skład Jury Konkursu Plakatów: Michał Baj, Krzysztof Doroba, Paweł Kowalczyk, Marianna Kraińska-Miszczak, Teresa Rząca-Urban**

Zespół Organizacyjny:

Jacek Ciborowski, Elżbieta Czerwosz, Jan Gaj, Maciej Geller, Paweł Kowalczyk, Wiktor Kurcewicz, Tomasz Matulewicz, Izabela Sosnowska, Magdalena Staszel

SYMPOSIUM IEP 2002
13-14 December 2002

Friday 13.12.2002		
9:00 – 9:20	Opening of the Symposium Dean: prof. Jan Bartelski Director of IEP: prof. Andrzej Twardowski	
Chairperson: prof. Andrzej Kajetan Wróblewski		
9:50 – 10:25	Katarzyna Perl	Looking for quark gluon plasma signatures
10:25 – 11:00	Piotr Wasylczyk	Nonlinear effects with ultrashort light pulses
11:00 – 11:35	Radosław Przeniosło	Unusual properties of nanocrystalline chromium
11:35 – 12:05	Tea or cofee	
Chairperson: prof. Janusz Zakrzewski		
12:05 – 12:40	Roman Walczak	The Warsaw group in DESY: The past and the present
12:40 – 13:15	Teresa Rząca-Urban	Rotating magnetic dipoles in atomic nuclei
13:15 – 14:45	Lunch + poster session	
14:45 – 15:15	Competition for demonstration of experiment	
Chairperson: prof. David Shugar		
15:15 – 16:25	Józef Ginter	Toward "Brain Computer System"
15:50 – 16:25	Borys Kierdaszuk	Emission spectroscopy of enzyme-substrate-inhibitor complexes
16:25 – 17:00	Competition for demonstration of experiment (c.d.)	
17:00 – 18:00	Poster session	

Saturday 14.12.2002		
Chairperson: prof. Jan Żylicz		
9:00 – 9:35	Marek Pfutzner	Discovery of thow-proton radioactivity
9:35 – 10:00	Ernest Grodner	Pikosecond life time of nuclei levels measured in Warsaw cyclotrone
10:00 – 10:35	Ewa Grzanka	X-ray diffraction study of nanocrystals surface
10:35 – 11:05	Tea or cofee	
Chairperson: prof. Ewa Skrzypczak		
11:05 – 11:40	Ryszard Kutner	Thermalization and relaxation in numerical experiments
11:40 – 12:15	Andrzej Wysmołek	High magnetic field spectroscopy of impurity states in semiconductors
12:15 – 12:50	Marta Gryglas	Resonant tunneling through a single impurity
12:50 – 13:25	Mirosław Andrejczuk	Numerical modeling of turbulences
13:25 – 13:45	Annoucement of results of the competition: Demonstation of experiment Annoucement of results of the poster competitions: IEP 2002	
13:45 – 14:00	Summary of the Symposium: prof. Andrzej Twardowski	

Organizing Comittee:
Jacek Ciborowski, Elżbieta Czerwosz, Jan Gaj, Maciej Geller, Paweł Kowalczyk, Wiktor Kurcewicz, Tomasz Matulewicz, Izabela Sosnowska, Magdalena Staszel

SYMPOSIUM IEP'2002 – poster session

Acronyms following the author's list signify a particular Division or Laboratory within the Institute according to the scheme:

BIO – Division of Biophysics
NP – Division of Nuclear Physics
NS – Division of Nuclear Spectroscopy
OP – Division of Optics
PFI – Division of Particles and Fundamental Interactions
PE – Division of Physics Education
SS – Division of Solid State Physics
SR – Division of Structure Research
MP – Laboratory of Medical Physics
SLD – Laboratory of Structure and Lattice Dynamics

1. A. Majerowski, M. Maciejczyk (PE)
   Animacje w nauczaniu fizyki
   Animations in Physics Education

2. A. Galant, A. Majerowski, R. Kutner (PE)
   Druga zasada termodynamiki w sformulowaniu Clausiusa - doświadczenie numeryczne
   Second law of thermodynamics by Clausius formulation - numerical experiment

3. M. Gall, D. Żebrowski, R. Kutner (PE)
   Rozpad radioaktywny - doświadczenie numeryczne w Javie
   Radioactive decay - numerical experiment in Java

4. M. Staszel, A. Majhofer, P. Olasek (PE)
   Żywe organizmy oczami fizyka
   Living organisms in the eye of a physicist

5. **Fizyka w gimnazjum i liceum ogólnokształcącym. Podręczniki i programy nauczania autorstwa Anny Kaczorowskiej** (PE)
   Physics in the lower and upper secondary school. Textbooks and curricula by Anna Kaczorowska

6. **Fizyka w gimnazjum: podręczniki, zeszyty ćwiczeń, programy nauczania autorstwa Stefanii Elbanowskiej** (PE)
   Physics in the lower secondary school. Textbooks, students' activities and curriculum by Stefania Elbanowska

7. **Przyroda w podręcznikach, zeszytach ćwiczeń i programach nauczania autorstwa Stefanii Elbanowskiej** (PE)
   Primary science in textbooks, students' activities and curriculum by Stefania Elbanowska

8. **Przyroda dla nauczycieli** (PE)
   Primary science for teachers

9. **My w mediach...**(PE)
   Our students in popular press

10. J. Gronkowski, J. Borowski (SR)
    Twierdzenie Wienera-Chinczyna dla promieniowania rentgenowskiego
    The Wiener-Khinchine theorem for x-ray radiation

11. J. Borowski, J. Gronkowski (SR)
    Numeryczne rozwiązania równań Takagiego-Taupina dla deformacji zależnych od głębokości
    Numerical solutions of Takagi-Taupin equations for depth-dependent deformations

12. V. S. Harutyunian, E. Zielińska-Rohozińska, M. Regulska (SR)
    Badanie wpływu domieszkowania krzemem na kolumnowy wzrost warstw GaN metodami wysokorozdzielczej dyfraktometrii rentgenowskiej
    High resolution x-ray diffraction study of Si doping influence on columnar crystal growth of GaN layers

13. E. Zielińska-Rohozińska, M. Regulska, K. Pakuła, R. Bożek (SR)
    Badanie mikrostruktury cienkich epitaksjalnych warstw $Al_xGa_{1-x}N$ metodami dyfrakcji w układzie trójosiowym
    Triple axis diffractometric investigations of the microstructure of thin $Al_xGa_{1-x}N$ epitaxial films

14. E. Olszyńska, M. Lefeld-Sosnowska, A. Pajączkowska, A. Kłos (SR)
Defekty sieci krystalicznej w kryształach $GdCa_4O(BO_3)_3$
Growth defects in $GdCa_4O(BO_3)_3$ crystals

15. M. Szymański, S. Pachocka (SR)
Reflektometria rentgenowska supersieci CdTe/MnTe
X-ray reflectometry of CdTe/MnTe superlattices

16. G. Kowalski, I. Frymark, M.Kamińska (SR)
Badania domieszkowanych warstw kryształów GaAs motodą rentgenowskich pomiarów refleksów pseudozabronionych
Investigations of GaAs based layers using x-ray quasi-forbidden reflections measurements

17. A. Niedźwiecka, J. Stępiński, E. Darżynkiewicz, R. Stolarski (BIO)
Termodynamika oddziaływań warstwowych kationu 7-metyloguaniny z tryptofanem w oddziaływaniach końca 5' mRNA z białkowym czynnikiem translacyjnym eIF4E
Thermodynamics of 7-methylguanine cation stacking with tryptophan upon mRNA 5' cap binding to translation factor eIF4E

18. A. Niedźwiecka, J. Stępiński, M. Jankowska-Anyszka, E. Darżynkiewicz, R. Stolarski (BIO)
Specyficzne rozpoznawanie końca 5' mRNA przez białkowy czynnik translacyjny eIF4E odbywa się dzięki wzmocnionemu oddziaływaniu warstwowemu kation-pi
Specific recognition of mRNA 5' cap by translation factor eIF4E results from enhanced cation-pi stacking

19. J. Włodarczyk, G. Stoychev, B. Kierdaszuk (BIO)
Specyficzne oddziaływanie fosforylazy nukleozydów purynowych z E.coli, z formycyną A wyznaczone za pomocą jego wpływu na anizotropię fluorescencji i fosforescencji oraz rezonansowe przeniesienia energii
Specific interaction of E.coli purine nucleoside phosphorylase (PNP) with formycin A determined by its effects on fluorescence and phosphorescence anisotropy and enzyme-ligand fluorescence resonance energy transfer

20. I. Rutkowska, K. Sznee, P. Nejman, G. Stoychev, M. Garstka, B. Kierdaszuk (BIO)
Wpływ tlenu na własności spektralne tylakoidów
Oxygen effect on the spectral properties of thylakoid membranes

21. K. Krawiec, B. Kierdaszuk, E. N. Kalinichenko, E. B. Rubinova, I. A. Mikhailopulo, S. Eriksson , B. Munch-Petersen, D. Shugar (BIO)
Zdolność adenozyno-2'(3')-trifosforanów i ich analogów do zastąpienia ATP w roli donora grupy fosforanowej dla ludzkich kinaz deoksyrybonukleozydowych, oraz kinazy pochodzącej z Drosophila melanogaster
Ability of adenosine-2'(3')-deoxy-3'(2')-triphosphates, and related analogues, to replace ATP as phosphate donor for all human, and Drosophila melanogaster, deoxyribonucleoside kinases

22. G. Stoychev, B. Kierdaszuk, D. Shugar (BIO)
Oddziaływanie fosforylazy nukleozydów purynowych (PNP) z E.coli z formą kationową i obojnaczą fluorescencyjnego substratu 7-metyloguanozyny
Interaction of E. coli purine nucleoside phosphorylase (PNP) with the cationic and zwitterionic forms of the fluorescent substrate N(7)-methylguanosine

23. A.Ukleja (PFI)
Struktura nukleonu (Eksperyment ZEUS)
Nucleon structure (ZEUS experiment)

24. M. Gryglas, M. Baj, B. Jouault, G. Faini, A. Cavanna (SS)
Rezonansowe tunelowanie przez stany pojedyńczych domieszek w strukturach GaAs/AlAs/GaAs
Resonant Tunnelling through single donor states in GaAs/AlAs/GaAs devices

25. K. Kowalik, A. Kudelski, J. A. Gaj (SS), T. Wojtowicz (Instytut Fizyki PAN) O. Krebs, P. Voisin (Laboratoire de Photonique et Nanostructures, CNRS, Route de Nozay, 91460 Marcoussis, France)
Optyczna anizotropia w płaszczyźnie parabolicznych i półparabolicznych studni kwantowych z CdTe/CdMnTe
In-plane optical anisotropy of half-parabolic and parabolic CdTe/CdMnTe quantum wells

26. A. Wołoś, M. Zając, M. Palczewska, M. Kamińska, A. Twardowski, M. Boćkowski, I. Grzegory, S. Porowski (SS)
Domieszka Mn w kryształach GaN
Mn impurity in GaN monocrystals

27. P. Płochocka, P. Kossacki, W. Maślana, J. Cibert, S. Tatarenko, C. Radzewicz , J. Gaj (SS)
Badania dynamiki naładowanych i neutralnych ekscytonów w pojedyńczej studni kwantowej
Femtosecond dynamics of neutral and charged exciton in single QW

28. J. Siwiec-Matuszyk, M. Baj, A. Babiński, D. Wasik (SS)
Gdzie jest elektron?
Where is an electron?

29. W. Maślana[1,2], M. Bertolini[2], P. Kossacki[1,2], D. Ferrand[2], J. Cibert[2], S. Tatarenko[2], and J. A. Gaj[1] (1) Institute of Experimental Physics, Warsaw University, Hoża 69, 00-681 Warsaw, Poland; SS, (2)CEA-CNRS-UJF Grenoble Group "Nanophysique et Semiconducteurs", Laboratoire de Spectrométrie Physique, B.P.87, 38402 Saint Martin d'Heres Cedex, France
Zmiana fazy magnetycznej spowodowana obecnością nośników ładunku w studniach kwantowych Cd_{1-x} Mn_xTe z dużą zawartością Mn
Carrier-induced magnetic phase transition in $Cd_{1-x}Mn_xTe$ quantum wells with high Mn content

30. M. Szot[1], K. Karpierz[1], J. Kossut[2] , M. Grynberg[1] ([1]Institute of Experimental Physics, Warsaw University, Warsaw, Poland, SS, [2]Polish Academy of Sciences, Warsaw, Poland) (SS)
Wewnątrzdomieszkowe przejścia elektronów zlokalizowanych przez fluktuacje potencjału w jednorodnie domieszkowanych jodem studniach kwantowych $CdTe/Cd_{1-x}Mg_xTe$
Intra-impurity transitions of electrons localized by potential fluctuations in uniformly Iodine doped $CdTe/Cd_{1-x}Mg_xTe$ quantum wells

31. J. Suffczyński, L. Kłopotowski, M. Nawrocki, E. Janik (SS)
Tunelowanie spolaryzowanych spinowo ekscytonów w układzie dwóch sprzężonych studni kwantowych
Tunelling of spin polarized excitons in coupled double quantum wells structures

32. T. Słupiński, H. Munekata, A. Oiwa (SS)
Ferromagnetyzm o temperaturze Curie 100 K w heterostrukturach (In,Ga,Mn)As/InGaAs/InP(001)
Ferromagnetism with Curie temperature 100 K in (In,Ga,Mn)As/InGaAs/InP(001) heterostructures

33. T. Słupiński, E. Zielińska-Rohozińska (SS)
Lokalny porządek atomów Te w silnie domieszkowanym GaAs:Te i efekt lokalizacji elektronów
Local order of Te impurity atoms in heavily doped GaAs:Te and electron localization effect

34. J. Łusakowski , A. Łusakowski (SS)
Dwuskalowa struktura fluktuacji potencjału w polizolacyjnym GaAs
Two-scale structure of potential fluctuations in semi-insulating GaAs

35. R. Marcinkowski, P. Laurent, C. Blondel, J. Grygorczuk, A Sołtan (NP)
Badanie własności transmisyjnych modułu ISGRI/INTEGRAL
Transparency of ISGRI module

36. E. Wójcik, O. Kijewska, M. Kicińska-Habior (NP)
Gigantyczny rezonas dipolowy w lekkich jądrach
Giant dipole resonance in light nuclei

37. K. Piasecki, T. Matulewicz, K. Tymińska, D. d'Enteria (NP)
Podprogowa produkcja mezonów π^0 w reakcjach Ar+C, Ni, Ag, Au przy energii 60 AMeV Subthreshold π^0 production in Ar+C, Ni, Ag, Au collisions at 60 AMeV energy

38. M.M. Smolarkiewicz, M. Kirejczyk, B. Sikora, K. Siwek-Wilczyńska, I.J. Soliwoda (NP)
Analiza intermitencji w przestrzeni pędowej dla reakcji Au+Au przy energiach 150-800 AMeV
Intermittency analysis in momentum space - Au+Au reactions at 150-800 AMeV

39. W. Wasilewski, P. Wasylczyk, M. Matuszewski, M. Trippenbach, C. Radzewicz (OP)
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