Institute
of
Experimental Physics

Faculty of Physics
Warsaw University

1999 - 2000

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PREFACE

At the turn of the century, the Institute of Experimental Physics celebrated its 80th anniversary of foundation in the building at Hoża street shown in the front-cover picture. Like all university institutions in Poland nowadays, the Institute faces various difficulties, keeping, however, its traditional high level of training and research.

At present, the Institute employs 108 physicists (102 full positions), among them 37 professors. It has 63 PhD students who also assist in teaching. The technical and administration staff includes 74 persons (68 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 advanced studies 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 as members of 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, edited by Izabela Sosnowska, covers the years 1999 and 2000. It begins with a general presentation of the teaching activities of the Institute by Michał Baj. This is followed by some detailed information on individual divisions. Finally, there is a report on the Symposium organized in December 2000 by the team headed by Maciej Geller.

Warsaw, April 2001 Jan Żylicz

Teaching activities of the Institute (1999-2000)

Similar to former years, also in the last two academic years, i.e. 1998/99 and 1999/2000, approximately 50% of the teaching activities of the whole Faculty of Physics, Warsaw University, were performed by employees and Ph.D. students of the Institute of Experimental Physics - in average 94 persons out of 105 of the whole scientific staff of the Institute and 39 out of 52 graduate students as well as 8 physicists from the technical staff 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. 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 did not want to finish their studies with B.Sc. but decided to continue until M.Sc. and 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 1999-2000 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 132 students made their M.Sc. theses, 51 got their B.Sc. degree (licentiate), 16 colleagues received their Ph.D. and 5 - the D.Sc. (habilitation).

Michał Baj

DIVISION OF BIOPHYSICS

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Senior Staff Members: prof. dr David Shugar, prof. dr hab. Barbara Czochralska, prof. dr hab. Bogdan Lesyng, dr hab. Ryszard Stolarski (professor), dr hab. Edward Darżynkiewicz (associate professor), dr hab. Maciej Geller (associate professor), dr hab. Ewa Kulikowska (associate professor), dr hab. Mieczysław Remin (associate professor), dr hab. Janusz Stępiński (associate professor), dr hab. Jan Antosiewicz (associate professor), dr. hab. Borys Kierdaszuk (associate professor), dr hab. Michał Dadlez (associate professor).
Scientific Staff (total): 16 persons
ETA (Engineers, Technicians, Administration): 6 persons
Number of grants in 1999-2000: 13

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 the biological activity. Physical basis of molecular mechanisms of gene expression and regulation: initiation of protein biosynthesis, electron and proton transfer, enzymatic phosphorylation and phosphorolysis, protein folding.

Methods:
Experimental: molecular spectroscopy (UV-VIS, fluorescence emission, stopped-flow, NMR, CD), X-ray diffraction, molecular photophysics, electrochemistry, chemistry, enzymology, genetic engineering. Theoretical: classical, Brownian, and quantum molecular dynamics, molecular (computer) modelling, quantum chemistry.

Main achievements:

1. Fluorescence, calorymetry and NMR were employed to study the interactions of various analogues of eukaryotic mRNA 5'-terminus (cap) with 25 kDa cap-binding protein eIF4E as well as its new-isolated isoforms IFE from nematode *C. elegans*. The studies were extended to the ternary complexes, which included eIF4E, cap, and synthetic peptides, fragments of the regulatory proteins eIF4G and 4E-BP. The fluorescence quenching data, confirmed by isothermal titration calorymetry (ITC), provided us with the precise values of the equilibrium association constants and thermodynamic parameters for formation the complexes of various specificity (enthalpy, entropy and heat capacity changes). The data were analysed regarding mechanisms of the molecular recognition in initiation of protein biosynthesis (translation).

2. Protonation equilibria of titrable residues in proteins were analysed on the basis of the Poisson-Boltzmann model of the solute - solvent system. The calculations of the protonation equilibria in the HIV-1 protease aspartyl dyad, free and in complexes with several inhibitors, agree well with the previously measured apparent ionization constants. Similar calculations of the residues important for the catalytic mechanism of protein kinases allowed to identify those, which are responsible for the experimentally observed pH dependence of the enzymes kinetics. Stopped-flow spectrofluorymetry and theoretical simulations of Brownian dynamics were joined to analyse kinetics of binding of 5'- mRNA cap - analogues to eIF4E. At least two-step binding was only moderately dependent on the electrostatic interactions. Computed and experimental bimolecular rate constants were shown to be in a good agreement.
3. Three-dimensional structures of a key enzyme of the nucleic acid metabolism purine nucleoside phosphorylase (PNP EC.2.4.2.1) from three different organisms, calf spleen, *E. coli* and *Cellulomonas*, were obtained by X-ray diffraction studies and compared to each other. Additionally, the structural properties of all three enzymes in solution were characterised *via* enzyme kinetic methods by means of UV and fluorescence spectroscopy. The properties of binding substrates in the enzyme active centers were elucidated, and a novel mechanistic pathway for the reaction catalysed by PNP was proposed. All three enzymes share one common feature, *i.e*. complex kinetic characteristics, which may be due to negative cooperativity between the enzyme subunits.
4. Steady-state and time-resolved fluorescence emission spectroscopy and enzyme kinetics were employed to study the mechanism of action of purine nucleoside phosphorylases (PNP) as well as human deoxynucleoside kinases. Effects of *E. coli* PNP binding with formycin A and B, and N^6-methylformycin A (specific inhibitors) on nucleoside excitation and emission spectra revealed shifts in tautomeric equilibria of the bound ligands. Both ionic species of the fluorescent substrate N(7)-methylguanosine are almost equally good substrates for *E. coli* PNP but differ for the mammalian enzymes. Substrate/inhibitor discrimination between deoxycytidine kinase and thymidine kinases TK1 and TK2 was observed for several nucleoside analogues, clearly useful in

following the role of these enzymes in intracellular metabolism. Unnatural stereoisomers were found to be as good substrates of deoxynucleoside kinases as their natural β-D counterparts.

5. Quantum-Classical Molecular Dynamics (QCMD) has been further developed to describe time-dependent proton and electron transfer in biomolecular systems, *e.g*. in enzymes. Coupling between quantum proton(s) or electron(s) and classical atoms was acomplished *via* extended Hellmann-Feynman forces, as well as the time-dependence of the potential energy function in the Schrödinger equation.

Equipment:
Time-resolved spectrofluorimeter System 5000 IBH Consultants Ltd, stopped-flow spectrometer SX.18MV Applied Photophysics Ltd., spectrofluorimeter LS50B Perkin Elmer, spectrofluorimetr FluoroMax Spex, ITC calorimeter OMEGA MicroCal Inc., cenrifuge Avanti J-20I Beckman-Coulter, 7 UV VIS and 2 IR spectrophotometers, HPLC Spectra Physics, FPLC LKB-Pharmacia, CV-37 Voltammograph Bioanalytical Systems, 3 Silicon Graphics workstations and *ca*. 20 PC computers; access to NMR spectrometer Varian UNITYplus 500 MHz, CD spectrometer Avis, MS spectrometer Q-Tof2 Micromass, and supercomputer CRAY.

M.Sc. (magister) theses (1999-2000)

1. Izabela Płochocka, Zastosowanie fotokatalitycznej metody z udziałem półprzewodnika TiO_2 w procesach degradacji zanieczyszczeń (Application of a photocatalytic method with TiO_2 semiconductor to degradation of contaminations), 1999, supervisor dr Elżbieta Bojarska.

2. Joanna Żuberek, Mechanizm działania kinazy tymidynowej przy pomocy metod emisyjnych i kinetyki enzymatycznej (Mechanism of enzymatic activity of thymidine kinase by means of emission spectroscopy and kinetic methods), 1999, supervisor dr hab. Borys Kierdaszuk.
3. Małgorzata Kurzepa, Badanie oddziaływań antybiotyków antracyklinowych z DNA metodami modelowania molekularnego (Investigations of interactions between DNA and anthracycline antibiotics by means of molecular modelling), 1999, supervisor prof. Bogdan Lesyng.
4. Teresa Szczepanik, Badanie oddziaływań podwójnie interkalujących anracyklin z DNA metodami modelowania molekularnego (Investigations of double intercalating anthracyclines with DNA by means of molecular modelling), 1999, supervisor prof. Bogdan Lesyng.
5. Marta Sidor, Konformacje cyklicznych analogów enkefaliny w roztworze, wyznaczane za pomocą magnetycznego rezonansu jądrowego (Conformations in solution of cyclic analogues of encephalin by means of nuclear magnetic resonance spectroscopy), 1999, supervisors: dr hab. Ryszard Stolarski and dr Jacek Wójcik (Institute od Biochemistry and Biophysics PAN, Warszawa).
6. Katarzyna Ruszczyńska, Badania magnetycznego rezonansu jądrowego struktur i stabilności trzeciej pętli białka kalmoduliny (Nuclear magnetic resonance investigations of structures and stability of the third loop of calmodulin protein), 1999, supervisor dr Jacek Wójcik (Institute of Biochemistry and Biophysics PAN, Warszawa).
7. Anna Brysiak, Badanie metodami spektroskopowymi oddziaływania miejsca wiążącego fosforylazy nukleozydów purynowych z inhibitorami bisubstratowymi z grupy fosforanów acyklonukleozydów (Spectroscopic investigations of interaction between the purine nucleoside phosphorylase binding center and bisubstrate inhibitors, phosphates of acyclonucleoside derivatives), 2000, supervisor dr Agnieszka Bzowska.
8. Aneta Wysocka, Oddziaływanie analogów fosforanu z fosforylazą nukleozydów purynowych (Interaction of phosphate analogues with purine nucleoside phosphorylase), 2000, supervisor dr hab. Borys Kierdaszuk.
9. Marcin Banrowski, Specyficzność kinaz nukleozydowych (Specificity of nucleoside kinases), 2000, supervisor dr hab. Borys Kierdaszuk.
10. Roman Bogacewicz, Badanie właściwości kompleksu proteazy wirusa HIV-1 i jego modelowego substratu metodą klasycznej dynamiki molekularnej (Classical molecular dynamics investigation of the properties of HIV-1 protease in complex with a model substrate), 2000, supervisor dr hab. Maciej Geller.
11. Marcin Cymborowski, X-ray studies of the structure of lipoxygenase mutants, 2000, supervisors: dr Agnieszka Bzowska and prof. Władysław Minor (University of Wirginia, USA).
12. Elżbieta Remiszewska, Charakteryzacja serii nowych inhibitorów proteinaz uzyskanych przez selekcję z bibliotek peptydowych na fagu M-13 (Characterisation of some new proteinase inhibitors derived from selection of the phage M-13 peptide library), 2000, supervisor dr hab. Michał Dadlez.
13. Piotr Kmieć, Opracowanie mezoskopowego modelu specyficznych oddziaływań dla wybranych układów biomolekularnych (Application of the mesoscopic model of specific interactions to some selected biomolecular systems), 2000, supervisor prof. B. Lesyng.
14. Renata Szklanowska, Badanie mechanizmów utleniania halogenopochodnych zasad purynowych (Investigation of oxidation mechanisms of purine nucleobases, substituted with halogens), 2000, supervisor dr Elżbieta Bojarska.
15. Elżbieta Florowska, Porównanie różnych metod pomiaru potencjału błonowego mitochondriów izolowanych i mitochondriów *in situ* (Comparison of various methods of transmembrane electrical potential measurements applied to isolated mitochondria and mitochondria *in situ*), 2000, supervisor: prof. Lech Wojtczak (Institute of Experimental Biology PAN, Warszawa)

Ph. D. (doctor) theses (1999-2000)

1. Beata Wielgus-Kutrowska, Fosforylazy nukleozydów purynowych - własności fizykochemiczne oraz mechanizm oddziaływania z ligandami (Purine nucleoside phosphorylases - physicochemical properties and mechanism of the protein - ligand interactions), 1999, supervisor prof. David Shugar
2. Krzysztof Krawiec, Oddziaływanie ludzkich kinaz nukleozydowych z substratami i inhibitorami (Interaction of human nucleoside kinases with substrates and inhibitors), 2000, supervisor prof. David Shugar.

D. Sc. (dr hab., habilitation) theses (1999-2000)

1. Jan Antosiewicz, Mezoskopowe modelowanie komputerowe w badaniach struktury, dynamiki i funkcjonowania kwasów nukleinowych i białek (Computer mesoscopic modelling in studing structure, dynamics and function of nucleic acids and proteins), 1999.
2. Borys Kierdaszuk, Właściwości emisyjne białek i ich wykorzystanie w charakterystyce oddziaływań z ligandami (Proteins emission and its application to characterisation of the protein - ligand interactions), 1999.

PUBLICATIONS (1999-2000)

1. B. Czochralska, L. Lindquist: Reaction mechanism in the photochemistry of the antileukemic agents 2-chloro- and 2-bromo-2'-deoxyadenosine, studied by nanosecondlaser flash photolysis, JOURNAL OF PHOTOCHEMISTRY AND PHOTOBIOLOGY B: BIOLOGY 50 (1999) 28
2. A. Niedźwiecka-Kornaś et al, Spectroscopic studies on association of mRNA cap-analogues with human translation factor eIF4E. From modelling of interactions to inhibitory properties, COLLECTION SYMPOSIUM SERIES (Spindlerov Mlyn, Czechy, eds. A. Holly, M. Hocek) 2 (1999) 214, coauthors: L. Chlebicka, J. Stępiński, E. Darżynkiewicz, R. Stolarski
3. E. Bojarska, B. Czochralska, Electrooxidation of the anti leukemic 2-chloro-2'-deoxyadenosine and related compounds, JOURNAL OF ELECTROANALYTICAL CHEMISTRY 47 (1999) 89
4. Z. Wieczorek et al., Fluorescence studies on association of human translation initiation factor eIf4E with mRNA cap – analogues, ZEITSCHRIFT FÜR NATURFORSCHUNG 54c (1999) 278, coauthors: A. Niedźwiecka-Kornaś, L. Chlebicka, , K. Kiraga, J. Stępiński, M. Dadlez, E. Darżynkiewicz, R. Stolarski.
5. J. Trylska et al., Thermodynamic linkage between protonation and binding of inhibitors to HIV protease, PROTEIN SCIENCE 8 (1999) 180, coauthors: J. Antosiewicz, M. Geller.
6. A. Lampio, et al., Guanosine nucleotide analogs as inhibitors of Alphavirus mRNA capping enzyme, ANTIVIRAL RESEARCH 42 (1999) 35, coauthors: E. Darżynkiewicz, J. Stępiński.
7. A. Niedźwiecka-Kornaś et al., Studies on association of mRNA cap-analogues with a synthetic dodecapeptide DGIEPMWEDEKEN, NUCLEOSIDES & NUCLEOTIDES 18 (1999) 1105, coauthors: R. Przedmojski, J. Stępiński, E. Darżynkiewicz, R. Stolarski.
8. W. Szeszkowski et al., Investigation of the ternary complex between recombinant rat hepatomathymidylate synthase, FdUMP or S^4FdUMP and N^5,N^{10} methylenetetrahydrofolate with the use of ^{1}H and ^{19}F NMR, NUCLEOSIDES & NUCLEOTIDES 18 (1999) 865, coauthors: R. Stolarski.
9. E. Bojarska et al., Hydrolysis of some mRNA 5'-cap analogues catalysed by the human fhit protein and leupin ApppA hydrolases, NUCLEOSIDES & NUCLEOTIDES 18 (1999) 1125, coauthors: R. Kraciuk, J. Stępiński, E. Darżynkiewicz
10. A. Cai et al., Quantitative assessment of mRNA cap analogs as inhibitors of in vitro translation, BIOCHEMISTRY 38(1999) 8538, coauthors: Chlebicka, J. Stępiński, R. Stolarski, E. Darżynkiewicz.
11. Z. Wieczorek, et al., The Cu^{2+} -promoted cleavage of mRNA 5'-cap analogs: a kinetic study with P^1 - (7-methylguanosin-5'-yl) P^3- (nucleosid-5'-yl) triphospates and P^1- methylguanosin-5'-yl) P^4-(guanosin-5'-yl) tetraphosphate, NUCLEOSIDES & NUCLEOTIDES 18 (1999) 1, coauthors: E. Darżynkiewicz, S. Kuusela, H. Lönnberg
12. J. Antosiewicz et al., Prediction of pK_{as} of titrable residues in proteins using a Poisson-Boltzmann model of the solute-solvent system, COMPUTATIONAL MOLECULAR DYNAMICS: CHALLENGES, METHODS, IDEAS (eds. P. Deuflhard et al.): LECTURE NOTES IN COMPUTATIONAL SCIENCE AND ENGINEERING 4 (1999) 176, coauthors: E.Błachut-Okrasińska, T.Grycuk, B. Lesyng
13. J.M. Briggs et al., Simulation of pH-dependent properties of proteins using mesoscopic models, REVIEW IN COMPUTATIONAL CHEMISTRY 13 (1999) 249 coauthor: J. Antosiewicz
14. E. Błachut-Okrasińska et al., The Poisson-Boltzmann model studies of molecular electrostatic properties of protein kinases, EUROPEAN BIOPHYSICAL JOURNAL 28 (1999) 457, coauthors: B. Lesyng, J. Antosiewicz
15. 16. K. Ginalski , M.Wojciechowski, B.Lesyng, Modelling of insulin receptor tyrosine kinase in its active form: a case for validation of theoretical methods, ACTA BIOCHIMICA POLONICA 46 (1999) 601,
17. C. Venclovas, K. Ginalski, K. Fidelis, Addressing the issue of sequences-to-structure alignments in comparative modeling of CASP3 target proteins, PROTEINS SUPPLEMENT 3 (1999) 73, coauthors: M. Wojciechowski, B. Lesyng
18. B. Wielgus-Kutrowska et al., Binding of substrates by purine nucleoside phosphorylase (PNP) from *Cellulomonas sp*. – kinetic and spectrofluorimetric studies, NUCLEOSIDES & NUCLEOTIDES 18 (1999) 871, coauthors: D. Shugar, A. Bzowska
19. A. Bzowska et al., Synthesis of 6-aryloxy- and 6-alkoxyaryl-2-chloropurines and their properties in purine nucleoside phosphorylase (PNP) system, NUCLEOSIDES & NUCLEOTIDES 18 (1999) 873 coauthors: B. Wielgus-Kutrowska, Z. Kazimierczuk
20. J. Wierzchowski et al., Interactions of purine nucleoside phosphorylase with antiviral acyclic nucleoside phosphonate inhibitors – kinetic and emission studies, NUCLEOSIDES & NUCLEOTIDES 18 (1999) 875, coauthors: E. Kulikowska, A. Bzowska, L. Magnowska, D. Shugar
21. J. N. Latosińska et al., Comparative studies of 2'-chloro-2'-deoxyadenosine and 2-chloroadenine by NQR spectroscopy and quantum chemical calculations, NUCLEOSIDES & NUCLEOTIDES 18 (1999) 1075 coauthors: J. Kasprzak, E. Bojarska, Z. Kazimierczuk
22. E. Bojarska et al., Determination of 2-chloro-2'-deoxy-adenosine (antileukemic agent) and related compounds by electrochemical method, NUCLEOSIDES & NUCLEOTIDES 18 (1999) 1073 coauthor: Z. Kazimierczuk
23. B. Kierdaszuk et al., Substrat/inhibitor specificities of human deoxycytidine kinase (dCK) and thymidine kinase (TK1 and TK2) towards the sugar moiety of nucleosides, including O'-alkyl analogues, NUCLEOSIDES & NUCLEOTIDES, 18 (1999) 1883, coauthors: K. Krawiec, Z. Kazimierczuk, D. Shugar

24. A. Bzowska et al., Synthesis of 6-aryloxy- and 6-arylalkoxy-2-chloropurines and their interactions with purine nucleoside phosphorylase from Escherichia coli, ZEITSCHRIFT FÜR NATURFORSCHUNG 54c (1999) 1055, coauthors: L. Magnowska, Z. Kazimierczuk
25. J. Tebbe et al., Crystal structures of purine nucleoside phosphorylase (PNP) from *Cellulomonas sp*. and its implications of the molecular mechanism of trimeric PNPs, JOURNAL OF MOLECULAR BIOLOGY 294 (1999) 1239, coauthors: A. Bzowska, B. Wielgus-Kutrowska, D. Shugar
26. M. Wojciechowski et al., Electrostatic and titration properties of phosphorylated model compounds and peptides, JOURNAL OF BIOSCIENCES 24 (1999) 58, coauthors: T. Grycuk, J. Antosiewicz, B. Lesyng
27. K. Ginalski et al., DFT-based parametrization of an approximate valence bond (AVB) method for QCMD/AVB simulations of the transphosphorylation process catalyzed by PKA, JOURNAL OF BIOSCIENCES 24 (1999) 49 coauthors: P. Grochowski, B. Lesyng
28. M. Maciejczyk et al., An effective potential for a mesoscopic model of DNA, JOURNAL OF BIOMOLECULAR STRUCTURES & DYNAMICS 16 (1999) 1341, coauthors: W. Rudnicki, B. Lesyng
29. W. Rudnicki et al., Lagrangian and quaternion dynamics of nucleic acids, JOURNAL OF BIOMOLECULAR STRUCTURE AND DYNAMICS 16 (1999) 1273, coauthors: G. Bakalarski, B. Lesyng
30. E. Błachut-Okrasińska et al., Stopped-flow and Brownian dynamics studies of electrostatic effects in the kinetics of binding of 7-methyl-GpppG to the protein eIF4E. EUROPEAN BIOPHYSICAL JOURNAL 29 **(**2000**)** 487, coauthors: E. Bojarska, A. Niedźwiecka, L. Chlebicka, E. Darżynkiewicz, R. Stolarski, J. Stępiński, J.M. Antosiewicz
31. B. Kierdaszuk et al., Formycyn A and its N-methyl analogues, specific inhibitors of E. coli purine nucleoside phosphorylase (PNP): induced tautomeric shifts on binding to enzyme, and enzyme-ligand fluorescence resonance energy transfer, BIOCHIMICA ET BIOPHYSICA ACTA 1476 (2000) 109, coauthors: A. Modrak-Wójcik, J. Wierzchowski, D. Shugar
32. J. Poznański et al., ^{1}H NMR conformational study of antiherpetic C5-substituted 2'-deoxyuridines: insight into the nature of structure-activity relationships, BIOCHEMICAL AND BIOPHYSICAL RESEARCH COMMUNICATIONS 272 (2000) 64, coauthors: K. Felczak, T. Kulikowski, M. Remin
33. J. Antosiewicz et al., A correlation between protonation equilibria in biomolecular systems and their shapes: studies using a Poisson-Boltzmann model, GAKUTO INTERNATIONAL SERIES MATHEMATICAL SCIENCES AND APPLICATIONS 14 (2000) 11, coauthors: E. Błachut-Okrasińska, T. Grycuk, B. Lesyng
34. W. Rudnicki et al., A simple model for predicting the free energy of binding between anthracycline antibiotics and DNA, ACTA BIOCHIMICA POLONICA 47 (2000) 1, coauthors: M. Kurzepa, T. Szczepanik, B. Lesyng
35. P. Bała et al., J.A. McCammon, Quantum-dynamical picture of a multi-step enzymatic process. Reaction catalyzed by phospholipase A2, BIOPHYSICAL JOURNAL 79 (2000) 1253, coauthors: P. Grochowski, K.Nowiński, B. Lesyng
36. W. Rudnicki et al., A mesoscopic model of nucleic acids: Part 1. Lagrangian and quaternion molecular dynamics, JOURNAL OF BIOMOLECULAR STRUCTURE AND DYNAMICS 17 (2000) 1079, coauthors: G. Bakalarski, B. Lesyng
37. M. Maciejczyk et al., A mesoscopic model of nucleic acids: Part 2. An effective potential energy function for DNA, JOURNAL OF BIOMOLECULAR STRUCTURE AND DYNAMICS 17 (2000) 1109, coathors: W. Rudnicki, B. Lesyng
38. K. Ginalski et al., Structure-based sequence alignment for the β-trefoil sub-domain of the clostridial neurotoxin family provides residue level information about the putative ganglioside binding site, FEBS LETTERS. 482 (2000) 119, coauthors: C. Venclovas, B. Lesyng, K. Fidelis
39. T. Stepanenko et al., Photochemical syn-anti isomerisation reaction in 1-methyl-N4-hydroxycytosine. An experimental matrix and theoretical density functional theory study. JOURNAL PHYSICAL CHEMISTRY 104 (2000) 9459, coathors: L. Lapinski, A.L. Sobolewski, M.J. Nowak, B. Kierdaszuk
40. A. Bzowska, E. Kulikowska, D. Shugar, Purine nucleoside phosphorylase: properties, functions and clinical aspects, PHARMACOLOGY & THERAPEUTICS 88 (2000) 349.

INVITED TALKS (1999-2000)

1. P. Bała et al., New developments in quantum dynamics of proton transfer processes, 13th International Conference on Horisons in Hydrogen Bond Research, Świeradów-Zdrój, Poland September 1999, speaker: Bogdan Lesyng
2. B. Lesyng, Theoretical studies of biomolecular systems with microscopic and mesoscopic models, 5th International Conference: Computers in Chemistry'99, Szklarska Poręba, Poland, July 1999
3. J. Antosiewicz, Simulations of diffusional encounters between enzymes and ligands, 5th International Conference: Computers in Chemistry'99, Szklarska Poręba, Poland, July 1999
4. B. Kierdaszuk, Enantiospecificity of human deoxycytidine kinases (dCK) and thymidine kinases (TK1, TK2) towards 3'-branched homologues of 2'-deoxynucleosides, 7th Symposium of European Society for the Study of Purine and Pyrimidine Metabolism in Man, Gdańsk, Poland, September 1999
5. A. Niedźwiecka-Kornaś et al, Spectroscopic studies on association of mRNA cap-analogues with human translation factor eIF4E. From modelling of interactions to inhibitory properties, XIth Symposium: Chemistry of Nucleic Acids Components, Spindlerov Mlyn, Czech Republic, September 1999, speaker: Ryszard Stolarski
6. B. Kierdaszuk, Multiple photon-induced fluorescence of biomolecules, International Conference on Photobiophysics in Technology and Medicine, Poznań, Poland, June 2000
7. B. Kierdaszuk, Mechanism of action of purine nucleoside phosphorylases (PNP) by emission spectroscopy, X-ray crystallography and enzyme kinetics: selective interaction of PNP with tautomeric and ionic species of substrates and inhibitors, International Conference on Enzymes of Nucleotide Metabolism - Structures, Catalysis and Drugs, Krogerup, Denmark, August 2000
8. B. Lesyng, Mesoscopic Poisson-Boltzmann and quantum-classical studies of enzymatic reactions, *ab initio* (from electronic structure) calculation of complex processes, PSIk2000, Schwabisch Gmund, Germany, August-September 2000

9. B. Lesyng, Poisson-Boltzmann and quantum-classical studies of enzymatic reactions. International Conference on Conformation of Peptides, Proteins and Nucleic Acids, Dębrzyno, Poland, August 2000
10. B. Lesyng, Microscopic and mesoscopic descriptions of biomolecular interactions, 2nd Polish-Japanese Days on Mathematical Aspects of Modelling Structure Formation Phenomena, Warszawa-Bedlewo, Poland, November 2000
11. B. Kierdaszuk, Multiphoton induced fluorescence of proteins and their constituents, An International Symposium Protein 2000, London, England, July 2000
12. J. Antosiewicz, Stopped-flow and Brownian dynamics studies of electrostatic effects in the kinetics of binding of 7-methyl-GpppG to the protein eIF4E, International Conference: Understanding Protein Electrostatics, Karolinska Institutet, Stokholm, Sweden, September 2000

DIVISION OF NUCLEAR PHYSICS

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Scientific Staff (total): 13 persons
ETA (Engineers, Technicians, Administration): 7 persons
Number of grants in 1999-2000: 6

SCIENTIFIC ACTIVITY

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

Main achievements:

1. Studies of p - p bremsstrahlung, single and double π meson and η meson production in pN and pd interactions, as part of the WASA Collaboration activities. Investigation of rare decay of π^0 and η mesons and search for dibarion states in $pp \rightarrow pp\pi^+\pi^-$ and $pp \rightarrow pp\gamma\gamma$ reactions.
2. Determination of the phase space distribution of charge kaons and antikaons produced in central nucleus-nucleus collisions Ni + Ni at 1.9 AGeV and Ru + Ru, Zr at 1.7 AGeV (work within the FOPI Collaboration). These results are pointing toward the in-medium modifications of K^+ and K^- properties at high temperatures and densities.
3. Completion of the upgrade of the Barrel TOF scintillation detector in the framework of the FOPI detector upgrade project. TOF resolution of 110-140 ps for minimum ionising particles has been achieved.
4. Development of a novel method of reconstruction of neutral meson kinematics from $\gamma\gamma$ decay. The method is based on a kinematical fit procedure with proper treatment of measurement errors, which allows for quantitative test of the reconstruction quality.
5. Construction of a model of pion reabsorption in nuclear matter. Momentum-dependent absorption length of pions is used for pion propagation. Comparison of the model predictions with available experimental data shows that primary pion angular distribution has a fixed dipolar term of $A_2=0.40\pm0.06$.
6. Formulation of a model for the description of the statistical decay of dynamically evolving very heavy systems. The model was used to simulate the correlation between pre- and post-scission neutron multiplicities measured in the ^{58}Ni + ^{208}Pb reaction. The model predictions are in good agreement with experimental data.
7. Identification of a new type of rotation, represented by the rotation of a large magnetic dipole around the nuclear spin, in a few nuclei in the A≈140 region. Information about the strength of the effective interaction between valence nucleons has been deduced.
8. Studies of neutron-rich, $^{88\text{-}94}$Kr nuclei, populated in spontaneous fission of ^{248}Cm, accomplished by measuring prompt γ - rays with EUROGAM2. Many new excited states have been identified. For the first time spins and parities were determined experimentally in these nuclei. The newly found levels suggest the existence of a new region of increased octupole correlations.
9. Investigation of K isomers with $I^{\pi} = 8^-$ and K = 8 in N = 74 isotones (^{132}Ce,^{134}Nd). New results concerning the decay paths and hindrance factors have been obtained. The experimental results have been compared with the recent theoretical model based on the band mixing mechanism. The experiment was performed at the Warsaw Cyclotron.
10. Experimental test of the Polarisation-Polarisation-Correlation (PPCO) method. The test has proved that the method can be successfully used for spin and parity assignment in experiments with modern multidetectors arrays.
11. Extensive studies of the Giant Dipole Resonance (GDR) in highly excited ^{70}Se* and ^{76}Se* nuclei at an effective nuclear temperature T= 1.6-2.5 MeV by ^{12}C + ^{58,64}Ni reactions. The importance of a correct description of the bremsstrahlung γ-ray emission and the pre-equilibrium particle emission for the evolution of the GDR parameters with increasing temperature was strongly pointed out.
12. Experimental evidence for the Jacobi shape transition in ^{46}Ti* compound nuclei in which GDR was excited in the ^{18}O + ^{28}Si reaction at 81 MeV. Evidence for the shape transition is based on calculations in the framework of the thermal shape fluctuation theory.
13. 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.

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), modular liquid scintillator neutron spectrometer, low-background detector for radionuclide concentration measurements, 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) theses (1999-2000)

1. Katarzyna Cieślak, Erwin Schrödinger i jego równanie (Erwin Schrödinger and his equation), 1999, supervisor: dr hab. Mirosław Kozłowski.
2. Katarzyna Kostrzewa, Planetoidy – pochodzenie i miejsce w strukturze Układu Słonecznego (Plametoids – the origin and their place in the structure of the solar system), 1999, supervisor: dr hab. Mirosław Kozłowski
3. Dorota Kurczyńska, Edwin Hubble i powstanie współczesnej kosmologii (Edwin Hubble and the creation of modern cosmology), 1999, supervisor: dr hab. Mirosław Kozłowski
4. Anna Nowicka, Jan Czochralski, twórca polskiej szkoły inżynierii materiałowej (Jan Czochralski, the creator of the Polish school of material engineering), 1999, supervisor: dr hab. Mirosław Kozłowski
5. Anna Piekarska, Arkadiusz Piekara i szkoła w Rydzynie (Arkadiusz Piekara and the school in Rydzyna), 1999, supervisor: dr hab. Mirosław Kozłowski
6. Anna Brzozowska, Stanisław Ulam, Polski wkład do badania reakcji syntezy jądrowej (Stanislaw Ulam, Polish contribution to studies of nuclear synthesis), 2000, supervisor: dr hab. Mirosław Kozłowski
7. Beata Czajkowska, Wirtualny Wydział Fizyki (Virtual Department of Physics), 2000, supervisor: dr hab. Mirosław Kozłowski
8. Katarzyna Dera, Aktywność elektryczna serca (Electrical activity of the heart), 2000, supervisor: dr hab. Mirosław Kozłowski
9. Daniel Gołaszewski, Ernest Rutherford i odkrycie jąder atomowych (Ernest Rutherford and the discovery of atomic nuclei), 2000, supervisor: dr hab. Mirosław Kozłowski
10. Monika Kokosza, Historia tranzystora (The history of the transistor), 2000, supervisor: dr hab. Mirosław Kozłowski
11. Anna Smolińska, Albert Einstein – biografia (Albert Einstein – the biography), 2000, supervisor: dr hab. Mirosław Kozłowski
12. Artur Stelmaszewski, Studia licencjackie nauk ścisłych na Uniwersytecie w Genewie (Bacalaureate studies of science at the Geneve University), 2000, supervisor: dr hab. Mirosław Kozłowski
13. Małgorzata Szcześniak, Pojęcie masy w Szczególnej Teorii Względności (The concept of mass in the Theory of Special Relativity), 2000, supervisor: dr hab. Mirosław Kozłowski.
14. Maryla Zych, Stefan Banach (Stefan Banach), 2000, supervisor: dr hab. Mirosław Kozłowski

M. Sc. (magister) theses (1999-2000)

1. Piotr Łada, Promieniowanie alfa w środowisku człowieka – pokazy (Alpha radiaton in human environment-demonstrations),1999, supervisor: dr Piotr Jaracz
2. Wojciech Jackowski, Badanie kształtu jądra ^{76}Se poprzez analizę danych z rozpadu GDR (Shape of ^{76}Se studied by analysing the GDR decay), 1999, supervisor: dr hab. Marta Kicińska-Habior
3. Robert Klimkowski, Modyfikacja metody oznaczania trytu w wodzie i pomiary stężeń trytu w wodach środowiskowych (Modification of the method of trithium-marking in water and measurements of trithium concentrations in environment water), 1999, supervisor: dr Piotr Jaracz
4. Elżbieta Kowalczyk, Dekonwolucja widm neutronów mierzonych spektrometrem MONA (Deconvolution of neutron spectra measured with MONA spectrometr), 1999, supervisor: dr hab. Zygmunt Szefliński
5. Przemysław Olbratowski, Badanie struktury ^{181}Ta metodą wzbudzeń kulombowskich (The structure of ^{181}Ta studied by the Coulomb excitation method), 1999, supervisor: dr Julian Srebrny
6. Beata Płaneta, Pozycyjna zdolność rozdzielcza detektora PET (Position resolution of PET detector), 1999, supervisor: dr hab. Zygmunt Szefliński
7. Monika Pracharz, Polaryzacja liniowa kwantów γ w reakcjach z ciężkimi jonami (Linear polarization of γ quanta in heavy ion reactions), 1999, supervisor: dr hab. Christian Droste
8. Renata Ratajczak, Badanie struktur defektowych w GaN metodami mikroanalizy jądrowej (The research of defect structures in GaN using methods of nuclear microanalysis), 1999, supervisor: dr hab. Krystyna Siwek-Wilczyńska and dr Lech Nowicki
9. Izabela Staniszewska, Gigantyczny rezonans dipolowy jako narzędzie do badania zmieszania izospinowego poziomów w jądrach wysokowzbudzonych (Giant dipole resonance as a tool to study the isospin-mixing of levels in highly excited nuclei), 1999, supervisor: dr hab. Marta Kicińska-Habior
10. Zbigniew Tymiński, Scyntylacyjny detektor czasu przelotu spektrometru FOPI dla II fazy eksperymentów (Scitillation time-of-flight detector of the FOPI spectrometer for phase II experiments), 1999, supervisor: dr Brunon Sikora
11. Olimpia Kijewska, Źródła wysokoenergetycznego promieniowania γ w reakcji ^{18}O+^{27}Al przy energii pocisku 8.3 MeV/u (The source of high energy γ radiaton in ^{18}O+^{27}Al reaction at projectile energy of 8.3 MeV/u), 2000, supervisor: dr hab. Marta Kicińska-Habior
12. Krzysztof Piasecki, Badanie podprogowej produkcji mezonów π^o w reakcjach wywołanych przez 60 AMeV ^{40}Ar (Investigation of subthreshold production of π^o mesons in reactions induced by 60 AMeV ^{40}Ar), 2000, supervisor: dr hab. Tomasz Matulewicz
13. Bożena Solecka, Badanie stopnia termalizacji gorących układów hadronowych powstających w reakcjach S+S, O+Au przy pędzie wiązki 200 AGeV/c (The study of the degree of thermalisation of the hadronic systems created in S+S and O+Au reactions at the beam momentum of 200 AGeV/c), 2000, supervisor: dr hab. Mirosław Kozłowski
14. Magdalena Zielińska, Struktura elektromagnetyczna jąder atomowych z obszaru ziem rzadkich (Electromagnetic structure of atomic nuclei from the rare earth region), 2000, supervisor: dr hab. Tomasz Czosnyka

Ph. D. (doctor) theses (1999-2000)

1. Marek Kirejczyk, Identyfikacja i badanie produkcji naładowanych mezonów K w spektrometrze FOPI (Identification and studies of the production of charged K mesons in FOPI spectrometer), 2000, supervisor: dr hab. Krystyna Siwek-Wilczyńska
2. Krzysztof Wiśniewski, Kaon and antikaon production in heavy-ion collisions the reactions Ru+Ru and Ru+Zr at 1.69 AGeV beam kinetic energy, 2000, supervisor: dr hab. Krystyna Siwek-Wilczyńska

D. Sc. (dr hab., habilitation) theses (1999-2000)

1. Tomasz Matulewicz, Rola detektorów scyntylacyjnych BaF_2 w badaniach podprogowej produkcji cząstek (The role of BaF_2 scintillator detectors in studies of subthreshold particle production), 1999

PUBLICATIONS (1999 – 2000)

1. A. Betsch et al., Obserwation of strong final-state effects in π^+ production in pp collisions at 400 MeV, PHYS. LETT. B 446 (1999) 179, coauthors: A. Turowiecki, Z. Wilhelmi
2. H. Calén et al., Higher partial, waves in pp→ppη near threshold, PHYS. LETT. B 458 (1999) 190, coauthors: A. Turowiecki, Z. Wilhelmi
3. Ch. Droste et al., PPCO: polarisation-polarisation correlation from oriented nuclei, NUCL. INSTR. and METH. A 430 (1999) 260, coauthors: K. Starosta, T. Morek, J. Srebrny
4. M. Górska et al., High spin spectroscopy of ^{104}Sn , ACTA PHYS. POL. B 30 (1999) 737, coauthor: M. Rejmund
5. Z. Janas et al., Eta strength distribution in the decays of neutron-deficient nuclei, ACTA PHYS. POL. B 30 (1999) 659, coauthors: M. Górska, M. Rejmund
6. M.P. Kelly et al., Giant dipole resonance in higly excited nuclei: does the width saturate?, PHYS. REV. LETT. 82 (1999) 3404, coauthors: M. Kicińska-Habior, Z. Trznadel
7. M.P. Kelly et al., The GDR width in hot Sn nuclei, NUCL. PHYS. A 649 (1999) 123c, coauthors: M. Kicińska-Habior, Z. Trznadel
8. M. Kicińska-Habior et al., Giant dipole resonance decay and bremsstrahlung emission as a source of high-energy γ - rays in ^{12}C+ ^{24,26}Mg and ^{12}C + $^{58, 64}$Ni reactions at 6-11 MeV/u, NUCL. PHYS. A 649 (1999) 130c, coauthor: Z. Trznadel
9. M. Kicińska-Habior et al., Bremsstrahlung γ-ray emission in heavy-ion collisions at 6-11 MeV/u, ACTA PHYS. POL. B 30 (1999) 535, coauthor: Z. Trznadel
10. M. Kicińska-Habior, Statistical decay of the giant dipole resonance excited by complete fusion reactions and other sources of high-energy γ-rays in heavy-ion collisions at 4-11 MeV/u, ACTA PHYS. POL. B 30 (1999) 1353
11. R. Kotte et al., On the space-time difference of proton and composite particle emission in central heavy-ion reactions at 400 A MeV, EUR. PHYS. J. A 6 (1999) 185, coauthors: M. Kirejczyk, B. Sikora, K. Siwek-Wilczyńska, K. Wiśniewski
12. M. Kozłowski et al., Z. Mucha, Metastable thermal states induced by ultra-short laser pulses, LASERS IN ENGINEERING 8 (1999) 175, coauthor: J. Marciak-Kozłowska
13. M. Kozłowski et al., Klein-Gordon thermal equation for a Planck gas, FUNDATION of PHYS. LETT. 12 (1999) 93, coauthor: J.Marciak-Kozłowska
14. M. Kozłowski et al., Why indeed quantum hyperbolic heat transport?, LASERS IN ENGINEERING 9 (1999) 39, coauthor: J. Marciak-Kozłowska
15. M. Kozłowski et al., Quantum heat transport on the molecular scale induced by femtosecond laser pulses, LASERS IN ENGINEERING 9 (1999) 103, coauthor: J. Marciak-Kozłowska
16. M. Kozłowski et al., Slowing and dephasing of the thermal wave induced by femtosecond laser pulses, LASERS IN ENGINEERING 9 (1999) 21, coauthor: J. Marciak-Kozłowska
17. M. Kozłowski et al., Quantum heat transport induced by ultra-short laser pulses: from basics to applications, LASERS IN ENGINEERING 9 (1999) 305, coauthor: J. Marciak-Kozłowska
18. M. Lach et al., High-spin structure of ^{57}Ni and nuclei nearby, ACTA PHYS. POL. B 30 (1999) 743, coauthor: M. Rejmund
19. R.M. Lieder et al., Observation of a $(v7/2^-[514])^2$ crossing in ^{180}Os, NUCL. PHYS. A 645 (1999) 465, coauthors: T. Rząca-Urban, T. Morek
20. Yu.N. Lobach et al., Lifetime measurement in the yrast band of ^{119}I, ACTA PHYS. POL. B 30 (1999) 1273, coauthors: J. Srebrny, Ch. Droste, T. Morek, K. Starosta
21. M. Loewe et al., Depopulation of the $K^{\pi} = 9^-$ isomer in ^{180} Ta via Coulomb excitation, ACTA PHYS. POL. B 30 (1999) 1319, coauthor: J. Srebrny
22. G. Martínez et al., Deep-Subthreshold η and π^0 production probing pion dynamics in the reaction Ar+Ca at 180 A MeV, PHYS. REV. LETT. 83 (1999) 1538, coauthor: T. Matulewicz
23. G. Martínez et al., Photon production in heavy-ion collisions close to the pion threshold, PHYS. LETT. B 461 (1999) 28, coauthor: T. Matulewicz
24. P.J. Napiórkowski et al., Nuclear structure studied via Coulomb excitation, ACTA PHYS. POL. B 30 (1999) 1309, coauthor: J. Srebrny
25. A. Nowak et al., New excitation scheme of ^{139}Cs, EUR. PHYS. J. A 6 (1999) 1, coauthor: T. Rząca-Urban
26. L. Próchniak et al., Collective quadrupole excitations in the 50<Z, N<82 nuclei with the general Bohr Hamiltonian, NUCL. PHYS. A 648 (1999) 181, coauthor: J. Srebrny
27. F. Rami et al., Flow angle from intermediate mass fragment measurements, NUCL. PHYS. A 646 (1999) 367, coauthors: M. Kirejczyk, B. Sikora, K. Siwek-Wilczyńska, K. Wiśniewski
28. M. Rejmund et al., Particle-octupole vibration coupling near ^{208}Pb, ACTA PHYS. POL. B 30 (1999) 733, coauthor: M. Górska

29. J. Sauvage et al., Nuclear structure of neutron-deficient Au and Pt isotopes from high-resolution laser spectroscopy at Isolde, ACTA PHYS. POL. B 30 (1999) 1393, coauthor: A. Wojtasiewicz
30. K. Starosta et al., Experimental test of the polarization direction correlation method (PDCO), NUCL. INSTR. and METH. A 423 (1999) 16, coauthors: T. Morek, Ch. Droste, J. Srebrny
31. C.A. Ur et al., Quadrupole moment of the yrast superdeformed band in ^{144}Gd, PHYS. REV. C 60 (1999) 05430, coauthor: T. Rząca-Urban
32. W. Urban et al., Neutron single-particle energies in the ^{132}Sn region, EUR. PHYS. J. A5 (1999) 239, coauthor: T. Rząca-Urban
33. M. Würkner et al., Coulomb excitation of ^{231}Pa, ACTA PHYS. POL. B 30 (1999) 1313, coauthors: Ch. Droste, J. Srebrny
34. K. Zając et al., Collective quadrupole excitations in even-even Ru isotopes, ACTA PHYS. POL. B 30 (1999) 765, coauthor: J. Srebrny
35. C. Bargholtz et al., The Celsius/Wasa 4π detector facility, ACTA PHYS. POL. B 31 (2000) 2249, coauthors: A. Turowiecki, Z. Wilhelmi
36. R. Bilger et al., The Celsius/Wasa facility, ACTA PHYS. POL. B 31 (2000) 77, coauthors: A. Turowiecki, Z. Wilhelmi
37. R. Bilger et al., The Wasa Detector at CELSIUS, NUCL. PHYS. A 663&664 (2000) 1073c, coauthors: A. Turowiecki, Z. Wilhelmi
38. R. Bilger et al., 2π Production in pp collisions close to threshold, NUCL. PHYS. A 663&664 (2000) 469c, coauthors: A. Turowiecki, Z. Wilhelmi
39. R. Bilger et al., Spectator tagging in quasi-free pn-reactions on deuterium at PROMICE/WASA, CELSIUS, NUCL. PHYS. A 663&664 (2000) 1053c, coauthors: A. Turowiecki, Z. Wilhelmi
40. W. Brodowski et al., Exclusive measurement of pp $\rightarrow$pp$\pi^+\pi^-$ at CELSIUS, ACTA PHYS. POL. B 31 (2000) 2295, coauthors: A. Turowiecki, Z. Wilhelmi
41. P. Crochet et al., Sideward flow of K^+ mesons in Ru+Ru and Ni+Ni reactions near threshold, PHYS. LETT. B 486 (2000) 6, coauthors: K. Wiśniewski, M. Kirejczyk, B. Sikora, K. Siwek-Wilczyńska
42. A. Gizon et al., Level structure of ^{123}Cs observed from ^{123}Ba decay and described using the IBFM and CQPC models, EUR. PHYS. J. A 8 (2000) 41, coauthor: Ch. Droste
43. M. Kicińska-Habior et al., Bremsstrahlung radiation in heavy-ion collisions ^{18}O+^{27}Al$\rightarrow$^{45}Sc at 8.3 MeV/u, ACTA PHYS. POL. B 31 (2000) 423, coauthor: O. Kijewska
44. A. Korgul et al., Properties of the N=84 even-even nuclei populated in spontaneous fission of ^{248}Cm, EUR. PHYS. J. A 7 (2000) 167, coauthors: T. Rząca-Urban, M. Rejmund
45. K. Korzecka et al.,Reconstruction of the π° kinematics from $\gamma\gamma$ decay, NUCL. INSTR. and METH. A 453 (2000) 606, coauthor: T. Matulewicz
46. K. Korzecka et al., Reconstruction of the π° kinematics from $\gamma\gamma$ decay, ACTA PHYS. POL. B 31 (2000) 71, coauthor: T. Matulewicz
47. M. Kozłowski et al., Electron thermal relaxation in metallic nanoparticles heated with ultra-short laser pulses, LASERS IN ENGINEERING 10 (2000) 37, coauthor: , J. Marciak-Kozłowska
48. M. Kozłowski et al., Gravitation and thermodynamics in a Planck Era, HADRONIC JOURNAL 23 (2000) 189, coauthor: , J. Marciak-Kozłowska
49. R.M. Lieder et al., From highly to superdeformed shapes: study of ^{143}Gd, NUCL. PHYS. A 671 (2000) 52, coauthors: T. Rząca-Urban, Ch. Droste, T. Morek
50. T. Matulewicz et al., Observation of $\Delta^+\rightarrow p\pi^\circ$ decay in heavy-ion collisions, EUR. PHYS. J. A 9, (2000) 69
51. A.A. Pasternak et al., Conflict coupling in the $\pi(g_{9/2})^{-1}$ bands of ^{119}I, ACTA PHYS. POL. B 31 (2000) 429, coauthors: J. Srebrny, Ch. Droste, T. Morek, K. Starosta
52. K. Pomorski et al., Collective quadrupole excitations in transitional nuclei, PHYS. SCRIPTA T 88 (2000) 111, coauthor: J. Srebrny
53. F. Rami et al., Isospin tracing: a probe of nonequilibrium in central heavy-ion collisions, PHYS. REV. LETT. 84 (2000) 1120, coauthors: M. Kirejczyk, B. Sikora, K. Siwek-Wilczyńska, K. Wiśniewski
54. M. Rejmund et al., Particle octupole-vibration coupling near ^{208}Pb, EUR. PHYS. J. A 8 (2000) 161, coauthor: M. Górska
55. T. Rząca-Urban et al., Study of quadrupole moments of superdeformed bands in ^{145}Gd, NUCL. PHYS. A 677 (2000) 25, coauthors: M. Rejmund, Z. Marcinkowska, R. Marcinkowski
56. T. Rząca-Urban et al., Shapes of the neutron-rich $^{88\text{-}94}$Kr nuclei, EUR. PHYS. J. A 9 (2000) 165, coauthors: W.Urban, A.Kaczor
57. B. Sikora, FOPI Collaboration, The many faces of FOPI from fragment to strangeness detector, ACTA PHYS. POL. B 31 (2000) 135
58. M.M. Smolarkiewicz et al., Search for an intermittency signal in Au+Au collisions, ACTA PHYS. POL. B 31 (2000) 385, coauthors: M. Kirejczyk, B. Sikora, K. Siwek-Wilczyńska, K. Wiśniewski
59. I.J. Soliwoda et al.,Equilibration in heavy ion collisions studied via dynamical fluctuations, ACTA PHYS. POL. B 31 (2000) 389, coauthors: M. Kirejczyk, B. Sikora, K. Siwek-Wilczyńska
60. J. Srebrny et al., Lifetime measurements and the nonaxial deformation in ^{119}I, ACTA PHYS. HUNGARICA NEW SERIES - HEAVY ION PHYSICS 12 (2000) 217, coauthor: Ch. Droste, T. Morek, K. Starosta
61. K. Starosta et al., γ - ray spectroscopy in ^{111}Te, PHYS. REV. C 61 (2000) 61
62. W. Urban et al., First observation of excited states in ^{137}Te and the extent of octupole instability in the lanthanides, PHYS. REV. C 61 (2000) 04 1301, coauthor: T. Rząca-Urban
63. K. Wiśniewski, FOPI Collaboration, Phase space distributions of K^- and K^+ mesons in heavy-ion collisions at SIS energies, ACTA PHYS. POL. B 31 (2000) 399
64. K. Wiśniewski et al., The FOPI Collaboration, Direct comparison of phase-space distributions of K^- and K^+ mesons in heavy-ion collisions at SIS energies – evidence for in-medium modifications of kaons ?, EUR. PHYS. J. A 9 (2000) 515, coauthors: M. Kirejczyk, M. Kowalczyk, B. Sikora, K. Siwek-Wilczyńska

65. K. Zając et al., The quadrupole and pairing vibrations in rare-earth nuclei, ACTA PHYS. POL. B 31 (2000) 459, coauthor: J. Srebrny
66. J. Złomańczuk et al., Differential cross sections of the pp $\rightarrow$ppπ° reaction from 310 to 425 MeV, NUCL. PHYS. A 663&664 (2000) 452c, coauthor: A. Turowiecki, Z. Wilhelmi
67. M. Kozłowski et al., Ballistic and diffusion thermal pulse propagation in the attosecond time domain, LASERS IN ENGINEERING 10 (2000) 293, coauthor: J.Marciak-Kozłowska
68. M. Kozłowski et al., The polarization of the electrons emitted after ultrashort laser pulse interaction with spin active solids, LASERS IN ENGINEERING 9 (2000) 255, coauthor: J.Marciak-Kozłowska
69. B.Roussiere et al., High-resolution measurements of low-energy conversion electrons, HYPERFINE INTERACTIONS 129 (2000) 119, coauthor: A.Wojtasiewicz

INVITED TALKS (1999-2000)

1. K. Siwek-Wilczyńska, Statistical emission from dynamically evolving heavy nuclear systems, International Workshop on Fusion-Fission Process in the Superheavy Nuclei Region, Messina, Italy, March 2000

INTERNATIONAL CONFERENCES ORGANIZED BY THE DIVISION (1999-2000)

1. XXVI Mazurian Lakes School of Physics, Nuclear Physics at the Turn of the Century, Krzyże, Poland, September 1-11, 1999, chairman: Ziemowid Sujkowski, co-organized by the Andrzej Sołtan Institute for Nuclear Studies and the Warsaw University.
2. NATO Advanced Research Workshop, Techniques and Selected Applications of Nuclear Physics, Krzyże, Poland, September 2-4, 1999, co-chairmen: Petter A. Butler and Ziemowid Sujkowski, co-organized by the Andrzej Sołtan Institute for Nuclear Studies and the Warsaw University.

DIVISION OF NUCLEAR SPECTROSCOPY

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Scientific staff (total): 10 persons
ETA (Engineers, Technicians, Administration): 4 persons
Number of grants in 1999-2000: 3

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 deformation (e.g. octupole deformed nuclei).

Collaboration links:
Experiments at the nuclear-research centres in Caen (GANIL), Darmstadt (GSI), Geneve (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 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. At GANIL Caen, for the first time a doubly magic ^{48}Ni has been identified. It is the most neutron deficient nucleus ever synthesized and one of the best candidates for the observation of a new decay mode – two - proton emission from the ground state.
2. On GSI-Darmstadt mass separator, decay of isomers in ^{52}Fe, ^{70}Br and ^{96}Ag were investigated, also a new isotopes ^{60}Ga and ^{93}Pd were identified as beta delayed proton emitters. For ^{114}Ba alpha decay was observed for the first time. Measurement of the alpha energy provided precise information on the Q-value for the ^{12}C emission from ^{114}Ba.
3. At Oak Ridge National Laboratory, new data about N = Z nuclei ^{66}As and ^{80}Zr have been measured using new experimental method of Delayed Gamma Tagging and fine structure in the proton decay of ^{145,146}Tm has been observed
4. 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 has 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.

In neutron rich area:

1. In the heavy ion fragmentation facility at GANIL Caen g-factors (magnetic moments) of neutron rich nuclei near ^{68}Ni were measured.
2. In series of prompt-γ studies of neutron rich nuclei in the vicinity of the doubly-magic ^{78}Ni nucleus, produced as fission fragments in spontaneous fission of ^{248}Cm, for Zr and Sr isotopes a shape change at N≈58 has been reinvestigated in detail.
3. For neutron-rich nuclei around ^{132}Sn several single-particle orbitals were identified in experiment done on fission mass separated samples (Studsvik, Sweden). These data make a serious test of the applicability of the shell model description two neutrons and the few protons away from the ^{132}Sn core.
4. On GSI Darmstad Fragment Separator microsecond isomers in the neutron rich rare earth nuclei in the A = 170 – 190 mass range were measured. Decays of more then 20 previously known as well as few new isomeric states have been observed including three cases with angular momentum 35/2, the highest reached in fragmentation reactions.
5. Heavy, exotic, neutron rich Pb, Bi and Po isotopes in isobaric chains A = 215,216 and 216, 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.
6. The introduction of the fast timing $\beta\gamma\gamma(t)$ method at ISOLDE (CERN) has opened the heavy actinide region to lifetime measurements, providing direct experimental means of measuring the E1 rates. Recently, this method has been successfully applied to ^{229}Ra and ^{231}Th located at the border of the A = 225 island of octupole deformation. The study shows that the effect of octupole correlations in ^{229}Ra is more intense than in ^{231}Th, but not so pronounced as in ^{227}Ra.

Additionally:

1. Theoretical analysis of the nuclear spin mixing oscillations in the hydrogenlike $^{229}Th^{89+}$ ion has been performed. A possible way for an indirect observation of these oscillations is proposed.

Equipment in Warsaw:

On-line mass-separator at the HI cyclotron (see also report of the 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, 2 SUN - Micro Sparc work stations, 9 PC (Pentium, 98, NT, LINUX) + some others.

M.Sc. (magister) theses (1999-2000)

1. Tomasz Kszczot, Identyfikacja i badanie produktów reakcji ^{16}O i ^{58}Ni (Identification and investigation of the reaction products for $^{16}O + ^{58}Ni$ reaction), 1999, supervisor: dr hab. Andrzej Płochocki
2. Marcin Głogowski, Reakcja syntezy ciężkojonowej z emisją klastrów – nowa droga do ^{100}Sn (Heavy ion induced complete fusion with cluster emission – a new way towards ^{100}Sn), 1999, supervisor: dr Marek Pfützner
3. Paweł Buraczewski, Pomiar energii końcowej widma pozytonów z rozpadu neutrono-deficytowych izotopów indu w spektrometrze całkowitej absorbcji promieniowania (Investigation of the endpoint of positon spectrum from neutron deficient Indium isotopes in total absorption spectrometer) , 2000, supervisor: dr Zenon Janas
4. Joanna Rękawek, Badanie własności stanów wzbudzonych w jądrach ^{139}Cs i ^{139}Xe populowanych w rozpadzie $ß^-$ (Investigation of the excited states in ^{139}Cs and ^{139}Xe fed in $ß^-$ decay), 2000, supervisor: dr Waldemar Urban
5. Małgorzata Krzemińska, Badania rozpadu beta w łańcuchu izobarycznym A = 152 (Investigation of the beta-decay in A=152 isobaric chain), 2000, supervisor: dr hab Andrzej Płochocki
6. Joanna Kisiel, IGISOL system na wiązce warszawskiego cyklotronu (IGISOL facility on heavy-ion beam of Warsaw Cyclotron), 2000, supervisor: prof. Wiktor Kurcewicz

Ph.D. (doctor) theses (1999-2000)

1. Jan Kurpeta, Własności neutrono nadmiarowych jąder atomowych z obszarów leżących na granicy poznanych nuklidów (Properties of the neutron-rich atomic nuclei from the border of known nuclides),1999, supervisor: dr hab. Andrzej Płochocki

PUBLICATIONS (1999 - 2000)

1. Z. Janas et al., Observation of the Z = N + 1 nuclei ^{77}Y, ^{79}Zr and ^{83}Mo, PHYS. REV. LETT. 82 (1999) 295, coauthor: R. Grzywacz
2. T. Aumann et al., Continuum excitation in ^{6}He, PHYS. REV. C 59 (1999) 1252, coauthor: M.Pfützner
3. C. Longour et al., Half-lives of the odd-odd N=Z nuclei ^{78}Y, ^{82}Nb, ^{86}Tc, J. PHYS. G 25 (1999) 759, coauthors: R. Grzywacz, T. Kszczot
4. K. Rykaczewski et al., Studies of nuclei at and beyond the proton drip-line with stable and radioactive beams at HRIBF, Proc.of the XXXIII Zakopane School of Physics, Zakopane, Poland, Sept. 1-9, 1998, ACTA PHYS. POL. B 30 (1999) 565, coauthors: R. Grzywacz, Z. Janas, M. Karny
5. Z. Janas et al., Beta strength distribution in the decays of neutron-deficient nuclei, Proc.of the XXXIII Zakopane School of Physics, Zakopane, Poland, Sept. 1-9, 1998, ACTA PHYS. POL. B 30 (1999) 659, coauthors: M. Gierlik, M. Karny, A. Płochocki, K. Rykaczewski
6. M. Pfützner, Borders of the nuclear world - 100 years after discovery of Polonium, Proc. of the Int.Conf. "Nuclear Physics Close to the Barrier", Warszawa, Poland, June 30 - July 4, 1998, ACTA PHYS. POL. B 30 (1999) 1197
7. I. Reusen et al., First beta-decay study of ^{54}Ni produced by an element selective laser ion source, PHYS. REV. C 59 (1999) 2416, coauthor: K. Rykaczewski
8. M. Oinonen et al., Beta decay of ^{61}Ga, EUR. PHYS. J. A 5 (1999) 151, coauthors: Z. Janas, A. Płochocki
9. C.R. Bingham et al., Identification of a proton-emitting isomer in ^{151}Lu, PHYS. REV. C 59 (1999) R2984, coauthors: K. Rykaczewski, R. Grzywacz, M. Karny
10. D. Cano-Ott et al., Pulse pile-up correction of large NaI(Tl) total absorption spectra using the true puls-shape, NUCL. INSTR. METH. A 430 (1999) 488, coauthor: M. Karny
11. D. Cano-Ott et al., Monte Carlo simulation of the response of a large NaI(Tl) total absorption spectrometer for β–decay studies, NUCL. INSTR. METH. A 430 (1999) 333 , coauthor: M. Karny
12. Z. Hu et al., Beta-decay of ^{97}Ag : Evidence for the Gamow-Teller resonance near ^{100}Sn, PHYS. REV. C 60 (1999) 024315, coauthors: M. Gierlik, Z. Janas, M. Karny, A. Płochocki
13. W. Urban et al., Neutron single-particle energies in the ^{132}Sn region, EUR. PHYS. J. A 5 (1999) 239, coauthor: W. Kurcewicz, A. Nowak
14. A.J. Aas et al., Quenched E1 transition rates in ^{231}Th, NUCL. PHYS. A 654 (1999) 499, coauthors: K. Gulda, W. Kurcewicz
15. L.M. Fraile et al., Octupole correlation in ^{229}Ra, NUCL. PHYS. A 657 (1999) 355, coauthors: K. Gulda, W. Kurcewicz
16. K. Rykaczewski et al, Proton emitters ^{140}Ho and ^{141}Ho: probing the structure of unbound Nilsson orbitals, PHYS. REV. C 60 (1999) 011301, coauthors: R. Grzywacz, M. Karny
17. P.J. Daly et al.,Yrast spectroscopy of N = 82,83 isotopes ^{136}Xe and ^{137}Xe from ^{248}Cm fission, PHYS. REV. C 59 (1999) 3066, coauthor: W. Urban

18. F.J. Hartmann et al., Antiprotonic atoms as a tool to study the nuclear periphery, NUCL. PHYS. A 655 (1999) 289c, coauthors: K. Gulda, W. Kurcewicz
19. L. Pieńkowski et al., Decay of Hot Nuclei Formed with Energetic Antiprotons (PS208), NUCL. PHYS. A 655 (1999) 269c, coautors: K. Gulda, W. Kurcewicz
20. A. Nowak et al., New excitation scheme of ^{139}Cs, EUR. PHYS. J. A 6 (1999) 1, coauthors, W. Urban, W. Kurcewicz
21. H. Grawe et al., Nuclear structure from N≅Z to N≥Z - ^{100}Sn, ^{78}Ni, ^{208}Pb", Highlights of Modern Nuclear Structure (1999) p. 137, ed. by Aldo Covello, World Scientific Publishing Company, coauthors: M. Pfützner, R. Grzywacz, K. Rykaczewski
22. R. Schmidt et al., Composition of the nuclear periphery from antiproton absorption using short-lived residual nuclei, PHYS. REV. C 60 (1999) 054309, coauthors: K. Gulda, W. Kurcewicz
23. A. Algora et al., The GT Resonance revealed in β^+ - decay using new experimental techniques, NUCL. PHYS. A 654 (1999) 727c, coauthors: M. Gierlik, Z. Janas, M. Karny, A. Płochocki, K. Rykaczewski
24. T. Suzuki et al., Nuclear radii of ^{17,19}B and ^{14}Be, NUCL. PHYS. A 658 (1999) 313, coauthor: M. Pfützner
25. T.N. Ginter et al., Proton emission from ^{150}Lu, PHYS. REV. C 61 (1999) 014308, coauthors: R. Grzywacz, Z. Janas, M. Karny, K. Rykaczewski
26. F. Hoellinger et al., First observation of excited states in the neutron-rich nucleus, EUR. PHYS. J. A 6 (1999) 375, coauthor: W. Urban
27. M. Lewitowicz et al., Study of μs-isomers in neutron-rich nuclei around Z=28 and N=40 shell closures, NUCL. PHYS. A 654 (1999) 687c, coauthors: R. Grzywacz, M. Glogowski, A. Nowak, A. Płochocki, M.Pfützner, K. Rykaczewski, M. Sawicka
28. W. Trinder et al., β-decay of ^{35}Ca, PHYS. LETT. B 459 (1999) 67, coauthor: R. Grzywacz
29. B. Blank et al., Discovery of doubly-magic ^{48}Ni, PHYS. REV. LETT. 84 (2000) 1116, coauthors: R. Grzywacz, Z. Janas, M. Pfützner
30. J. Daugas et al., The 8^+ isomer in ^{78}Zn and the E2 polarisation of the doubly magic ^{78}Ni core, PHYS. LETT. 476 (2000) 213, coauthors: R. Grzywacz, M. Pfützner, K. Rykaczewski, M. Sawicka
31. J. Kurpeta et al., The decay of the neutron-rich nucleus ^{216}Bi, EUR. PHYS. J A 7 (2000) 49, coauthors: M. Karny, A. Płochocki, K. Rykaczewski
32. C. Chandler et al., Observation of isomeric states in neutron deficient A ~ 80 nuclei following the projectile fragmentation of ^{92}Mo, PHYS. REV. C 61 (2000) 044309, coauthors: R. Grzywacz, Z. Janas
33. A. Korgul et al., Properties of N = 84, even-even nuclei populated in the spontaneous fission of ^{248}Cm, EUR. PHYS. J. A 7 (2000) 167, coauthor: W. Urban
34. C. Foin et al., New insight in the level structure of ^{153}Er, EUR. PHYS. J. A 7 (2000) 149, coauthor: A. Płochocki
35. W. Urban et al., First observation of excited states in ^{137}Te and the extent of octupole instability in the lanthanides, PHYS. REV. C 61 (2000) 041301R, coauthor: A. Korgul
36. T. Rząca-Urban et al., Study of quadrupole moments of superdeformed bands in ^{145}Gd, NUCL. PHYS. A 677 (2000) 25, coauthor: W. Urban
37. W.F. Mueller et al., β-decay of ^{66}Co, ^{68}Co, and ^{70}Co, PHYS. REV. C 61 (2000) 054308, coauthors: J. Kurpeta, Z. Janas, M. Karny, T. Kszczot, A. Płochocki
38. W. Urban et al., Simplex s = ± i excitations in ^{141}Xe, EUR. PHYS. J. A 8 (2000) 5
39. W. Urban et al., Medium-spin structure of single valence-proton nucleus ^{133}Sb, PHYS. REV. C 62 (2000) 027301, coauthors: W. Kurcewicz, A. Korgul
40. A.Ozawa et al., Production cross-section of light neutron-rich nuclei from ^{40}Ar fragmentation at about 1 GeV/nucleon, NUCL. PHYS. A 673 (2000) 411, coauthor: M.Pfützner
41. T. von Egidy et al., Neutrons produced by 1.22 GeV antiproton interactions with nuclei, EUR. PHYS. J. A 8 (2000) 197, coauthor: W. Kurcewicz
42. Zs. Podolyak et al., Isomer Spectroscopy of $^{190}W_{116}$, PHYS. LETT. B 491 (2000) 225, coauthors: M.Pfützner, R. Grzywacz, M. Sawicka
43. W. Kurcewicz, Octupole deformation in the actinide region, HYPERFINE INTERACTIONS 129 (2000) 175
44. P. Hoff et al., Nuclear spectroscopy at ^{133}Sn, HYPERFINE INTERACTIONS (2000) 141, coauthor: W. Kurcewicz
45. W. Urban et al., Excited states in ^{139}Te and the properties of r-process nuclei with Z ≈50 and N>86, PHYS. REV. C 62 (2000) 044315
46. T. Rząca - Urban et al., Shapes of the neutron-rich $^{88-94}$Kr nuclei, EUR. PHYS. J. A 9 (2000) 165, coauthor: W. Urban
47. C. Schlegel et al., *K*-Isomer in Very Neutron-Rich Nuclei Around Mass 180, PHYSICA SCRIPTA T 88 (2000) 72, coauthor: M. Pfützner, R. Grzywacz, M. Sawicka,
48. K. -H. Schmidt et al., Relativistic radioactive beams: A new access to nuclear-fission studies, NUCL.PHYS. A 665 (2000) 221, coauthor: M. Pfützner
49. C. Foin et al., New investigation of the decay of the high-spin isomer in ^{151}Er, EUR. PHYS. J. A 8 (2000) 451, coauthor: A. Płochocki
50. Z. Hu et al., B-decay of ^{98}Ag: Evidence for the Gamow-Teller resonance near ^{100}Sn, PHYS. REV. C 62 (2000) 064315, coauthors: Z. Janas, M. Karny, A. Płochocki
51. K. Schmidt et al., Beta decay of ^{93}Pd, EUR. PHYS. J A 8 (2000) 303, coauthor: Z. Janas
52. Piechaczek et al., Multipolarity of the 228.5 keV transition in ^{80}Y, PHYS. REV. C 61 (2000) 047306, coauthors: R.Grzywacz, K. Rykaczewski
53. M. La Comarra et al., Production of very neutron-deficient isotopes near ^{100}Sn via reactions involving light-particle and cluster emission, NUCL. PHYS. A 669 (2000) 43, coauthors: M. Glogowski, K. Rykaczewski
54. J.J. Ressler et al., Half-life measurement for the rp-process waiting point nuclide ^{80}Zr, PHYS. REV. LETT. 84 (2000) 2104, coauthors: R. Grzywacz, K. Rykaczewski
55. C.J. Gross et al., Performance of the recoil mass spectrometer and its detector system at the holifield radioactive ion beam facility, NUCL. INSTR. METH. A 450 (2000) 12, coauthors: R. Grzywacz, K. Rykaczewski

INVITED TALKS (1999-2000)

1. K. Rykaczewski, Proton-Drip Line Studies at HRIBF, International Symposium on Proton-Emitting Nuclei, Oak Ridge, Tenn. Oct. 7-9, 1999, AIP Conference. Proceedings. 518, American Institute of Physics, Woodbury, N.Y., 2000, p. 49
2. M. Pfützner, Search for Two-Proton Emitters at FRS-GSI, International Symposium on Proton-Emitting Nuclei, Oak Ridge, Tenn. Oct. 7-9, 1999, AIP Conference. Proceedings. 518, American Institute of Physics, Woodbury, N.Y., 2000, p. 89
3. M. Karny, A distribution of GT-strength and βp-Emission near ^{100}Sn, International Symposium on Proton-Emitting Nuclei, Oak Ridge, Tenn. Oct. 7-9, 1999, AIP Conference. Proceedings. 518, American Institute of Physics, Woodbury, N.Y., 2000, p. 246
4. Z. Janas, Spectroscopy of β-delayed Charged Particles at Projectile Fragment Separators, ibid., p. 255
5. R. Grzywacz, Isomeric properties of nuclei near ^{78}Ni, Second International Conference on Fission and Neutron-rich Nuclei, St. Andrews, Scotland, June 28 – July 2, 1999, World Scientific 2000, eds. J.H. Hamilton, W.R. Phillip, H.C. Carter, p. 38
6. W. Urban, Octupole effects in the lanthanides, Second International Conference on Fission and Neutron-rich Nuclei, St. Andrews, Scotland, June 28 – July 2, 1999, World Scientific 2000, eds. J.H. Hamilton, W.R. Phillip, H.C. Carter, p. 136
7. K. Rykaczewski,New Microsecond Proton Emitters, Nuclear Chemistry Gordon Research Conference, New London, New Hampshire, June 1-18, 1999, unpublished
8. K. Rykaczewski, Nuclear Properties far off Stability (Near the Proton Drip Line) and the rp-Process), XXVI Mazurian Lakes School of Physics, Krzyże, Poland, 1-11 September, 1999 Nuclear Physics at the Turn of the Century, unpublished
9. K. Rykaczewski, New Microsecond Isomers in Very Neutron-Rich Nuclei Studied with Fragmentation of Heavy Ion Beams 217th ACS National Meeting: From Rapid Chemistry to Rapid Nucleosynthesis, Anaheim, California, March 21-25, 1999, unpublished
10. A. Płochocki, Properties of the neutron-rich Pb, Bi and Po isotones, Symposium „Nuclear and Heavy-Ion-Accelerator Physics in Finland and Poland", Warsaw, 2-3 December, 1999, unpublished
11. A. Płochocki, Properties of the neutron-rich Pb, Bi and Po isotopes for A = 215, 216 and 217 isobaric chains, Meeting on „Nuclear Structure in the Pb region", Leuven, Belgium, 10-11 April, 2000, unpublished
12. K. Rykaczewski, Digital decay spectroscopy with XIA electronics at Oak Ridge", Meeting on „Nuclear Structure in the Pb region", Leuven, Belgium, 10-11 April, 2000, unpublished
13. Z. Janas, Gamow-Teller decay of neutron-deficient nuclei, Int. Workshop on N=Z Nuclei, (PINGST 2000), Lund, June 2000, ed.by D.Rudolph and M.Hellström, Int. Rep. Of Lund University (2001), p. 99
14. K. Rykaczewski, Towards digital spectroscopy of proton emitters, Conference „Nuclear Structure 2000", East Lansing, Michigan, USA, 15-19 August 2000, NUCL. PHYS. A 682 (2001) 270c
15. K. Rykaczewski, Fine studies of proton radioactivity with digital signal processing, XXXV Zakopane School of Physics, Trends in Nuclear Physics, Zakopane, Poland, 5-13 September 2000, ACTA PHYS.POL. vol. 32, no. 3 (2001) 971
16. J. Żylicz, Oscillations of nuclear-spin mixing in the hydrogenlike ^{229}Th^{89+} ion, XXXV Zakopane School of Physics, Trends in Nuclear Physics, Zakopane, Poland, 5-13 September 2000, unpublished
17. K. Rykaczewski, Fine structure in proton emission, Town Meeting on Nuclear- and Astro-Physics, Oakland, California, USA, 9-12 November 2000, unpublished
18. K. Rykaczewski, Nuclei at the (experimental) limits, INT workshop „Nuclear Structure for the 21st Century", Seattle, Washington, USA, 13-18th November 2000, unpublished
19. W. Urban, Gamma spectroscopy of very neutron-rich nuclei around ^{132}Sn, International Workshop NSNA 2000, Nuclear Spectroscopy and Nuclear Astrophysics, Forschungszentrum Rossendorf, Germany, April 27-29, 2000, unpublished
20. R. Grzywacz, Microsecond Isomer Studies, UNIRIB Workshop, Oak Ridge, Tenn., February 2000, unpublished
21. R. Grzywacz, Digital signal processing in nuclear spectroscopy, Exotag Workshop, CERN, Geneva, October 2000, unpublished
22. R. Grzywacz, In -beam study of the N=Z nucleus ^{66}As using the decay tagging technique, Exotag Workshop, CERN, Geneva, October 2000, unpublished

INTERNATIONAL CONFERENCES ORGANIZED BY THE DIVISION (1999-2000)

1. Workshop on Total Absorption Gamma Spectroscopy, Warsaw, 22-24 August 1999, chairman: dr hab. Andrzej Płochocki
2. Workshop on Isomeric Spectroscopy Following Relativistic Fragmentation, Warsaw, 11-14 November 1999, chairman: dr Marek Pfützner
3. Symposium: „Nuclear and Heavy-Ion-Accelerator Physics in Finland and Poland" (within the „Finnish Science Days in Poland organized by the Academy of Finland and the Polish Academy of Science), Warsaw, 2-3 December, 1999, chairmen: prof. J.Äystö, prof. J.Żylicz; co-organizers: Heavy Ion Laboratory, Warsaw University, and Department of Physics, University of Jyväskylä

DIVISION OF OPTICS

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Scientific Staff (total): - 10 persons
ETA (Engineering, Technicians, Administration): 5 persons
Number of grants in 1999 – 2000: 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 (1999 - 2000)

1. Piotr Wasylczyk, Nieliniowa propagacja ultrakrótkich impulsów światła w ośrodkach dyspersyjnych (Nonlinear propagation of ultrashort light pulses in dispersive media), (1999), supervisor: prof. Czesław Radzewicz
2. Aleksander Pietruczuk, Badanie aerozoli atmosferycznych przy pomocy lidaru (Investigation of atmospheric aerosol by means of lidar), 1999, supervisor: prof. Tadeusz Stacewicz
3. Konrad Nowak, Fluorescencja par sodu pobudzanych promieniowaniem laserowym o długości fali 330 nm (Fluorescence of sodium vapour excited by 330 nm laser radiation), 1999, supervisor: prof. Tadeusz Stacewicz
4. Sebastian Jałocha, Zmiany poziomu zanieczyszczeń atmosferycznych na obszarze „Czarnego Trójkąta" w ostatnim 10-leciu (Changes of atmospheric polution in the „Black triangle" region in the last decade), 1999, supervisor: dr Wojciech Skubiszak
5. Marcin Karolak, Zanieczyszczenie atmosfery w rejonie elektrowni Turów (Atmospheric pollution in the region of electric power station in Turów), 1999, supervisor: prof. Krzysztof Ernst
6. Paulina Płochocka, Femtosekundowy optyczny efekt Kerra w cieczach molekularnych (Femtosecond optical Kerr effect in molecular liquids), 2000, supervisor: prof. Czesław Radzewicz

7. Katarzyna Kołacz, Przystosowanie lidaru typu DIAL do pomiaru aerozoli (Adaptation of DIAL system for aerosol measurements), 2000, supervisor: prof. Tadeusz Stacewicz
8. Grzegorz Karasiński, Automatyzacja urządzeń spektroskopowych (Automatization of spectroscopic equipment), 2000, supervisor: prof. Tadeusz Stacewicz
9. Łukasz Kilianek, Badanie absorpcji metodą CRDS (Absorption investigation by means of CRDS), 2000, supervisor: prof. Tadeusz Stacewicz
10. Tomasz Kutner, Optyczne badania fullerenów (Optical investigations of fullerens), 2000, supervisor: prof. Tadeusz Stacewicz
11. Justyna Strzemieczna, Spektroskopia międzyatomowego oddziaływania $Cd(5^1P_1)$ + Xe (Spectroscopy of interatomic interaction for $Cd(5^1P_1)$ + Xe), 2000, supervisor: dr hab. Teresa Grycuk
12. Grażyna Jabłońska, Wyznaczanie parametrów jądrowych z pomiarów struktury nadsubtelnej w izotopie ^{24}Na (Determination of nuclear parameters from measurements of hyperfine structure of ^{24}Na isotope), 2000, supervisor: prof. Aleksandra Kopystyńska
13. Robert Krawczyk, Spektroskopia warstw fullerenowych adsorbujących rtęć (Spectroscopy of fulleren layers adsorbing mercury), 2000, supervisor: dr Elżbieta Czerwosz

Ph.D. (doctor) theses (1999-2000)

1. Piotr Wiewiór, Badania femtosekundowej dynamiki uporządkowania krótkiego zasięgu w cieczach przy pomocy femtosekundowego optycznego efektu Kerra (Short range order dynamics in liquids studies by femtosecond optical Kerr effect), 1999, supervisor: prof. Czesław Radzewicz
2. Jacek Chorąży, Dyfuzja promieniowania rezonansowego w silnie pobudzonych parach atomowych (Diffusion of resonance radiation in strongly excited atomic vapour), 1999, supervisor: prof. Tadeusz Stacewicz
3. Artur Szymański, Wykorzystanie lidaru do badań ozonu i aerozolu atmosferycznego (Lidar monitoring of atmospheric ozone and aerosol), 2000, supervisor prof. Krzysztof Ernst

PUBLICATIONS (1999-2000)

1. K. Banaszek et al., Determination of the Wigner function from photon statistics, ACTA PHYSICA SLOVAKIA 49 (1999) 643, coauthors: C. Radzewicz, K. Wódkiewicz
2. K. Banaszek et al., Direct measurement of the Wigner fuction by photon counting, PHYS. REV. A 60 (1999) 674, coauthors: C. Radzewicz, K. Wódkiewicz
3. C. Radzewicz et al., Ultra-short light wavepackets, PROCEEDINGS OF SPIE 3609 (1999) 130, coauthors: M. Trippenbach
4. C. Corsi et al., Detection of HCl on the first and second overtone using semiconductor diode laser at 1.7 μm and 1,2 μm, APP. PHYS. B 68 (1999) 267, coauthors: S. Chudzyński, K. Ernst
5. S. Chudzyński et al., Practical solutions for calibration of DIAL system, OPTICA APPLICATA XXIX (1999) 477, coauthors: A. Czyżewski, W. Skubiszak, T. Stacewicz, K. Stelmaszczyk, A. Szymański, K. Ernst
6. E. A. Pazyuk et al., Spin-orbit coupling in the $D^1\Pi$ $d^3\Pi$ complex of ^{23}NaK, MOL. PHYS. 96 (1999) 955, coathors: P. Kowalczyk
7. S. Rousseau et al., Theoretical study of the electronic structure of KLi and comparison with experiments, CHEM. PHYS. 247 (1999) 193, coauthors: P. Kowalczyk
8. P. Kowalczyk et al., Potential energies of the $4^1\Pi$ and $5^1\Pi$ states of NaK by polarization labelling spectroscopy and by ab initio calculations, CHEM. PHYS. LETT., 314 (1999) 47
9. J. Chorąży, T. Stacewicz, Investigation of radiation trapping in atomic vapour excited by weak resonant laser pulses, ACTA PHYS. POL. 96 (1999) 383
10. S. Chudzyński et al., Lidar monitoring of atmospheric ozone and aerozol, PROCEEDINGS of SPIE 4238 (2000) 255, coauthors: A. Czyżewski, K. Ernst, W. Skubiszak, T. Stacewicz, K. Stelmaszczyk, A. Szymański
11. Y. B. Band et al., Radio frequency output coupling of the Bose-Einstein condensate for atom lasers, PHYS. REV. A 59 (1999) 3893, coauthors: M. Trippenbach
12. L. Deng et al., Nonlinear atom optics: multi-wave mixing with matter waves. NATURE, 398 (1999) 218, coathors:, M. Trippenbach
13. E. Czerwosz et al., Electron emitting nanostructures of carbon+Pd system, J. MOL.& LIQUID CRYSTALS 253 (1999) 237
14. E. Czerwosz et al., AFM and TEM investigations of catalytic formed nanotubes in C_{60}/C_{70}+Ni layers, APPL. SURF. SC. 141 (1999) 350
15. Czerwosz et al., Topography and structure of C_{60}/C_{70}+Ni film containing carbon nanotubes grown perpendicularly to the substrate, VACUUM 54 (1999) 57
16. K. Stelmaszczyk et al., New Method of Elaboration of the Lidar Signal, APPL. PHYS. B 70 (2000) 295, coauthors: A. Czyżewski, A. Szymański, A. Pietruczuk, S. Chudzyński, K. Ernst, T. Stacewicz
17. N. A. Gorbunov et al., Observation of photoelectric forces in sodium vapour resonantly excited by laser light, TECHNICAL PHYS. LETT. 2000. V.26, N15 Aug, p. 21, (Russian version: ЖТФ 26, p21, 2000), coauthor: T. Stacewicz
18. S. Chudzyński et al., Observation of Ozone Concentration during the Solar Eclipse, ATMOS. RESEARCH Vol. 57/1 (2001) 43, coauthors: A. Czyżewski, K.Ernst, A. Pietruczuk, W. Skubiszak, T. Stacewicz, K. Stelmaszczyk, A. Szymański,
19. E. Czerwosz, et al., Photoluminescence and Raman Investigations of Structural Transformation of Fullerenes into Carbon Nanotubes in Vacuum Annealed C_{60}/C_{70}+Ni Films, J. PHYS.& CHEM. of SOLIDS 61 (12), (2000) 1973

20. E. Czerwosz et al., From Fullerenes to Carbon Nanotubes by Ni Catalysis; DIAMOND AND RELATED MATERIALS 9 (2000) 901
21. E. Czerwosz et al., Electron Emission from C_{60}/C_{70}+Pd Films Containing Pd Nanocrystals, J. VAC. SCIENCE & TECHNOL. B 18 (2000) 1064
22. K. Rzążewski et al., Statistics of atomic population in output coupled wavepackets from Bose-Einstein condensates: four wave mixing, PHYS. REV. bf A (2000) 61, coauthors: M. Trippenbach
23. Y.Band et al., Elastic scattering loss of atoms from colliding Bose-Einstein condensate wavepackets, PHYS. REV. LETT.84 (2000) 5462, coauthor: M. Trippenbach
24. M. Trippenbach et al., Mixing of matter waves from a Bose-Einstein condensate, PHYS. REV. A 62 023608-1 (2000)
25. M. Trippenbach et al., Structure of multicomponent Bose-Eistein condensates, J. PHYS. B. 33 (2000) 4017
26. M. Trippenbach et al., Coherence properties of an atom laser, J. PHYS. B.33 (2000) 47
27. Y. B. Band et al., Nonlinear atom optics: four wave mixing, PROC. of the SPIE Vol.3927 (2000) 90, coauthor: M. Trippenbach
28. R. Ferber et al., The $c^3\Sigma^+$, $b^3\Pi$ and a $^3\Sigma^+$ states of NaK revisited, J. CHEM. PHYS. 112 (2000) 5740, coauthor: P. Kowalczyk
29. A. Pashov et al., Construction of potential curves for diatomic molecular states by the IPA method, COMPUT. PHYS. COMMUN. 128 (2000) 622, coauthor: P. Kowalczyk
30. W. Jastrzębski et al., Spectroscopic investigation of the double minimum $2^1\Sigma^+_u$ state of potassium dimer, PHYS. REV. A 62 (2000) 042509, coauthors: W. Jaśniecki, P. Kowalczyk
31. A. Pashov et al., Accurate potential curve of the double minimum $2^1\Sigma+_u$ state of Na_2, J. MOL.SPECTROSC. 203 (2000) 264, coauthors: W. Jaśniecki, V. Bednarska, P. Kowalczyk
32. S. Kasahara et al., Doppler-free optical-optical double resonance polarization spectroscopy of the $2^1\Sigma^+_u$ double minimum state and the $C^1\Pi_u$ state of Li_2, J. CHEM. PHYS. 113 (2000) 6227, coauthor: P. Kowalczyk
33. A. Pashov et al., The Li_2 $F^1\Sigma^+_g$ "shelf" state. Accurate potential energy curve based on the Inverted Perturbation Approach, J. CHEM. PHYS. 113, (2000) 6624, coauthors: P. Kowalczyk
34. A. Pashov et al., Improved description of the double minimum $6^1\Sigma^+$ state of NaK by an IPA potential energy curve, J. PHYS. B. 33 (2000) L611, coauthors: P.Kowalczyk
35. Y. B. Band et al., Elastic scattering loss of atoms from colliding Bose-Einstein condensate wavepackets, PHYS. REV. LETT. 84 (2000) 5462, coauthors: M. Trippenbach
36. Y. B. Band et al., Theory of four wave mixing of matter waves from a Bose-Einstein condensate, PHYS. REV. A 62 (2000) 023608-1, coauthors: M. Trippenbach

INVITED TALKS (1999-2000)

1. M. Trippenbach, „Four wave mixing of matter waves", Workshop of BEC, Benasque, Spain 1999
2. T. Grycuk, „Optical spectra of Li (n = 2,3) – He collision molecules probing interaction potentials and dipole transition moments", 6-th International Workshop on Atomic Interactions in Laser Fields, Toruń , Poland, 1999
3. T. Stacewicz, „Elaboration of the DIAL signal, II Osterreicher LIDAR Workshop, Graz, Austria 1999
4. C. Radzewicz, J. S. Krasinski, M. Trippenbach, Y. B. Band "Ultra short light wavepackets" LASE '99, San Jose, USA , 1999, (speaker: C. Radzewicz)
5. C. Radzewicz "Linear and nonlinear propagation of femtosecond laser pulses in dispersive media " ICO XVIII Conference, San Francisco, USA, 1999
6. C. Radzewicz "Femtosecond dynamics of molecular liquids",VI Dutch-Polish Colloquium, Poznań, Poland, February 11-12, 2000
7. A. Kopystyńska, S. Chojnacki, T. T. Inamura, M. Kisieliński, M. Kowalczyk „High resolution laser spectrometer", 4th International Worshop „Laser spectroscopy on beams of radioactive nuclei.", Poznań, Poland, 1999, PROCEEDINGS of IV International Workshop on Application of Lasers in Nuclei Research, Poznań, Poland, 1999, p. 121, (speaker: A. Kopystyńska)

DIVISION OF PARTICLES AND FUNDAMENTAL INTERACTIONS

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Scientific Staff (total): 27 persons
ETA (Engineers, Technicians, Administration): 9 persons
Number of grants in 1999-2000: 8

SCIENTIFIC ACTIVITY

Main scientific activities are centered on 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 scattering experiments (NMC, SMC, COMPASS) at CERN Super Proton Synchrotron,
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. Preparation of the proton-proton experiment at the forthcoming CERN Large Hadron Collider (CMS),
6. Proton decay and observations of cosmic, solar and atmospheric neutrinos (SuperKamiokande)
7. Development of radiation detectors for high energy physics experiments and other fields. Physics of radiation detection.

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.

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

The group is involved in the simulation, software development, analysis and detector development, 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). Our main responsibility in the CMS experiment at the CERN LHC is the first level muon trigger.

Most important results in the last two years include:
- prototype processor construction for the first level muon trigger in the CMS 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
- Establishing limits on Higgs mass.

Presently we have twelve graduate students.

M.Sc. (magister) theses

1. Justyna Łagoda, Detektory gazowe typu RPC w układzie bieżącej detekcji mionów w eksperymencie CMS (RPC type gazeus detectors for muon detection in CMS experiment), 1999, supervisor: dr hab. W. Dominik
2. Katarzyna Brodziak, Pomiar całkowitego przekroju czynnego dla reakcji głęboko nieelastycznego rozpraszania ep z wymianą prądów naładowanych w eksperymencie ZEUS (Total Cross Section Measurement for Deep Inelastic ep Scattering with Charge Current Exchange in ZEUS Experiment), 1999, supervisor: prof. dr hab. J. Ciborowski
3. Elżbieta Sidor, Produkcja dwóch mezonów ρ^0 w oddziaływaniach $\gamma\gamma$ w LEPie (Double ρ^0 Production in $\gamma\gamma$ interactions at LEP), 1999, supervisor: prof. dr hab. K. Doroba

4. Agnieszka Hermaniuk, Produkcja jetów w reakcji głęboko nieelastycznego rozpraszania ep z wymianą prądów naładowanych w eksperymencie ZEUS (Jet Production in Charge Current Induced Deep Inelastic ep Scattering in ZEUS Experiment), 1999, supervisor: prof. dr hab. J. Ciborowski
5. Oleg Grajek, Poszukiwania skalarów z rozszerzonego sektora Higgsa za pomocą detektora DELPHI (Search for Scalars from Extended Higgs Sector in DELPHI Experiment), 1999, supervisor: dr P. Zalewski (IPJ)
6. Małgorzata Szydłowska, Badanie charakterystyk modelu detektora RPC dla eksperymentu CMS (Characteristics of the RPC model for the CMS experiment), 2000, supervisor: dr hab. W. Dominik
7. Katarzyna Perl, Pomiar funkcji korelacyjnej Φ_{pt} w zderzeniach Pb+Pb przy energii 158 GeV/nukleon (Measurement of the Φ_{pt} correlation function for PbPb collisions at 158 GeV/nucleon), 2000, supervisor: prof. dr hab. E. Skrzypczak
8. Paweł Zych, Badanie produkcji χ_{c2} w akceleratorze LEP (χ_{c2} Production at the LEP Accelerator), 2000, supervisor: prof. dr hab. K. Doroba
9. Sylwia Godlewska, Promienie kosmiczne w eksperymencie ZEUS (Cosmic Rays in the ZEUS Experiment), 2000, supervisor: dr hab. T. Tymieniecka
10. Joanna Zalipska, Performance Studies of a Time of Flight Detector, 2000, supervisors: dr P. Szymański (IPJ), prof. dr hab. K. Doroba
11. Artur Ukleja, Badanie fragmentacji protonu w głęboko nieelastycznym rozpraszaniu elektronu na protonie (Proton Fragmentation Studies in Deep Inelastic ep Scattering), 2000, supervisor: dr hab. T. Tymieniecka
12. Łukasz Gościło, Symulacja odpowiedzi wielostopniowego systemu wyzwalania detektora CMS (Simulation of Multilevel Trigger System for the CMS Detector), 2000, supervisor: dr hab. G. Wrochna (IPJ)
13. Jolanta Sztuk, Rekonstrukcja przypadków produkcji J/ψ i ψ` w głęboko nieelastycznym rozpraszaniu e±p (J/ψ and ψ` events reconstruction in deep inelastic e±p scattering), 2000, supervisor: dr hab. A. F. Żarnecki
14. Justyna Tomaszewska, Produkcja wysokoenergetycznych par mionów w eksperymencie ZEUS (High energy muon pair production in ZEUS Experiment), 2000, supervisor: dr G. Grzelak
15. Michał Bluj, LEP jako narzędzie poszukiwania nowej fizyki (LEP as a Tool in Search for new Physics), 2000, supervisor: dr P. Zalewski (IPJ)
16. Piotr Orepuk, Inkluzywna produkcja cząstki Δ^{++} w DELPHI (Inclusive Δ^{++} production in DELPHI), 2000, supervisor: prof. dr hab. K. Doroba
17. Izabela Orepuk, Inkluzywna produkcja π^0 w DELPHI (Inclusive π^0 production in DELPHI), 2000, supervisor: prof. dr hab. K. Doroba

Ph.D. (doctor) theses

1. Grzegorz Grzelak, Production of Intermediate W and Z Bosons in ep Interactions at 300 GeV Centre of Mass Energy, 1999, supervisor: prof. dr hab. J. Ciborowski.
2. Katarzyna Grzelak, Two-photon production of charged meson pairs at LEP, 2000, supervisor: dr hab. K. Doroba
3. Joanna Kiryluk, Spin asymmetries A_1 and spin dependent structure functions g_1 of the proton and the deuteron at low x and low Q^2 from polarized high energy muon scattering, 2000, supervisor: prof. dr hab. B. Badełek

D.Sc. (dr hab., habilitation)

1. Aleksander F. Żarnecki, Global analysis of eeqq contact interactions and future prospects for high energy physics, 2000.

PUBLICATIONS (1999-2000)

1. M. Ćwiok et al., Bakelite chambers for time-of-flight measurements, NUCLEAR INSTRUMENTS AND METHODS IN PHYSICS RESEARCH A 433 (1999) 523, coauthors: W. Dominik, M. Górski, J. Królikowski
2. M. Ćwiok et al., Highly efficient resistive plate chambers for high rate environment, NUCLEAR PHYSICS B (Proc. Suppl.) 78 (1999) 438, coauthors: W. Dominik, M. Górski, J. Królikowski
3. J. Breitweg et al., Measurement of jet shapes in high Q^2 deep inelastic scattering at HERA, ZEUS Collaboration, EUR. PHYS. J. C8 (1999) 367, 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.
4. J. Breitweg et al., Forward jet production in deep inelastic scattering at HERA, ZEUS Collaboration, EUR. PHYS. J. C6 (1999) 239, 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.
5. J. Breitweg et al., Measurement of the diffractive cross section in deep inelastic scattering using ZEUS 1994 Data, ZEUS Collaboration, EUR. PHYS. J. C6 (1999) 43, 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
6. J. Breitweg et al., Measurement of inclusive $D^{*\pm}$ and associated dijet cross sections in photoproduction at HERA, ZEUS Collaboration, EUR. PHYS. J. C6 (1999) 67, 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
7. J. Breitweg et al., Exclusive electroproduction of ρ^0 and J/ψ mesons at HERA, ZEUS Collaboration, EUR. PHYS. J. C6 (1999) 603, 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
8. J. Breitweg et al., ZEUS results on the measurement and phenomenology of F_2 at low x and low Q^2, ZEUS Collaboration, EUR. PHYS. J. C7 (1999) 609, 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

9. J. Breitweg et al., Measurement of high Q^2 neutral current e^+p deep inelastic scattering cross sections at HERA, ZEUS Collaboration, EUR. PHYS. J. C11 (1999) 427, 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
10. J. Breitweg et al., Measurement of multiplicity and momentum spectra in the current and target regions of the breit frame in deep inelastic scattering at HERA, ZEUS Collaboration, EUR. PHYS. J. C11 (1999) 251, 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
11. J. Breitweg et al., Measurement of dijet photoproduction at high transverse energies at HERA, ZEUS Collaboration, EUR. PHYS. J. C11 (1999) 35, 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
12. P. Abreu et al., Measurement of inclusive rho0, f(0)(980), f(2)(1270), k*0(2)(1430) and f-prime(2)(1525) production in Z^0 decays, DELPHI Collaboration, PHYS.LETT. B 449 (1999) 364, coauthors: K. Doroba, K .Grzelak, P. Nieżurawski, M. Trochimczuk
13. P. Abreu et al., Study of the four-jet anomaly observed at LEP center-of-mass energies of 130 GeV and 136 GeV, DELPHI Collaboration, PHYS.LETT. B 448 (1999) 311, coauthors: K. Doroba, K. Grzelak, P .Nieżurawski, M. Trochimczuk
14. P. Abreu et al., Measurement of a(fb)(b anti-b) in hadronic Z decays using a jet charge technique, DELPHI Collaboration, EUR.PHYS. J. C9 (1999) 367, coauthors: K. Doroba, K. Grzelak, P. Nieżurawski, M. Trochimczuk
15. P. Abreu et al., A precise measurement of the partial decay width ratio r(b)**0 = gamma(b anti-b) / gamma(had), DELPHI Collaboration, EUR.PHYS. J. C 10 (1999) 415, coauthors: K. Doroba, K. Grzelak, P. Nieżurawski, M. Trochimczuk
16. P. Abreu et al., Search for charginos, neutralinos and gravitinos in e^+e^- interactions at $\sqrt{s}$ = 183 GeV, DELPHI Collaboration, PHYS. LETT. B 446 (1999) 75, coauthors: K. Doroba, K. Grzelak, P. Nieżurawski, M. Trochimczuk
17. P. Abreu et al., Search for leptoquarks and fcnc in e^+e^- annihilations at $\sqrt{s}$ = 183 GeV, DELPHI Collaboration, PHYS. LETT. B 446 (1999) 62, coauthors: K. Doroba, K. Grzelak, P. Nieżurawski, M. Trochimczuk
18. P. Abreu et al., Search for lightest neutralino and stau pair production in light gravitino scenarios with stau nlsp, DELPHI Collaboration, EUR.PHYS.J. C7 (1999) 595, coauthors: K. Doroba, K. Grzelak, P. Nieżurawski, M. Trochimczuk
19. P. Abreu et al., Search for composite and exotic fermions at LEP-2, DELPHI Collaboration, EUR.PHYS. J. C8 (1999) 41, coauthors: K. Doroba, K. Grzelak, P. Nieżurawski, M. Trochimczuk
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115. P. Abreu et al., Hadronization properties of b quarks compared to light quarks in e+ e- to Q anti-Q from 183-GeV to200-GeV, DELPHI Collaboration, PHYS. LETT. B 479 (2000) 118, Erratum-ibid.B492:398,2000, coauthors: K. Doroba, K. Grzelak, P. Nieżurawski, M. Trochimczuk
116. P. Abreu et al., Search for supersymmetric particles in scenarios with a gravitino lsp and stau nlsp, DELPHI Collaboration, EUR. PHYS. J. C 16 (2000) 211, coauthors: K. Doroba, K. Grzelak, P. Nieżurawski, M. Trochimczuk
117. P. Abreu et al., Determination of |V(UB)| / |V(CB)| with DELPHI at LEP, DELPHI Collaboration, PHYS. LETT. B 478 (2000) 14, coauthors: K. Doroba, K. Grzelak, P. Nieżurawski, M. Trochimczuk
118. P. Abreu et al., Search for heavy stable and long-lived particles in e+ e- collisions at √s = 189-GeV, DELPHI Collaboration, PHYS. LETT. B 478 (2000) 65, coauthors: K. Doroba, K. Grzelak, P. Nieżurawski, M. Trochimczuk
119. P. Abreu et al., Consistent measurements of alpha(s) from precise oriented event shape distributions, DELPHI Collaboration, EUR. PHYS. J. C 14 (2000) 557, coauthors: K. Doroba, K. Grzelak, P. Nieżurawski, M. Trochimczuk

INVITED TALKS (1999-2000)

1. B. Badełek, Workshop on Small x Physics, Tel Aviv, June 1999.
2. B. Badełek, 2nd ECFA/DESY Study on Physics and Detectors for a Linear Electron-Positron Collider, Obernai (France), October 1999
3. D. Kiełczewska (for the Super-Kamiokande Collaboration), "Neutrino Oscillations at Super-Kamiokande", International Workshop on "Particles in Astrophysics and Cosmology", Valencia (Spain), May 3-8, 1999
4. D. Kiełczewska, "neutrinos and Muons", 26th International Conference on Cosmic Rays, Salt Lake City, August 1999
5. D. Kiełczewska, "Na tropie masy neutrin", XXXV Zjazd Fizyków Polskich, Białystok, 20-23 września 1999
6. D. Kiełczewska (for the Super-Kamiokande and K2K Collaborations), "Experimental Results on Neutrino Oscillations using Atmospheric, Solar and Accelerator Beams", Cracow Epphany Conference on Neutrinos in Physics and Astrophysics, Cracow, Poland, January 6-9, 2000
7. B. Badełek, "Spin dependent structure function g_1 at low x and low Q^2",8th International Workshop on Deep Inelastic Scattering, DIS 2000, Liverpool (England), April 2000
8. A. F. Żarnecki, "Leptoquarks and contact interactions from a global analysis", DIS-2000, Liverpool (England), April 2000
9. W. Dominik, "The fluorescence imaging device for the melanoma cancer detection at early stages", International Conference IMAGING 2000, Stockholm (Sweden) June 28 – July 1 2000

DIVISION OF PHYSICS EDUCATION

Head: Dr hab. Tadeusz Pniewski (docent)
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Senior Staff Members: Prof. dr hab. Jerzy Ginter, dr hab. Tadeusz Pniewski (docent),
dr hab. Andrzej Hennel (professor), dr hab. Andrzej Majhofer (associated professor)
Scientific Staff (total): 7 persons
ETA (Engineers, Technicians, Administration): 6 persons
Number of grants in 1999-2000: 2

SCIENTIFIC ACTIVITY

Main activities:

1. Preparation of curricula, textbooks and teaching materials for the reformed school system
    a. curricula, textbooks, teachers'guides and other teaching materials for physics in lower secondary school (gymnasium)
    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 the concept and design of an interactive, multimedial program for teaching physics at secondary school level. Part 1: thermodynamics with elements of the kinetic theory of matter.
4. Developing methods and techniques for the promotion of physics in public media.
5. Intensive summer courses in modern physics for secondary school teachers (in collaboration with the Institute of Physics of the Polish Academy of Sciences); financed by the Stefan Batory Foundation.
6. Creation of multimedial data base containing documents related to teaching of the energy concept (collaboration within the SOCRATES-COMENIUS project „Teaching and learning energy across Europe")

M.Sc. (magister) theses (1999-2000)

1. Agnieszka Palmowska, Eksperymenty w nauczaniu mechaniki: Praca i energia mechaniczna (Experiments in teaching of mechanics: Work and mechanical energy), 1999,supervisor: doc. dr hab. T. Pniewski
2. Tomasz Perka, Proste zjawiska nieliniowe i możliwość ich przedstawienia w szkole średniej (Simple nonlinear phenomena and their possible presentation in secondary school), 1999, supervisor: dr Magdalena Staszel
3. Wioletta Gołaszewska, Doświadczalne problemy otwarte w nauczaniu fizyki (Open experiments in physics teaching), 1999, supervisor: dr Magdalena Staszel
4. Mariusz Gołaszewski, Prąd elektryczny i jego skutki magnetyczne - nauczanie w szkole podstawowej i średniej (Electric current and its magnetic effects: teaching in lower and upper secondary school), 1999, supervisor: dr Magdalena Staszel
5. Agata Tatarczak, Pomiary w nauczaniu fizyki w szkole średniej (Measurements in physics teaching in upper secondary school), 2000, supervisor: doc. dr hab. T. Pniewski
6. Paweł Sosiński, Eksperymenty w nauczaniu mechaniki: Badanie ruchu ciała pod działaniem siły sprężystości (Experiments in teaching of mechanics: Study of the motion of a body under the influence of elastic force), 2000, supervisor: doc. dr hab. T. Pniewski
7. Katarzyna Dąbrowska, Warsztaty z fizyki współczesnej (Workshop in modern physics), 2000, supervisor: dr Magdalena Staszel

B.Sc. theses (1999-2000)

21 bachelor theses supervised by prof. Jerzy Ginter, dr Magdalena Staszel, dr Stefania Elbanowska and dr hab. Andrzej Majhofer

PUBLICATIONS (1999-2000)

1. H.P. Fischer et al., Subsurface ordering kinetics at Cu_3Au (001), EUROPHYSICS LETTERS 49, (1999) 755, coauthor A. Majhofer
2. M. Staszel et al., Toys and conservation laws, Proc. of the ICPE-GIREP Int. Conf. „Hands-on Experiments in Physics Education", ed. G.Born et al, publ. ICPE / IUPAP & Univ. of Duisburg, 1999, p. 348, coauthor: A. Majhofer
3. J. Ginter, Dyfrakcyjne rozmycie obrazów tworzonych przez soczewkę. (Diffraction smearing of images formed by a lens) FIZYKA W SZKOLE, vol. 45, no. 1, WSiP, Warszawa 1999, p. 20
4. A. Rogulski, Krystalizacja cieczy przechłodzonej (Cristallization of overcooled liquid) FIZYKA W SZKOLE, vol. 45, no. 5, WSIP, Warszawa 1999,p. 294
5. A.Rogulski, Elektroniczny pomiar prędkości światła, (Electronic measurement of the speed of light), FIZYKA W SZKOLE, vol.45, no. 2, WSiP, Warszawa 1999, p. 87

6. S. Elbanowska , Elementy fizyki w przyrodzie (Elements of physics in early science teaching), PROC. of 5th TEACHERS' IDEAS FAIR, Charles University, Prague, 2000
7. A. Rogulski, Elektroniczny termometr cyfrowy, (Electronic digital thermometer), FIZYKA W SZKOLE, vol. 46, no. 2-3, WSIP, Warszawa 2000, p. 101
8. A. Rogulski, Punkt krytyczny materii (Critical point of matter), FIZYKA W SZKOLE, vol. 46, no. 5 WSIP, Warszawa 2000, p. 245

Curricula, textbooks and other teaching materials for primary and secondary school students

1. A. Kaczorowska, Program nauczania fizyki i astronomii w gimnazjum w klasach I, II, III (Physics and astronomy curriculum for gymnasium, grades I-III), no. DKW-4014-98/99, WYD.EDUKACYJNE „ŻAK" 1999
2. S. Elbanowska et al., Program nauczania dla klas IV-VI szkoły podstawowej. Przyroda (Elementary science curriculum for grades IV-VI of primary school), no. DKW-4014-54/99, Juka 1999
3. R. Kowalski et al., Program nauczania przyrody w klasach IV-VI (Elementary science curriculum for grades IV-VI of primary school), no. DKW-4014-186/99, PRÓSZYŃSKI I S-ka SA 1999; coauthor: S.Elbanowska
4. S. Elbanowska et al., Woda źródłem życia. Podręcznik przyrody dla uczniów klasy IV szkoły podstawowej (Water - a source of life. Elementary science textbook for grade IV of primary school), JUKA, 1999
5. S. Elbanowska et al., Nauczanie przyrody w kl. IV. Przewodnik metodyczny do podręcznika przyrody dla kl. IV „Woda źródłem życia" (Teaching science in grade IV. Teachers' guide), JUKA, 1999
6. S. Elbanowska et al., Zeszyt ćwiczeń do podręcznika przyrody dla uczniów klasy IV szkoły podstawowej. Cz.1. (Activities for grade IV science), JUKA ,1999
7. J. Ginter et al., Fizyka i astronomia. Program nauczania dla gimnazjum (Physics and astronomy curriculum for gymnasium), FIZYKA W SZKOLE, vol. 45 (1999): part 1 - p.135, part 2 - p.199
8. J. Ginter, Fizyka. Gimnazjum 1. Podręcznik (Physics - textbook for grade 1 of gymnasium), WSIP, 1999
9. K. Tabaszewski et al., Fizyka 1 z prostymi doświadczeniami - podręcznik dla klasy 1 gimnazjum (Physics with simple experiments for grade 1 of gymnasium), PRÓSZYŃSKI I S-ka SA, 1999
10. S. Elbanowska et al., Przyroda - człowiek w środowisku. Podręcznik dla kl.V. (Man in his environment, elementary science textbook for grade V), JUKA, 2000
11. S. Elbanowska et al., Przyroda - człowiek w środowisku. Zeszyt ćwiczeń dla kl. V (Activities for grade V science), JUKA, 2000
12. S. Elbanowska et al., Przyroda - człowiek w środowisku. Przewodnik metodyczny do kl. V (Man in his environment - science teachers' guide for grade V), JUKA, 2000
13. S. Elbanowska et al., Fizyka i astronomia do gimnazjum 1, program (Physics and astronomy curriculum for grade 1 of gymnasium), JUKA, 2000
14. S. Elbanowska et al., Fizyka i astronomia do gimnazjum 1, podręcznik (Physics and astronomy - textbook for grade 1 of gymnasium), JUKA, 2000
15. S. Elbanowska et al., Fizyka i astronomia do gimnazjum 1, zeszyt ćwiczeń (Physics and astronomy - activities for grade 1 of gymnasium), JUKA, 2000
16. A. Kaczorowska, Fizyka i astronomia 1, podręcznik do gimnazjum (Physics and astronomy - textbook for grade 1 of gymnasium), WYD.EDUKACYJNE „Żak" 2000
17. A. Kaczorowska, Fizyka i astronomia 1, scenariusze lekcji (Physics and astronomy for grade 1 - lesson scenarios), WYD.EDUKACYJNE „Żak" 2000
18. A. Kaczorowska, Fizyka i astronomia 2, podręcznik do gimnazjum (Physics and astronomy, textbook for grade 2 of gymnasium), WYD.EDUKACYJNE „Żak" 2000
19. J. Rybiński et al., Laboratorium fizyczne - skrypt dla studentów (Undergraduate physics laboratory), SGIP, Warszawa 2000; coauthor: S. Elbanowska

DIVISION OF SOLID STATE PHYSICS

Head: Prof. dr hab. Marian Grynberg
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Scientific Staff (total): 26 persons
ETA (Engineers, Technicians, Administration): 9 persons
Number of grants in 1999-2000: 26

SCIENTIFIC ACTIVITY

Areas of scientific activity:
Electronic structure and investigations of low dimensional systems
Investigation of magnetic interaction in diluted magnetic semiconductors – bulk and quantum wells.
Growth and characterization of III-V – nitrides and antimonides.
Optical investigations of II-VI and III-V semiconducting compounds in external fields (magnetic field, hydrostatic pressure and uniaxial stress).

Methods:
Optical studies of electronic levels energy and symmetry.
Influence of external fields (magnetic, hydrostatic pressure, uniaxial stress) on the energy and symmetry of electronic states.
Growth of II-VI and III-V monocrystals and low dimensional structures.
Study of magnetic properties of diluted magnetic semiconductors.

Main achievements:
Magnetooptics of free and bound excitons in hetero- and homoepitaxial GaN layers has been investigated at high magnetic fields. The donor- and acceptor- bound excitons have been identified.
The growth of GaN/InGaN/GaN quantum wells has been developed in the MOCVD system. On the basis of GaN thin layers UV detector, blind for visible and infrared radiation was constructed.
The investigation of trions in doped semimagnetic semiconductors (=diluted magnetic semiconductor - DMS) has been precisely analysed.
Interband optical absorption in disorder material was investigated. Calculation was compared with experimental results on GaMnAs. Role of indirect optical transition in disorder materials was stressed.
Ammono-thermal growth of GaN: Mn was performed. Magnetic and electronic properties of GaN: Mn up to 6% of Mn were investigated.
Magnetooptical investigation in the far infrared of doped CdTe with J quatum wells were done at liquid helium temperature. Results are interpreted using the idea of D- center in QW.
Optical investigation of Mg-H and related complexies in doped GaN were performed in near infrared region.
High-pressure investigations of resonant tunneling through X-minimum related states in GaAs/AlAs/GaAs, single barrier modulated structure.

Equipment:
1. High pressure system for crystals growth using the Czochralski method,
2. MOCVD system for growing III-V layers and nanostructures,
3. Optical and magnetooptical systems for investigations in the visible, near-infrared and infrared spectral ranges (up to 10T),
4. SQUID magnetometer,
5. Helium liquefier,
6. Atomic Force Microscopy,
7. Fourier Transform Spectrometer,
8. Equipment for TEM preparation,
9. AMONO thermal method for nitride growth.

B.Sc. (licentiate) thesis (1999-2000)

1. Katarzyna Racka, Badanie własności optycznych InAs (Optical studies of InAs), 1999, supervisor: prof. Roman Stępniewski
2. Izabella Szabłowska, Własności elektryczne struktur GaAs/InGaAs/GaAs z modulacyjnym domieszkowaniem planarnym (Electrical properties of GaAs/InGaAs/GaAs structures with modulation planar doping), 1999, supervisor: dr Adam Babiński

3. Ewa Ilczuk, Badania domieszkowanych planarnie heterostruktur GaAs/InGaAs/AlGaAs metodami pojemnościowymi (Investigation of planary doping GaAs/InGaAs/AlGaAs), 1999, supervisor: dr Adam Babiński
4. Iwona Kowalik, Morfologia powierzchni warstw GaN badana AFM (Morfology of GaN surface investigated by AFM), 1999, supervisor: prof. Jacek Baranowski
5. Jolanta Jaros, Badanie własności optycznych warstw półprzewodnikowych w podczerwieni (Investigation of optical properties of semiconductor layers), 1999, supervisor: dr hab. Andrzej Witowski
6. Monika Rostek, Zjawisko Halla w cienkich warstwach InAs i InSb (Halla effect in InAs and InSb thin layers), 2000, supervisor: dr Krzysztof Karpierz
7. Paweł Łapiński, Badanie wzrostu bufora niskotemperaturowego InAb (Investigation of low temperature buffer layer of InAs), 2000, supervisor: prof. Jacek Baranowski
8. Anna Łasińska, Własności diamagnetyczne związków półprzewodnikowych grupy III-V (Diamagnetic properties of group III-V semiconducting compunds), 2000, supervisor: prof. Andrzej Twardowski
9. Aneta Miracka, Badania defektów naturalnych w kryształach AlN metodą rezonansu paramagnetycznego (Investigation of natural defects in AlN crystals by means of paramagnetic resonance technique), 2000, supervisors: prof. Maria Kamińska, dr Maria Palczewska
10. Marcin Pocipka, Badania magnetotransportowe w modulowanym polu magnetycznym (Magnetotransport studies in modulated magnetic field), 2000, supervisor: prof. Michał Baj.
11. Aneta Zdunik, Zastosowanie transmisyjnej mikroskopii elektronowej do badania mikrostruktury kontaktów omowych na przykładzie kontaktu omowego na bazie złota z barierą antydyfuzyjną azotku tytanu do arsenku galu typu p (The use of transmission electron microscopy for studies of ohmic contacts (example: ohmic contact based on gold with antidiffusive barrier made of titanium nitride for p-type GaAs), 2000, supervisor: dr Jacek Jasiński
12. Agnieszka Gromada, Własności elektryczne heterostruktur CdMgTe/CdTe o obniżonej wymiarowości (Electrical properties of low-dimensional CdMgTe/CdTe heterostructures), 2000, supervisor: dr Dariusz Wasik
13. Monika Samczuk, Charakteryzacja fosforku indu domieszkowanego rutenem metodą DLTS (DLTS characterization of InP:Ru), 2000, supervisor: dr Adam Babiński,
14. Iwona Pawłowska, Transport elektronowy w warstwach azotku galu (GaN) hodowanych metodą MOCVD na podłożach szafirowych (Electron transport in GaN layers grown by MOCVD technique on sapphire substrate), 2000, supervisor: prof. Maria Kamińska
15. Anna Włosek, Badanie powierzchni półprzewodników za pomocą mikroskopu sił atomowych (Investigation of semiconductor surface by AFM), 2000, supervisor: prof. Jacek Baranowski

M.Sc. (magister) thesis (1999-2000)

1. Andrzej Żubka, Własności fizyczne warstw GaN wyhodowanych metodą reactive ionplating (Physical properties of GaN layers grown by means of reactive ion platin technique), 1999, supervisor: prof. Maria Kamińska
2. Roman Banasik, Badanie własności warstw i studni kwantowych GaInN (Investigation of properties of GaInN layer and quantum wells), 1999, supervisor: prof. Jacek Baranowski
3. Mariusz Gwardiak, Właściwości warstw III-V z wąską przerwą energetyczną (Properties of the III-V narrow gap semiconducting layers), 1999, supervisor: prof. Roman Stępniewski
4. Agnieszka Wołoś, Sprzężenie plazmon-fonon w rozpraszaniu ramanowskim w azotku galu (Plazmon-phonon coupling in Raman scattering observed in GaN), 1999, supervisor: prof. Maria Kamińska
5. Marta Gryglas, Tunelowanie w strukturach z pojedyńczą barierą AlAs (Tunneling in structures with one AlAs barier), 1999, supervisor: dr Jacek Przybytek
6. Piotr Zalewski, Magnetooptyczne badania płytkich stanów donorowych w cienkich war-stwach CdTe w dalekiej podczerwieni (Magnetooptical investigation of shallow donor state in thin llayer of CdTe in Far Infra Red), 1999, supervisor: dr Krzysztof Karpierz
7. Małgorzata Czeczott, Interdyfuzja w nieintencjonalnie wygrzewanych kropkach kwantowych InGaAs/GaAs (Interdiffusion in nonintentional annealed quantum dots in InGaAs/GaAs system), 1999, supervisor: dr Jacek Jasiński
8. Adam Fiorek, Przejście dwuelektronowe w GaN (Two electrons transition i GaN), 1999, supervisor: prof. Jacek Baranowski
9. Michał Szot, Badania magnetooptyczne związków II-VI w dalekiej podczerwieni (Magnetooptical investigation of II-VI compounds in the Far Infra Red), 2000, supervisor: dr Krzysztof Karpierz
10. Wiktor Maślana, Zastosowanie efektu Faraday'a do badania stanów spinowych (Application of Faraday effect to spin state investigation), 2000, supervisor: prof. Jan Gaj
11. Aneta Kasińska, Fotoluminescencja heterostruktur AlGaN/GaN (Photoluminescence of AlGaN/GaN heterostructures), 2000, supervisor: prof. Jacek Baranowski
12. Dariusz Suska, Zastosowanie metody mapowania elektroodbicia do badania studni kwantowych GaAs/InGaAs/AlGaAs (Application of photoreflection mapping to GaAs/InGaAs/AlGaAs quantum wells), 2000, supervisor: dr Adam Babiński
13. Marcin Zając, GaMnN – nowy półprzewodnik półmagnetyczny (GaMnN – new semimagnetic semiconductor), 2000, supervisor: prof. Andrzej Twardowski

PhD. (doctor) thesis (1999-2000)

1. Anna Stachow-Wójcik, Magnetyczne warstwy półprzewodnikowe (Magnetic semiconductor layers), 1999, supervisor: prof. Andrzej Twardowski
2. Tomasz Tomaszewicz, Elektroodbicie w strukturach niskowymiarowych InGaAs/GaAs/AlGaAs (Electroreflection in low dimensional structures), 2000, supervisor: prof. Jacek Baranowski

PUBLICATIONS (1999-2000)

1. V.Y. Aleshkin et al., Far infrared emission and population inversion of hot holes in MQW InGaAs/GaAs heterostructures under real space transfer, ULTRAFAST PHENOMENA in SEMICONDUCTORS 297-2 (1999) 261, coauthor: J. Łusakowski
2. C. Bernhard et al., Far-infrared ellipsometric study of the spectral gap in the c- axis conductivity of $Y_{1-x}Ca_xBa_2Cu_3O_{7-\delta}$ a crystals, PHYSICAL REVUE B - CONDENSED MATTER 59 (1999) R6631, coauthor: A. Golnik
3. C. Bernhard et al., Coexistence of ferromagnetism and superconductivity in the hybrid ruthenate-cuprate compound $RuSr_2GdCu_2O_8$ studied by muon spin rotation and dc magnetization, PHYSICAL REVUE B - CONDENSED MATTER 59 (1999) 14099, coauthor: A. Golnik
4. T. Blasius et al., Muon spin rotation studies of the vortex matter in the high-T-c superconductor $Bi_2Sr_2CaCu_2O_{8+\delta}$, ACTA PHYSICA POLONICA A 96 (1999) 245, coauthor: A. Golnik
5. T. Blasius et al., Evidence for a two-stage melting transition of the vortex matter in $Bi_2Sr_2CaCu_2O_{8+\delta}$ single crystals obtained by muon spin rotation, PHYSICAL REVUE LETTERS 82 (1999) 4926, coauthor: A. Golnik
6. J. Cibert et al., Ferromagnetic transition in II-VI semimagnetic QWs, JOURNAL of CRYSTAL GROWTH 202 (1999) 670, coauthor: P. Kossacki
7. J.A. Gaj, Semimagnetic semiconductors, ACTA PHYSICA POLONICA A 96 (1999) 651
8. Golnik et al., The far-infrared in-plane conductivity of YBaCuO studied by ellipsometry, PHYSICA STATUS SOLIDI B-Basic Research 215 (1999) 553
9. M. Herbich et al., , Role of the Jahn-Teller effect of the V^{2+} center in the magnetic anisotropy of $Cd_{1-x}V_xS$ and $Cd_{1-x}V_xSe$, PHYSICAL REVUE B - CONDENSED MATTER 59 (1999) 2726 , coauthors: W. Mac, A. Twardowski, M. Demianiuk
10. J. Jasiński, Connecting quality improvement practices to reaccreditation, QUALITY PROGRESS 32 (1999) 90
11. J. Jasiński, The inverse TM solution for self-guided dark beams in defocusing non-Kerr media, OPTICAL and QUANTUM ELECTRONICS 31 (1999) 85
12. J. Jasiński, Bright solitons of generalized nonlinear Schrodinger equation, OPTICS COMMUNICATIONS 172 (1999) 325
13. E. Kamińska et al., Ni/Si-based contacts to GaN: Thermally activated structural transformations leading to ohmic behavior, MRS INTERNET JOURNAL of NITRIDE SEMICONDUKTOR RESEARCH 4 (1999) U875-U880, coauthor: J. Jasiński
14. M. Klose et al., Photoluminescence dynamics of InGaN/GaN quantum wells with different in concentrations, PHYSICA STATUS SOLIDI B - BASIC RESEARCH 216 (1999) 325, coauthors: K.P. Korona, J. Kuhl, M. Heuken
15. K.P. Korona et al., Temporally and spatially resolved spectroscopy of GaN, PHYSICA STATUS SOLIDI B - BASIC RESEARCH 215 (1999) 53, coauthors: J. Kuhl, J.M. Baranowski
16. K.P. Korona et al., Excitonic thermalization and recombination in homoepitaxial gallium nitride, PHYSICA STATUS SOLIDI B - BASIC RESEARCH 216 (1999) 85, coauthors: J. Kuhl, J.M. Baranowski, S. Porowski
17. P. Kossacki et al., High-temperature magnetic and optical properties of CdTe-MnTe superlattices, PHYSICAL REVUE B - CONDENSED MATTER 59 (1999) 7679, coauthor: J.A. Gaj
18. P. Kossacki et al., Neutral and positively charged excitons: A magneto-optical study of a p-doped $Cd_{1-x}Mn_xTe$ quantum well, PHYSICAL REVUE B - CONDENSED MATTER 60 (1999) 16018, coauthor: J.A. Gaj
19. Kudelski et al., Population effects in magnetoabsorption of (DX)-X-0 centers in $Cd_{1-x}Mn_xTe$, SOLID STATE COMMUNICATIONS 112 (1999) 173, coauthor: J.A. Gaj
20. E. Litwin-Staszewska et al., Electrical properties of GaN bulk single crystals doped with Mg, , PHYSICA STATUS SOLIDI B - BASIC RESEARCH 216 (1999) 567, coauthors: D. Wasik, A. Witowski
21. S. Maćkowski, J.A. Gaj, Interdiffusion of Mn and Mg ions in CdTe-based quantum wells, studied by spin tracing, DEFECT and DIFFUSION FORUM 174 (1999) 47
22. M.O. Manasreh et al., Localized vibrational modes of carbon-hydrogen complexes in GaN, APPLIED PHYSICS LETTERS 75 (1999) 659, coauthors: J.M. Baranowski, K. Pakuła,
23. Munzar et al., A new interpretation of the phonon anomalies in the far- infrared c-axis conductivity of underdoped $YBa_2Cu_3O_y$, PHYSICA STATUS SOLIDI B - BASIC RESEARCH 215 (1999) 557, coauthor: A. Golnik
24. Munzar et al., Anomalies of the infrared-active phonons in underdoped $YBa_2Cu_3O_y$ as evidence for the intra-bilayer Josephson effect, SOLID STATE COMMUNICATIONS 112 (1999) 365, coauthor: A. Golnik
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29. Stachow-Wójcik et al., Ferromagnetic transition in EuS-PbS multilayers, PHYSICSL REVUE B - CONDENSED MATTER 60 (1999) 15220, coauthor: A. Twardowski,
30. R. Stępniewski et al., Symmetry of excitons in GaN, PHYSICSL REVUE B -CONDENSED MATTER 60 (1999) 4438, coauthors: A. Wysmołek, K. Pakuła, J.M. Baranowski, J. Łusakowski
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43. A. Babiński et al., Transport and quantum electron mobility in the modulation Si delta-doped pseudomorphic $GaAs/In_{0.2}Ga_{0.8}As/Al_{0.2}Ga_{0.8}As$ quantum well grown by metalorganic vapor phase epitaxy, APPLIED PHYSICS LETTERS 77 (2000) 999, coauthors: J. Siwiec-Matuszyk, J. M. Baranowski
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53. B. Clerjaud et al., Infrared spectroscopy of Mg-H local vibrational mode in GaN with polarized light, PHYSICAL REVIEW B 61 (2000) 8238, coauthors: J. M. Baranowski, K. Pakuła, D. Wasik
54. T. Dietl et al., Ferromagnetism induced by free carriers in p-type structures of diluted magnetic semiconductors, PHYSICA E 7 (2000) 967, coauthor: P. Kossacki
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60. W. Mac et al, The ferromagnetic p-d exchange interaction in $Cd_{1-x}V_xS$, SEMICONDUCTOR SCIENCE AND TECHNOLOGY 15 (2000) 748, coauthors: M. Herbich, A. Twardowski, M. Demianiuk
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62. J. Mikucki et al., Metastability of the phosphorus antisite defect in low- temperature InP, PHYSICAL REVIEW B 61 (2000) 7199, coauthors: M. Baj, D. Wasik
63. G. Neu et al., Far-infrared and selective photoluminescence studies of shallow donors in GaN hetero- and homoepitaxial layers, APPLIED PHYSICS LETTERS 77 (2000) 1348, coauthors: A. M. Witowski, K. Pakuła
64. L. Nowicki et al., Characterization of InGaN/GaN heterostructures by means of RBS/channeling, NUCLEAR INSTRUMENTS & METHODS In Physics Research Section B - Beam Interactions With Materials And Atoms 161 (2000) 539, coauthors: J.M.Baranowski, K. Pakuła

65. M. Palczewska et al., Electron spin resonance of erbium in gallium nitride, SOLID STATE COMMUNICATIONS 114 (2000) 39, coauthors: A. Wołoś, M. Kamińska
66. A.A. Sirenko et al., Soft-mode hardening in $SrTiO_3$ thin films, NATURE 404 (2000) 373, coauthor: A. Golnik
67. J. Siwiec et al., Pressure reduction of parasitic parallel conduction in InGaAs/InP heterostructures containing LT-InP layers, HIGH PRESSURE RESEARCH 18 (2000) 75, coauthors: J. Mikucki, M. Baj
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69. A. Stachow-Wójcik et al., Magnetic properties of $Cd_{1-x}Mn_xTe$ and $Zn_{1-x}Mn_xTe$ epilayers with high concentration of Mn, PHYSICA STATUS SOLIDI A - APPLIED RESEARCH 177 (2000) 555, coauthors: W. Mac, A. Twardowski
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71. T. Story et al., Magnetic anisotropy in EuS-PbS multilayers, ACTA PHYSICA POLONICA A 97 (2000) 435, coauthors: A. Stachow-Wójcik, A. Twardowski
72. A. Twardowski, Diluted magnetic III-V semiconductors, ACTA PHYSICA POLONICA A 98 (2000) 203
73. D. Wasik et al., Hydrostatic-pressure-induced degradation of MBE CdTe/CdMgTe heterostructures grown on GaAs substrate, HIGH PRESSURE RESEARCH 18 (2000) 95, coauthors: J. Mikucki, J. Siwiec, M. Baj, J. Jasiński
74. A.M. Witowski et al., Phonon spectrometry with a bolometer based on spin-lattice relaxation, APPLIED PHYSICS LETTERS 76 (2000) 1749
75. T. Yasuhira et al., Giant Faraday rotation spectra of $Zn_{1-x}Mn_xSe$ observed in high magnetic fields up to 150 T, PHYSICAL REVIEW B 61 (2000) 4685, coauthor: A. Twardowski

INVITED TALKS (1999-2000)

1. P. Kossacki, et al., Magnetooptical studies of magnetic ordering in modulation doped quantum well of $Cd_{1-x}Mn_xTe$ NATO Science Series, 3 High Technology 81, 225 (2000)
2. R. Stępniewski, GaN electronic structure and luminescence mechanism from magnetooptics in high magnetic field, 25th International Conference on the Physics of Semiconductors, Osaka, Japan, September 17-22, 2000
3. A Twardowski, Magnetic III-V Semiconductors – Optical and Magnetic Properties, Workshop on Magnetoelectronic Materials and Devices, Buffalo, USA, September 171-8, 1999
4. A. Twardowski, Diluted magnetic III-V semiconductors, XXIX International School on the Physics of Semiconducting Compounds Jaszowiec 2000
5. A. Twardowski, Electron Paramagnetic Resonance and visible spectroscopy of III-V Diluted Magnetic Semiconductors, Polish-Japanese Seminar On Spin-related Phenomena in Semiconductors, Sendai, September 11-12, 2000, speaker: A. Twardowski

INTERNATIONAL CONFERENCES ORGANIZED BY THE DIVISION (1999-2000)

1. NATO Advanced Research Workshop: "Optical Properties of Semiconductor Nanostructures" Ustroń-Jaszowiec, Poland, June 12-16, 1999, chairman: prof. Marian Grynberg, co-chairman: prof. Marek Potemski, Grenoble High Magnetic Field Laboratory.
2. XXVIII International School on the Physics of Semiconducting Compounds "Jaszowiec'99" Ustroń-Jaszowiec, Poland, June 1999 chairman: prof. Andrzej Twardowski, co-organiser: Institute of Physics Polish Academy of Sciences.
3. XXVIII International School on the Physics of Semiconducting Compounds "Jaszowiec 2000" Ustroń-Jaszowiec, Poland, June 2000, chaiman: prof. Piotr Bogusławski, co-organiser: High Pressure Research Centre Polish Academy of Sciences.

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Scientific Staff (total): 7 persons
ETA (Engineers, Technicians, Administration): 3 persons
Number of grants in 1999–2000: 2

SCIENTIFIC ACTIVITY

Areas of scientific activity:
Investigation of defects and deformations of single-crystal lattices and semiconductor thin layers systems (especially AIII-BV and GaN) by means of X-ray topography and high-resolution X-ray diffractometry.
Investigation of magnetic structure and interlayer correlations in semiconductor superlattices (EuTe/PbTe, EuS/PbS, GaMnAs/GaAs) by means of neutron reflectometry and diffraction.

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

Main achievements:
1. New structural model of the metastability of the EL2 center in GaAs has been proposed. Results are based on reciprocal space mapping of diffuse X-ray scattering using synchrotron radiation.
2. High resolution x-ray diffraction and computer simulations have been applied to study of anisotropy of strain relaxation in thin $In_xGa_{1-x}N$ epilayers deposited on GaN sublayer grown on sapphire. The biaxial (in-plane and out-of-plane) strain components and the hydrostatic strain component in thick undoped and Si doped GaN layers have been extracted.
3. The existence of ferromagnetic interlayer interactions in Ga(6%Mn)As/GaAs superlattices has been revealed by polarized neutron reflectometry studies. The interlayer magnetic coupling in GaMnAs/GaAs or EuS/PbS may play a crucial role in functioning of future spintronic materials.

Equipment:
X-ray generators (6 pcs), topographic cameras (8 pcs), high-resolution multi-crystal X-ray diffractometers (2 pcs), triple-axis neutron spectrometer.

M.Sc. (magister) theses:

1. Ilona Frymark, Badanie defektów sieci krystalicznej metodą topografii odbiciowej (A study of crystal defects by X-ray reflection topography), 1999, supervisor: dr hab. M. Lefeld-Sosnowska
2. Szymon Grzanka, Badania dyfrakcyjne struktur warstwowych AlGaAs na podłożu 1:GaAs SI oraz 2:GaAs:Te (An X-ray diffraction study of AlGaAs layer structures on GaAs SI and GaAs substrates), 1999, supervisor: dr hab. E. Zielińska-Rohozińska
3. Sylwia Knieć, Wyznaczanie orientacji monokryształów metodą dyfraktometryczną (Orienting single crystals by X-ray diffractometry), 1999, supervisor: dr hab. E. Zielińska-Rohozińska
4. Sylwia Kultys, Analiza dyfraktogramów neutronowych i rentgenowskich metodą profilową Rietvelda (Analysis of neutron and X-ray diffractograms by Rietveld profile method), 1999, supervisor: dr M. Szymański
5. Małgorzata Regulska, Badanie realnej struktury kryształów metodą wysokorozdzielczej dyfraktometrii rentgenowskiej (A study of real crystal structure by high resolution X-ray diffractometry), 1999, supervisor: dr hab. M. Lefeld-Sosnowska
6. Aneta Bilińska, Topograficzne badania diamentów syntetycznych (X-ray topography study of synthetic diamonds), 2000, supervisor: dr G. Kowalski
7. Elżbieta Dadacz, Dyfrakcja promieni rentgenowskich na cienkich supersieciach CdTe/MnTe (X-ray diffraction from thin CdTe/MnTe superlattices), 2000, supervisor: dr M. Szymański
8. Zbigniew Grygoruk, Badanie mikrodefektów w monokryształach Si:Ge (A study of microdefects in Si:Ge single crystals), 2000, supervisor: dr hab. M. Lefeld-Sosnowska
9. Agnieszka Kasztelanic, Badanie monokryształu berylu za pomocą promieniowania synchrotronowego (A study of beryllium single crystal with synchrotron radiation), 2000, supervisor: dr hab. J. Gronkowski
10. Krzysztof Kuciński, Badanie mikrowydzieleń w diamentach syntetycznych (A study of microprecipitates in synthetic diamonds), 2000, supervisor: dr G. Kowalski
11. Anna Paczuska, Pomiary dyfraktometryczne na warstwach LT-GaAs domieszkowanych berylem (X-ray diffractometry measurements of LT-GaAs layers doped with beryllium), 2000, supervisor: dr G. Kowalski

12. Alina Perzyna, Reflektometryczne pomiary rentgenowskie na filmach Langmuira–Blodgett (X-ray reflectometry measurements of Langmuir–Blodgett films), 2000, supervisor: dr H. Kępa
13. Radosław Rzeczkowski, Badanie dyfrakcji promieni rentgenowskich na supersieciach CdTe/MnTe (A study of X-ray diffraction from CdTe/MnTe superlattices), 2000, supervisor: dr M. Szymański
14. Jacek Zborowski, Badanie uporządkowanych warstw FePt/Pt metodą DAFS (A study of ordered FePt/Pt layers by DAFS), 2000, supervisor: dr hab. J. Gronkowsk

D.Sc. (dr hab., habilitation) theses (1999-2000)

1. Grzegorz Kowalski, Metody rentgenowskie w badaniach defektów sieci krystalicznej o wielkościach submikronowych (X-ray methods in studies of crystal defects of submicrometer size), 2000

PUBLICATIONS (1999–2000)

1. J. Borowski et al., X-ray diffuse scattering from extended microdefects of orthorhombic symmetry for Si single crystals, J. ALLOYS AND COMPOUNDS 286 (1999) 250
2. J. Gronkowski, J. Borowski, E. Zielińska-Rohozińska, High-resolution characterization of microdefects by X-ray diffuse scattering, PHIL. TRANS. R. SOC. LOND. A 357 (1999) 2721
3. D. Klinger et al., Study of extended defects structure induced by pulsed laser annealing in implanted silicon crystals, PHYS. STAT. SOL. A 171 (1999) 389, coauthor: M. Lefeld-Sosnowska
4. G. Kowalski et al., Application of x-ray phase-contrast imaging to polycrystalline CVD diamond, J. PHYSICS D: APPLIED PHYSICS 32 (1999) A166
5. G. Kowalski et al., X-ray topography studies of microdefects in silicon, PHIL. TRANS. R. SOC. LOND. A 357 (1999) 2707, coauthors: M. Lefeld-Sosnowska, J. Gronkowski, J. Borowski,
6. M. Lefeld-Sosnowska, Dislocations generated in Si annealed under normal or high pressure, PHYS. STAT. SOL. A 171 (1999) 105
7. M. Moore et al., Reciprocal-space mapping of synthetic and natural diamond, J. PHYSICS D: APPLIED PHYSICS 32 (1999) A37, coathor: G. Kowalski
8. G. Kowalski et al., Lattice relaxation and metastability of the EL2 defect in SIGaAs and low temperature GaAs, J. APPL. PHYS. 87 (2000) 3663
9. D. Wasik et al., Hydrostatic-pressure-induced degradation of MBE CdTe/CdMgTe heterostructures grown on GaAs substrate, HIGH PRESSURE RESEARCH 18 (2000) 95, coauthor: J. Gronkowski
10. T. Słupiński et al., Local order of Te impurity atoms and free electron concentration in heavily doped GaAs:Te, THIN SOLID FILMS 367 (2000) 227, coauthor: E.Zielińska-Rohozińska
11. T. Słupiński et al., Local order of Te impurity atoms and accompanying electron localization effect, MAT. RES. SOC. SYMP. PROC. 583 (2000) 261, coauthor: E.Zielińska Rohozińska

INVITED TALKS (1999–2000)

1. M. Lefeld-Sosnowska, Diffraction imaging of crystal lattice defects, „Synchrotron Radiation Studies of Materials”, 5th National Symposium of Synchrotron Radiation Users, 31 May–1 June 1999, Warsaw

INTERNATIONAL CONFERENCES ORGANIZED BY THE DIVISION (1999–2000)

1. "Synchrotron Radiation Studies of Materials", 5th National Symposium of Synchrotron Radiation Users, 31 May–1 June 1999, Warsaw. Chairperson: prof. M. Lefeld-Sosnowska. Co-organisers: Institute of Physics and Institute of Physical Chemistry Polish Academy of Sciences.
2. 5th European Conference on High Resolution X-ray Diffraction and Topography "XTOP2000", 13 - 15 September 2000, Jaszowiec-Ustroń. Chairperson: prof. J. Gronkowski. Co-organiser: Institute of Physics Polish Academy of Sciences.

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ETA (Engineers, Technicians, Administration): 2 persons
Number of grants in 1999-2000: 3

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

Main achievements:
1. Explanation, in terms of computational model, of sleep spindles properties: their frequency and time-pattern of occurrence. Eluciation of topographical distribution of sleep spindles in human.
2. Determination of the time-frequency structure of EEG connected with planning of voluntary movement. Estimation of topographical distribution of synchronization and desynchronization patterns.
3. Hypothesis concerning neurophysiological mechanism of focal attention tested using neural network model.
4. Identification of mechanism leading to transition from normal to epileptic activity in the brain. New methods of seizure suppression based on computer simulation.

M.Sc. (magister) theses (1999-2000)

1. Józef S. Ginter, Wpływ świadomej czynności motorycznej na sygnały elektryczne z mózgu (Influence of voluntary motor activity on the brain electric signals), 1999, supervisor: prof. K. Cieślak-Blinowska
2. Natalia M. Terajewicz, Analiza promieniowania laserowego reemitowanego z tkanki (Analysis of laser radiation from tissue), 1999, supervisors: prof. Katarzyna Cieślak-Blinowska, prof. Roman Maniewski
3. Katarzyna Balcerzak, Analiza oddziaływań między strukturami mózgu za pomocą badania korelacji i widm sygnału EEG (Analysis of interactions between brain structures by means of correlations and power spectra), 1999, supervisors: prof. Katarzyna Cieślak-Blinowska, doc. dr hab. Stefan Kasicki
4. Longina M. Borowska, Badanie bieżącej i odbitej fali ciśnienia krwi w naczyniach tętniczych człowieka na podstawie nieinwazyjnych pomiarów ultradźwiękowych (Investigation of forward and backward blood pressure wave in arteries based on non-invasive ultrasonal measurements), 1999, supervisors: prof. Katarzyna Cieślak-Blinowska, doc. dr hab. Tadeusz Powałowski
5. Cezary P. Nowosad, Zmiany aktywności kory baryłkowej szczura podczas warunkowania, rejestrowane metodą potencjałów wywołanych (Changes of activity of rats barrel cortex during conditioning, by means of evoked potentials), 1999, supervisor: prof. Andrzej Wróbel
6. Krzysztof Chełmiński, Badanie i wizualizacja elastyczności tkanek przy użyciu fal ultradźwiękowych (Investigation and visualization of tissue elasticity by means of ultrasounds), 1999, supervisors: prof. Katarzyna Cieślak-Blinowska, prof. Andrzej Nowicki
7. Małgorzata Fereniec, Porównanie propagacji sygnału EEG u osób depresyjnych i zdrowych metodą DTF (Comparison of EEG signal propagation for normal and depressed patients by means of DTF method), 1999, supervisor: prof. Katarzyna Cieślak-Blinowska.
8. Arkadiusz W. Słomiński, Ocena metod napromieniowania blizny po mastekotomii(Estimation of the irradiation methods applied to a mastecotomy scar), 1999, supervisor: dr Paweł Kukołowicz
9. Agnieszka A. Walewska, Wyznaczanie współczynników rozpraszania na głowicy akceleratora CLINAC 2300 C/D dla promieniowania X o energii 6MV(Determination of the dispersion coefficients on the head of CLINAC 2300 C/D accelerator for X rays of energy 6 MV), 2000, supervisor: dr Paweł Kukołowicz
10. 10.Małgorzata A. Mańczak, Opracowanie metody oceny bezpośredniego oddziaływania między strukturami mózgu (Method of estimation of the direct interactions between brain structures), 2000, supervisors: prof. Katarzyna Cieślak-Blinowska, doc. dr hab. Stefan Kasicki

11. Dariusz Krzos, Badanie rozkładu pól promieniowania rentgenowskiego dla zestawu wzorcowego z generatorem typu PANTAK 320 (Investigation of the X rays field distribution for scaling unit of PENTAK 320 generator), 2000, supervisors: prof. Katarzyna Cieślak-Blinowska, mgr inż. Hanna Dikiewicz-Sapiecha
12. Hubert A. Klekowicz, Parametryzacja i detekcja artefaktów w EEG snu (Parameterizatio and detection of artifacts in sleep EEG), 2000, supervisor: dr Piotr Durka.
13. Ewa Krupińska, Przejście ze stanu normalnego do padaczkowego: charakterystyka i prognozowanie (Transition from normal to epileptic state: characterization and predictability), 2000, supervisor: prof. Katarzyna Cieślak-Blinowska
14. Daniel Brutkowski, Przystosowanie wielokanałowego modelu AR do analizy krótkoczasowej sekwencji sygnału EEG (Adaptation of multichannel AR model to the analysis of short time EEG series), 2000, supervisor: dr Piotr Durka
15. Agnieszka M. Żmuda, Ocena przydatności metod analizy wzajemnych wpływów pobudzających między motoneuronami w oparciu o badania symulacyjne (Analysis of usefulness of the methods of analysis of motoneuron excitation, using computer simulation), 2000, supervisor: doc. dr hab. Maria Piotrkiewicz
16. Janusz Sierdziński, Badanie właściwości skurczów tężcowych mięśnia szkieletowego (Investigation of the properties of tetanic contractions of skeletal muscle), 2000, supervisor: doc. dr hab. Maria Piotrkiewicz

17. Iwona Sugiera, Ocena przydatności metod analizy wzajemnych wpływów hamujących między motoneuronami w oparciu o badania symulacyjne (Analysis of usefulness of the methods of analysis of motoneuron inhibition, using computer simulation), 2000, supervisor: doc. dr hab. Maria Piotrkiewicz

PhD. (doctor) theses (1999-2000)

1. Jarosław Żygierewicz, Analiza wrzecion snu i model ich generacji (Analysis of sleep spindles and model of their generation), 2000, supervisor: prof. Katarzyna Cieślak-Blinowska
2. Piotr Suffczyński, Modele obliczeniowe procesów dynamicznych leżących u podstaw oscylacji wzgórzowo – korowych w mózgu (Neural dynamics underlying brain thalamic oscillations investigated with computational models), 2000, supervisor: prof. Katarzyna Cieślak-Blinowska

PUBLICATIONS (1999-2000)

1. J. Żygierewicz et al., High Resolution Study of Sleep Spindles, CLINICAL NEUROPHYSIOLOGY 110 (1999) 2136, coauthors: K. J. Blinowska, P .J. Durka.
2. P. Suffczyński, et al., Event related dynamics of alpha rhythms: a neuronal network model of focal ERD/surround ERS, In EEG HANDBOOK. Eds. F.H. Lopes da Silva, G. Pfurtscheller VI 5 (1999) 67
3. P. Kudela, et al., Model of the propagation of synchronous firing in a reduced neuron network, NEUROCOMPUTING 26-27 (1999) 411
4. C. Stam, et al., Dynamics of human alpha rhythm: evidence for non-linearity? CLINICAL NEUROPHYSIOLOGY 110 (1999) 1801, coauthors: P. Suffczyński
5. M. Akay, et al., Electroencephalography, WILEY ENCYCLOPEDIA OF ELECTRICAL AND ELECTRONICS ENGINEERING, 6 (1999) 394 coauthors: K. J. Blinowska, P. J.Durka
6. J. Parra, et al., Magnetic Source Imaging in Fixation-Off Sensitivity: Relationship with alpha Rhyhm, CLINICAL NEUROPHYSIOLOGY 17 (2000) 212, coauthor: P .S Suffczyński
7. J. Żygierewicz et al., Reply to H. Merica. Fast and slow frequency spindles in sleep: two generators?, CLINICAL NEUROPHYSIOLOGY 111 (2000) 1705, coauthors: K. J. Blinowska

INVITED TALKS (1999-2000)

1. K. J. Blinowska, Time-Frequency and Topographic Representation of Movement Planning. Abstracts of The First Joint Meeting of BMES & EMBS, Atlanta, October, 1999
2. K. J. Blinowska, Non-linear analysis of physiological signals highlights and pitfalls, Materials of EUROATTRACTOR 2000, Warsaw, June, 2000
3. P. Durka. Clinical EEG Clinical EEG Analysis: from Craft to Science. IV th International Seminar on Statistics and Clinical Practice. Warsaw, July, 2000
4. P. J. Durka. Clinical EEG Analysis: from Craft to Science. Konferencja Polskiego Tow. Neurofizjologii Klin., Lokalizacja źrodeł czynności bioelektrycznej mózgu,
   Warsaw, October, 2000
5. M. Kamiński, Directed Transfer Function (DTF) in EEG Analysis, Konferencja. Lokalizacja źródeł czynności elektrycznej mózgu. Warsaw, October, 2000

LABORATORY OF STRUCTURE AND LATTICE DYNAMICS

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Scientific Staff (total): 3 persons
ETA (Engineers, Technicians, Administration): 1 person
Number of grants in 1999-2000: 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-brownian random motion and anomalous diffusion.

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

Main achievements:
1. It has been shown that the magnetic ordering of the magnetic moments of Mn^{3+} and Mn^{4+} ions in the mixed valence system $CaMn_7O_{12}$ undergoes a commensurate-to-incommensurate magnetic phase transition [1,2]. It was found that the modulation vector as well as the coherence lengths of this ordering changes considerably at the transition temperature. The modulated magnetic ordering exists also in an external field of 4Tesla [12].
2. New magnetic properties were found when a part of the iron ions are replaced by manganise ions in ferroelectric-aniferromagnets bismuth ferrites [4,5,11].
3. The crystal microstructure of pulse-electrodeposited nanocrystalline 3d metals: Ni, Co and Cr, shows a fractal-like density autocorrelation function. This specific microstructure is probably due to the electrochemical preparation method.
4. Basing on the Weierstrass hierarchical process and the spatio-temporal coupling, the general Lévy walk instead of the Lévy flight process was developed. Hence also, the general diffusion "phase diagram" was constructed which includes all types of diffusion i.e., the Ficke's one, the sub- and superdiffusion, the ballistic one, next enhanced till the Richardson diffusion [3, 6-8, 10].
5. The Monte Carlo algorithm was developed and used for simulation of the Bose-Einstein condensation in a harmonic trap within canonical ensemble; good agreement with experimental data was obtained. Besides ground level, the statistical physics of excited levels were studied [9].

Equipment:
X-ray diffractometer TUR-62M 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 (1999-2000)

1. Renata Jasek, Symulacja Monte Carlo statystyki Fermiego-Diraca pod Javą w Internecie (Monte Carlo simulation of Fermi-Dirac statistics under Java in Internet), 2000, supervisor: dr hab. Ryszard Kutner.

M.Sc. (magister) theses (1999-2000)

1. Marcin Regulski, Badanie własności statystycznych i termodynamicznych kondensatu Bosego-Einsteina metodą symulacji Monte Carlo (Study of statistical and thermodynamical properties of Bose-Einstein condensate by Monte Carlo simulations), 2000, supervisor: dr hab. Ryszard Kutner.
2. Krzysztof Wysocki, Określenie struktury krystalicznej przewodnika protonowego $Ba_3Ca_{1+b}Nb_{2-y}O_{9-\delta,}$ (Determination of the crystal structure of the protonic conductor $Ba_3Ca_{1+b}Nb_{2-y}O_{9-\delta}$,) 2000 , supervisor prof. dr hab. I. Sosnowska.

PUBLICATIONS (1999-2000)

1. R. Przeniosło, et al., Domain size effects in neutron and SR powder diffraction studies of some oxides. J. ALLOYS AND COMPOUNDS, 286 (1999) 180. Coauthor: I. Sosnowska
2. R. Przeniosło et al., Magnetic ordering in the manganese perovskite $CaMn_7O_{12}$. SOLID STATE COMM. 111 (1999) 687. Coauthor: I. Sosnowska
3. I. Sosnowska, Neutron Scattering in Proton Conducting Perovskite-Oxides, SOLID STATE IONICS 119 (1999) 261
4. I. Sosnowska, B.M.T. Willis, Neutrons and Synchrotron X-rays in Materials Science. J. ALLOYS &COMPOUNDS 286 (1999) 174
5. I. Sosnowska, M. Shiojiri, Oxides: Neutron and Synchrotron X-ray diffraction studies, JOURNAL OF ELECTRON MICROSCOPY, 48 (1999) 681
6. R. Kutner, Hierarchical spatio-temporal coupling in fractional wanderings. I. Continuous-time Weierstrass flights, PHYSICA A 264 (1999) 84
7. R. Kutner, M.Regulski, Hierarchical spatio-temporal coupling in fractional wanderings. II.Diffusion phase diagram for Weierstrass walks, PHYSICA A 264 (1999) 107
8. R. Kutner, K.Wysocki, Applications of statistical mechanics to non-brownian random motion, PHYSICA A 274 (1999) 67
9. R. Kutner, M.Regulski, Bose-Einstein condensation shown by Monte Carlo simulation, COMP.PHYS.COMM., 121-122 (1999) 586
10. R. Kutner, Spatio-temporal coupling in the continuous-time Levy flights, SOLID STATE IONICS 119 (1999) 323
11. I. Sosnowska, W. Schäfer, I. O. Troyanchuk, Investigations of Crystal and Magnetic Structutre of $BiMn_{0.2}Fe_{0.8}O_3$, PHYSICA B 276-78 (2000) 576
12. R. Przeniosło et al., SANS study of magnetic phase transitions in $CaMn_7O_{12}$. PHYSICA B 276-78 (2000) 547. Co-author: I. Sosnowska
13. P. Strunz et al., General formula for determination of cross sections from measured SANS intensities. J. APPL. CRYST. 33 (2000) 829. Co-author: R. Przeniosło
14. I. Sosnowska et al., Neutron diffraction studies of the $Ba_3Ca_{1+b}Nb_{2-y}O_{9-d} + xD_2O$, PHYSICA B 276-78 (2000) 864. Co-author: R. Przeniosło
15. R. Kutner, book review of „Thermal Physics“ by R.Baierlein, EUROP. J. PHYS. 21 (2000) 197-198

INVITED TALKS (1999-2000)

1. I. Sosnowska, W. Schäfer, W. Kockelman, R. Przeniosło, I.O. Troyanchuk, Magneto-electric effect in bismutgh ferrite solid solutions, Structural & Dynamical Aspects of Molecular and Ionic Solids Using Neutrons, Oxford, August, 1999, speaker: I. Sosnowska
2. I. Sosnowska, Time-of-flight Neutron Diffractometry in Material Science, 3rd Polish –Japanese Symposium on Material Science, Zakopane, July, 2000
3. I. Sosnowska, Diffraction - powder, amorphus, liquid, Introductory Course of the European Neutron Scattering Conference ENSC'99, Budapest, September, 1999
4. R. Kutner, Applications of statistical mechanics to non-brownian random motion, Statistical Physics Applied to Practical Problems, NATO ARW, Technical University of Budapest, May 19-22, 1999
5. R. Kutner, Possibility of observation the non-brownian random motion, One-day Symposium on Random Walk and Applications, Forschungszentrum Jülich, Germany, June 25, 1999

INTERNATIONAL CONFERENCES ORGANIZED BY LABORATORY (1999-2000)

1. I. Sosnowska, member of International Programme and Organizing Committee of the 5th International School and Symposium on Synchrotron Radiation in Natural Science, 12-17 June 2000, Jaszowiec, Poland
2. R. Kutner, member of the Organizing Committee of International Conference "One-day Symposium on Random Walk and Applications", Forschungszentrum Jülich, Germany, June 25, 1999

Scientific Symposium IEP 2000 – a short summary

The purpose of this Symposium, 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 eight members of the Institute (K. Doroba, J. Gaj, M. Geller, P. Kowalczyk, W. Kurcewicz, T. Matulewicz, I. Sosnowska & M. Staszel), was formed in the spring of 2000.

The duration of the Symposium was fixed to two days, which enables presentation of major achievements of all divisions of the Institute during the 1999-2000 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 awarded prizes for posters presented by P. Płochocka, P. Wasylczuk, and Z. Marcinkowska.

During the Symposium, the Dean of the Faculty awarded Dr Piotr Kossacki the Stefan Pieńkowski 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 1999/2000. Prizes for lectures were awarded to Marian Grynberg and Maria Kamińska, and for laboratory exercises to Zygmunt Ajduk and Tomasz Grycuk.

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 Paulina Płochocka and Wojciech Wasilewski for “High is beautiful”; Piotr Fita and Katarzyna Surowiecka shared the second award, and the third went to Piotr Nieżurawski (Jury members: K. Chałasińska-Macukow, Jan Gaj, Andrzej Gołębiewski, Marta Kicińska-Habior, and Filip Żarnecki). This type of competition will be continued at future Symposia.

At the end of the Symposium staff and students voted for the best presentation. A special award was given to prof. Krzysztof Ernst for his invited talk about the physics of ping-pong as a good example of the popularization of physics, and to Joanna Kutner-Pielaszek, M.Sc., for her scientific presentation.

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

On behalf of
the Organizing Committee
Maciej Geller

Sympozjum IFD 2000
Grudzień 8-9, 2000

Piątek 8.12.2000		
9:00 – 9:20	Otwarcie Sympozjum Dziekan: prof. Katarzyna Chałasińska-Macukow Dyrektor IFD : prof. Jan Żylicz	
Przewodniczący : prof. Jerzy Ginter		
9:20 – 9:55	Jacek Szczytko	Arsenek i azotek galu z manganem dla spintroniki
9:55 – 10:10	Krzysztof Korona	Ultraszybkie procesy w ultrafiloletowych półprzewodnikach, czyli świecenie ekscytonów w azotkach
10:30 – 11:05	Radosław Przeniosło	Badanie dyfrakcyjne mikrostruktury metali 3d i ich tlenków
11:05 – 11:45	Ankiety: IFD'2000 dla IFD'2010/2050 Kawa i herbata	
Przewodniczący : prof. David Shugar		
11:45 – 12:20	Jarosław Żygierewicz	Oscylacje w mózgu
12:20 - 12:55	Jan Antosiewicz	Rozpoznawanie końca 5' mRNA w procesie inicjacji translacji
12:55 – 14:30	Kanapki + sesja plakatowa	
14:30 – 15:00	Konkurs pokazów fizycznycj	
Przewodniczący : prof. Zdzisław Wilhelmi		
15:00 – 15:40	Marek Kirejczyk	Kaony w materii jądrowej
14:40 – 16:15	Waldemar Urban	Spektroskopia egzotycznych jąder neutronowo-nadmiarowych a nukleosynteza
16:15 - 16:40	Konkurs pokazów fizycznych (c.d.)	
16:40 - 16:55	Wręczenie nagrody im. Stefana Pieńkowskiego	
16:55 - 17:45	Sesja plakatowa	

Sobota 9.12.2000		
Przewodniczący : prof. Krzysztof Haman		
9:00 – 9:35	Krzysztof Markowicz	Badanie zmian klimatu Ziemi: eksperyment INDOEX
9:35 – 10:10	Joanna Kutner – Pielaszek	Supersieci magnetyczne EuS/PbS
10:10 – 10:45	Marek Trippenbach	Nieliniowa optyka fal materii w kondensatach Bosego-Einsteina
10:45 – 11:20	Kawa i herbata	

Przewodniczący : prof. Ewa Skrzypczak		
11:20 – 12:05	**Krzysztof Ernst**	**Fizyka ping-ponga**
12:05 – 12:25	**Barbara Smalska**	**Oddziaływania dyfrakcyjne w eksperymencie ZEUS**
12:25 – 13:10	**Jan Królikowski**	**Tryger mionowy w eksperymncie CMS przy LHC**
13:10 – 13:45	**Ogłoszenie wyników konkursu pokazów fizycznych Ogłoszenie wyników konkursu posterów IFD'2000 i zamknięcie zbierania ankiet IFD'2000 dla IFD'2010/2050**	
13:45 – 14:00	**Podsumowanie Sympozjum: prof. Jan Żylicz**	

Symposium IEP'2000

Friday 8.12.2000		
9:00 – 9:20	**Opening of the Symposium Dean: prof. Katarzyna Chałasińska-Macukow Director of IEP: prof. Jan Żylicz**	
Chairperson: prof. Jerzy Ginter		
9:20 – 9:55	**Jacek Szczytko**	**Gallium arsenide and gallium nitride for spintronics**
9:55 – 10:10	**Krzysztof Korona**	**Ultrafast processes in sitraviolet semiconductors – excitonic luminescence in nitrides**
10:30 – 11:05	**Radosław Przeniosło**	**Diffraction studies of the microstructure of 3d metals and their oxides**
11:05 – 11:45	**IEP 2000 for IEP 2010/2050 : inquiry Tea or cofee**	
Chairperson: prof. David Shugar		
11:45 – 12:20	**Jarosław Żygierewicz**	**Oscillations in the brain**
12:20 - 12:55	**Jan Antosiewicz**	**Recognition of 5'-end of m-RNA during initiation of translation**
12:55 – 14:30	**Lunch + poster session**	
14:30 – 15:00	**Competition for demonstration of experiment**	
Chairperson: prof. Zdzisław Wilhelmi		
15:00 – 15:40	**Marek Kirejczyk**	**Kaons in nuclear matter (studied in heavy ion collisions at intermediate relativistic energies)**

14:40 – 16:15	**Waldemar Urban**	**Spectroscopy of egzotic, neutron-rich nuclei and nucleosynthesis**
16:15 - 16:40	**Competition for demonstration of experiment (c.d.)**	
16:40 - 16:55	**Award of the Stefan Pieńkowski prize**	
16:55 - 17:45	**Poster session**	

Saturday 9.12.2000		
Chairperson: prof. Krzysztof Haman		
9:00 – 9:35	**Krzysztof Markowicz**	**Changing climate – INDOEX experiment**
9:35 – 10:10	**Joanna Kutner - Pielaszek**	**Magnetic superlattices EuS/PbS**
10:10 – 10:45	**Marek Trippenbach**	**Nonlinear optics of the matter waves**
10:45 – 11:20	**Tea or coffee**	
Chairperson: prof. Ewa Skrzypczak		
11:20 – 12:05	**Krzysztof Ernst**	**Physics of Ping-Pong**
12:05 – 12:25	**Barbara Smalska**	**Diffractive interactions in the ZEUS experiment**
12:25 – 13:10	**Jan Królikowski**	**RPC L1 Muon Trigger for the CMS experiment at LHC in CERN**
13:10 – 13:45	**Announcement of results of the competition: Demonstration of experiment Announcement of results of the poster competitions : IEP 2000**	
13:45 – 14:00	**Summary of the Symposium: prof. Jan Żylicz**	

Organizing Comittee:

Krzysztof Doroba, Jan Gaj, Maciej Geller, Paweł Kowalczyk, Wiktor Kurcewicz, Tomasz Matulewicz, Izabela Sosnowska i Magdalena Staszel

Symposium IEP'2000 - 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. R.Kutner (SLD)
   Od fizyki do techniki.
   From physics to technique.

2. R.Kutner, K.Wysocki, M.Regulski (SLD)
   Błądzenia fraktalne a transport dyspersyjny.
   Non-brownian random motion and dispersive transport.

3. K. Wysocki, I. Sosnowska, R. Przeniosło, W. Schäfer, W. Kockelmann oraz R. Hempelmann (SLD)
   Badania możliwych położeń deuteru w wysokotemperaturowym przewodniku protonowym $BaCa_{1.18}Nb_{1.82}O_{9-d} + xD_2O$ metodą dyfrakcji promieni X i neutronów.
   Investigation of possible deuterium positions in the high temperature protonic conductor $BaCa_{1.18}Nb_{1.82}O_{9-d} + xD_2O$ by means of X-ray and neutron diffraction.

4. M. Regulski, R. Przeniosło, I. Sosnowska, D. Hohlwein (SLD)
   Badania struktury magnetycznej Mn_2O_3 metodą dyfrakcji neutronów.
   Investigations of the magnetic structure of Mn_2O_3 by neutron diffraction.

5. J. Borowski, J. Gronkowski and M. Lefeld-Sosnowska (SR)
   Badania spójnosci wiązek rentgenowskich.
   Coherence properties of X-ray beams.

6. H. Kępa, J. Kutner-Pielaszek, A. Twardowski, A.Yu. Siputov, C.F. Majkrzak, T. Story, R.R. Galazka, T.M. Giebultowicz (SR)
   Międzywarstwowe korelacje w ferromagnetycznych półprzewodnikowych supersieciach EuS/PbS.
   Interlayer correlations in ferromagnetic semiconductor superlattices EuS/PbS.

7. M. Lefeld-Sosnowska, Z. Grygoruk, K. Wokulska, J. Błażewicz (SR)
   Badania topograficzne kryształów objetościowych Si:Ge.
   Topography and lattice parameter of Si: Ge bulk crystals.
8. Lefeld-Sosnowska, I. Frymark (SR)
   Defekty objętościowe w monokrysztalach GaNM.
   Extended defects in GaN single crystals.

9. J.S. Reid, M. Moore, M. Golshan, G. Kowalski, S. Collins B. Murphy (SR)
   Wysokorozdzielcze badania dyfrakcyjne 'zabronionego' refleksu 222 w diamencie.
   A high-resolution diffraction study of the 222 'forbidden' reflection of diamond.

10. E. Zielińska-Rohozińska, K. Pakuła, M. Majer, M. Regulska, J. Gronkowski (SR)
    Rentgenowskie badania dyfrakcyjne niejednorodnego rozmieszczenia domieszek indu w warstwach InGaN.
    X-ray diffraction studies of inhomogeneities of indium incorporation in InGaN layers.

11. E. Zielińska-Rohozińska, J. Gronkowski, T. Słupiński, M. Regulska (SR)
    Badania kryształów GaAs metodami wysokorozdzielczej dyfrakcji promieni X.
    X-ray high-resolution diffraction study of GaAs single crystals

12. E. Zielińska-Rohozińska, J. Gronkowski, S. Grzanka, R. Bożek (SR)
Wysokorozdzielcze rentgenowskie pomiary składu warstw epitaksjalnych $Ga_xAl_{1-x}As$ na podłożu SI GaAs domieszkowanym Te.
High-resolution x-ray diffraction measurement of the composition of $Ga_xAl_{1-x}As$ epilayers grown on SI GaAs and Te doped substrates.

13. J. Zuberek, A. Wysłouch-Cieszyńska, M Dadlez, A-C. Gingras, J. Marcotrigiano, E. Darzynkiewicz, N. Sonenberg, S. K. Burley (BIO)
Semisynteza eIF4E (DELTA27), selektywnie fosforylowanego na Ser 209, przy użyciu inteiny.
Intein Mediated Semisynthesis of selectively Ser 209 phosphorylated DELTA27 eIF4E.

14. K. Kiraga, M. Wszelaka-Rylik, E. Darzynkiewicz, W. Zielenkiewicz (BIO)
Wyznaczanie stałej asocjacji i entalpii oddziaływania białka eIF4E DELTAN27 z 7-metyloguanozynodifosforanem m7GDP (analogiem 5'-konca mRNA) metodą mikrokalorymetrycznego miareczkowania izotermicznego.
Isothermal titration calorimetry measurements of the association constant and association enthalpy of the eIF4E (DELTAN27) protein and 7-methylguanosinediphosphate m7GDP, ananalogue of the 5'-mRNA terminus.

15. A. Niedźwiecka, J. Stepiński, R. Stolarski, A. Wysłouch-Cieszyńska, M. Jankowska-Anyszka, D. Haber, E. Darzynkiewicz (BIO)
Termodynamiczne aspekty asocjacji czynnika translacyjnego eIF4E z analogami 5'-końca mRNA oraz fragmentami eIF4G i 4E – BP1.
Thermodynamic analysis of association of the translation factor eIF4E with analogues of 5'-mRNA terminus as well as peptide fragments of eIF4G and 4E-Bp1.

16. K. Ruszczyńska, Z. Wieczorek, A. Stachelska, M. Jankowska-Anyszka, K. Ginalski, J. Stępiński, J. Wójcik, R. E. Rhoads, E. Darzynkiewicz, R. Stolarski (BIO)
Asocjacja form izomorficznych bialka eIF4E z C. elegans z monometyloguanozyno- i trimetyloguanozyno-cap.
Association of the eIF4E isoforms from C. elegans with monomethylguanosine- and trimethylguanosine-caps.

17. J. Włodarczyk, M. Wodzisławska, G. Stoychev, B. Kozankiewicz, D. Shugar, B. Kierdaszuk (BIO)
Formycyna A i jej analogi N-metylo, specyficzne inhibitory fosforylazy nukleozydów purynowych z *E. coli*: Wpływ oddziaływania enzym-inhibitor na ich fluorescencję i fosforescencję.
Formycin A and its N-methyl analogues, specific inhibitors of *E. coli* purine nucleoside phosphorylase (PNP): Effect of enzyme-inhibitor interaction on their fluorescence and phosphorescence.

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

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

20. M. Banrowski, K. Krawiec, N.G. Johansson, B. Munch-Petersen, S. Eriksson, D. Shugar, B. Kierdaszuk (BIO)
Stereospecyficzność ludzkich enzymów: kinazy deoksycytydynowej (DCK) i kinazy tymidynowej (TK1 i TK2), wobec analogów 2'-deksynukleosydów z przedłużeniem przy C(3').
Stereospecificities of human deoxycytidine kinase (dCK) and thymidine kinases (TK1 and TK2) towards C(3')-branched homologue of 2'-dexynucleosides.

21. B. Kierdaszuk (BIO)
Fluorescencja białek i ich składników indukowana za pomocą jednego i dwóch fotonów.
One- and two-photon induced fluorescence of proteins and their constituents.

22. Fizyka w gimnazjum - programy nauczania, podręczniki dla ucznia i nauczyciela I (PE)
Physics curricula, textbooks and teachers' guides for gymnasium I.

23. Fizyka w gimnazjum - programy nauczania, podręczniki dla ucznia i nauczyciela II (PE)
Physics curricula, textbooks and teachers' guides for gymnasium II.

24. Fizyka w gimnazjum - programy nauczania, podręczniki dla ucznia i nauczyciela III (PE)
Physics curricula, textbooks and teachers' guides for gymnasium III.

25. Fizyka w gimnazjum - programy nauczania, podręczniki dla ucznia i nauczyciela IV (PE)
Physics curricula, textbooks and teachers' guides for gymnasium IV.

26. Przyroda w szkole podstawowej: program nauczania, podręczniki dla ucznia i nauczyciela. (PE)
Science curriculum, textbooks and teachers's guide for primary school (PE)

27. Proste środki w nauczaniu fizyki (PE)
Low-cost experiments in physics education (PE).

28. Warsztaty dla nauczycieli fizyki z całej Polski (PE)
Workshops for physics teachers from all over the country

29. Przyrządy fizyczne i urządzenia pomocnicze opracowane przez mgr A. Rogulskiego (PE)
Educational equipment developed by Mr. A.Rogulski, M.Sc.

30. K. Bajer, S. Malinowski, K. Markowicz
Wpływ drobnoskalowej turbulencji na koncentracje kropel w chmurach.
Influence of the small-scale turbulence structure on the concentration of cloud droplets.

31. A. Jaczewski, S. Malinowski
Badanie zjawiska clustering'u kropel w małych skalach w laboratoryjnym procesie mieszania chmury z powietrzem.
Investigation of droplet clustering on small scales in laboratory cloud-clear air mixing.

32. M. Kirejczyk, B. Sikora, K. Siwek-Wilczyńska, M. Smolarkiewicz, J. Soliwoda-Poddany, Z. Tyminski, K. Wiśniewski (NP)
Produkcja kaonów i ich propagacja w gorącej i gęstej materii jądrowej - wyniki z FOPI.
Results from FOPI on kaon production and propagation in hot and dense nuclear matter.

33. T. Morek, J. Srebrny, Ch. Droste, M. Kowalczyk, T. Rząca-Urban, K. Starosta, W. Urban, R. Kaczarowski, E. Ruchowska, M. Kisieliński, A. Kordyasz, J. Kownacki, M. Palacz, E. Wesołowski, W. Gast, R. M. Lieder, P. Bednarczyk, W. Męczyński, J. Styczeń (NP)
Badanie stanów izomerycznych za pomocą cyklotronu ciężkich jonów - izomer w ^{132}Ce.
Isomeric state investigation using the Warsaw Cyclotron - isomer in ^{132}Ce.

34. K. Tymińska, K. Piasecki, T. Matulewicz (NP)
Reabsorbcja mezonów π^0 w materii jądrowej.
Reabsorption of π^0 mesons in nuclear matter.

35. K. Tymińska, K. Piasecki, T. Matulewicz (NP)
Podprogowa produkcja mezonów π^0 w zderzeniach jądro-jądro, wywołanych przez wiązkę ^{40}Ar o energii 60A MeV.
Subthreshold pion production in nucleus-nucleus collisions induced by 60A MeV ^{40}Ar beam.

36. R. Marcinkowski, M. Denis, A. Sołtan (NP)
SPI-INTEGRAL kosmiczny teleskop gamma.
SPI-INTEGRAL space gamma telescope.

37. Z. Marcinkowska, T. Rząca-Urban, W. Urban, T. Morek, Ch. Droste (NP)
Rotacja magnetyczna w jądrze ^{141}Eu
Magnetic Rotation in ^{141}Eu.

38. O. Kijewska, M. Kicińska-Habior, K. A. Snover, J. A.Behr, Z. M. Drebi (NP)
Promieniowanie hamowania w zderzeniach ciężkich jonów ^{18}O + ^{27}Al z utworzeniem jądra złożonego ^{45}Sc przy energii pocisku 8.3 MeV/nukleon.
Bremsstrahlung radiation in heavy-ion collisions ^{18}O+^{27}Al->^{45}Sc at 8.3 MeV/u.

39. M. Kicińska-Habior, Z. Trznadel, M. Kisieliński, D. Chmielewska, P. Cichocki, J. Dworski, W. Jackowski, P. Kaszyński, M. Kowalczyk , J. Kownacki , A. Krzyczkowska , J. Kwieciński , A. Maj , T. Matulewicz, Z. Sujkowski (NP)
Badania Gigantycznego Rezonansu Dipolowego w jądrach selenu na wiązce z Warszawskiego Cyklotronu.
Giant Dipole Resonance in selenium nuclei studied at the Warsaw Cyclotron.

40. E. Czerwosz, P. Dłużewski, T. Grycuk (OP)
Spektroskopowe badania wpływu Hg na własności warstw C_{60}.
Spectroscopic studies of Hg influence on C_{60} film properties.

41. T. Kutner, E.Czerwosz, P.Dłużewski, T.Stacewicz (OP)
Badania pracy wyjścia elektronów z warstw węglowych zawierających nanokryształy Ni.
Photoelectric work function studies of carbonaceous films containing Ni nanocrystals.

42. A. Czyżewski, S. Chudzyński, K. Ernst, G. Karasiński, Ł. Kilianek, A. Pietruczuk, W. Skubiszak, T. Stacewicz, K. Stelmaszczyk (OP)
Spektrografia CRDS.
Cavity Ring-Down Spectrography.

43. A. Gluzicka, A. Kopystyńska, S. Chojnacki, T. Inamura (OP)
Spektrometr laserowy wysokiej zdolności rozdzielczej.
High resolution laser spektrometer.

44. T. Grycuk, W.Behmenburg, V.Staemmler (OP)
Spektroskopia układów Li*He i Li*Ne w wysokich stanach wzbudzonych litu: eksperyment i teoria.
Spectroscopy of the Li*He and Li*Ne diatomics in high excited states of Li: experiment and theory.

45. T. Grycuk, M.Michalicka (OP)
Obliczenia kwantowe pasm satelickich linii Cd (5^3P_1-5^1S_o) zaburzonej przez Xe jako test potencjału oddziaływania CdXe o podwójnym minimum.
Quantum calculation of satelites of the Cd (5^3P_1-5^1S_o) line broadened by Xe probing the double minimum $B^3 1$ state of CdXe.

46. W. Jaśniecki, P. Kowalczyk, W. Jastrzębski, R. Nadyak i A. Pashov (OP)
Badania stanu z podwójnym minimum potencjału, $2^1\Sigma^+_u$, w cząsteczce K_2 metodą spektroskopii znakowania polaryzacyjnego.
The "double-minimum" $2^1\Sigma^+_u$ state of K_2 studied by polarization labelling spectroscopy.

47. P. Kowalczyk, W. Jastrzębski, A. Pashov (OP)
Konstrukcja krzywych potencjału cząsteczek dwuatomowych metodą "odwrotnego podejścia perturbacyjnego" (IPA)
Concstruction of potential energy curves for diatomic molecules by the Inverted Perutrbation Approach (IPA) method.

48. M. Michalicka, T. Grycuk (OP)
Spektroskopia cząsteczek van der waalsowskich Cd_2 i Cd-Ar(Xe): wyznaczanie potencjałów oddziaływań na dużych odległościach.
Spectroscopy of Cd_2 and Cd-Ar(Xe) Van der Waals molecules: long-range potentials determination.

49. P. Płochocka, C. Radzewicz (OP)
16 fs laser impulsowy w badaniach optycznego efektu Kerra.
16 fs pulse laser in Optical Kerr Effect measurements.

50. K. Stelmaszczyk, S. Chudzyński, A. Czyżewski, K. Ernst, A. Pietruczuk, W. Skubiszak, T. Stacewicz, A. Szymański (OP)
Badania korelacji między rozpraszaniem wstecznym i ekstynkcją światła przez aerozol atmosferyczny.
Investigation of correlation between backscatering and extinction of light by atmospheric aerosol.

51. P. Wasylczyk, C. Radzewicz, J.S. Krasinski (OP)
"FROG" dla ubogich.
Poor men's FROG.

52. J. M. Daugas, R. Grzywacz, M. Lewitowicz, L. Achourid, J. C.Anghlique, D. Baiborodin, K. Bennaceur, R. Bentida, R. Bhraud, C. Borcea, C. Bingham, W. N. Catford, A. Emsallem, G. de France, H. Grawe, K. L.J ones, R. C. Lemmon, M. J. Lopez Jimenez, F. Nowacki, F. de Oliveira Santos, M. Pf|tzner, P. H. Regan, K. Rykaczewski, J .E. Sauvestre, G. Sletten, M. Stanoiu, M. Sawicka (NS)
Czy ^{78}Ni jest podwójnie magiczny?
Is ^{78}Ni double magic?

53. A. Syntfeld, W. Kurcewicz, H. Mach, R. Kaczarowski, I. Miernicka (NS)
Granice deformacji oktupolowej w obszarze aktynowców i lantanowców.
Octupole deformation borders in the Actinides and the Lanthanides regions.

54. M. Gierlik (NS)
TAS a Cluster Cube - przemiana beta ^{102}In.
TAS versus Cluster Cube - beta decay of ^{102}In.

55. Koło Fizyki Medycznej przy Pracowni Fizyki Medycznej IFD UW
Prezentacja Koła Fizyki Medycznej
Presentation of the Medical Physics Students' Group.

56. A. Golnik, A. Kudelski, J. A. Gaj, T. Ruf, M. Cardona, T. Wojtowicz, G. Karczewski, G. Cywiński (SS)
Ekscytonowe rozpraszanie ramanowskie z odwróceniem-spinu w warstwach $Cd_{1-x}Mn_xTe$.
Excitonic resonant spin-flip Raman scattering in $Cd_{1-x}Mn_xTe$ thin films.

57. M. Gryglas, J . Przybytek, M. Baj, M. Henini, L. Eaves (SS)
Tunelowanie rezonansowe przez stany związane z minimum X w pojedyńczej barierze w strukturach GaAs/AlAs/GaAs.
Resonant Tunneling through X-minimum - related states in a single barrier GaAs/AlAs/GaAs heterostructure.

58. M. Gryglas, J. Przybytek, M. Baj, M. Henini, L. Eaves (SS)
Tunelowanie rezonansowe przez stany związane z minimum X w pojedyńczej barierze w strukturach GaAs/AlAs/GaAs pod ciśnieniem hydrostatycznym.
Pressure Investigations of Resonant Tunneling through X-minimum - related states in a single barrier GaAs/AlAs/GaAs heterostructure.

59. J. Jasiński, A. Babiński, R. Bożek, J. M. Baranowski (SS)
Obróbka termiczna kropek kwantowych InAs/GaAs.
Post-growth thermal treatment of the InAs/GaAs quantum dots.

60. Ł. Kłopotowski, M. Nawrocki, G. Cywiński, S. Maćkowski, E. Janik, T. Wojtowicz, J. Allegre, D. Scalbert (SS)
Magnetooptyczne badania dynamiki ekscytonów w niesymetrycznym układzie dwóch studni kwantowych.
Magnetooptical Studies of Exciton Dynamics in Asymmetric Double Quantum Well Structures.

61. P. Kossacki, V. Ciulin, M. Kutrowski, J.-D. Ganiere, T. Wojtowicz, B. Deveaud (SS)
Relaksacja spinowa ujemnie naładowanych ekscytonów w studniach kwantowych zbudowanych z CdTe.
Spin relaxation of negatively charged excitons in CdTe-based quantum wells.

62. A. Kudelski, A. Golnik, J. A. Gaj, S. Maćkowski, G. Karczewski, J. Kossut (SS)
Efekt Zeemana i optyczna anizotropia mikroluminescencji samoorganizujących się kropek kwantowych CdTe/ZnTe.
Zeeman effect and optical anisotropy in microluminescence of self-assembled CdTe/ZnTe quantum dot systems.

63. A. Kudelski, A. Golnik, J.A. Gaj, S. Maćkowski, G. Karczewski, J. Kossut (SS)
Zastosowanie efektu Faradaya do badania efektu "kradzieży" siły oscylatora dla ekscytonów w domieszkowanych studniach kwantowych wykonanych z półprzewodników półmagnetycznych.
Oscillator strength stealing for excitons in doped semimagnetic quantum wells studied by Faraday rotation.

64. M. Pietras, R. Doradziński, M. Kamińska, M. Palczewska, E. Grzanka, M. Lefeld-Sosnowska (SS)
Intensywna niebieska luminescencja mikrokryształów amono GaN: Zn w temperaturze 300K.
Intensive Blue Luminescence at 300K of Ammono GaN: Zn Microcrystals.

65. J. Siwiec-Matuszyk, A. Babiński, M. Baj (SS)
Własności transportowe pseudomorficznej studni GaAs/InGaAs/AlGaAs domieszkowanej planarnie krzemem wyhodowanej metodą MOCVD.
Transport properties of Si delta-doped pseudomorphic GaAs/InGaAs/AlGaAs quantum well grown by metalorganic vapour phase epitaxy.

66. J. Szczytko, A. Twardowski, M. Palczewska, R. Jabłoński, K. Światek, H. Munekata, H. Ohno (SS)
Natura centrum manganu w warstwach epitaksjalnych GaMnAs i InMnAs.
The nature of Mn impurity in $Ga_{1-x}Mn_xAs$ and $In_{1-x}Mn_xAs$ epilayers.

67. M. Szot, K. Karpierz, T. Wojtowicz, M. Grynberg (SS)
Płytkie domieszki w podsieci metalu i niemetalu CdTe typu n wprowadzane metodą MBE.
Shallow donors in metal and nonmetal sublattice of n-CdTe introduced by means of MBE method.

68. D. Wasik, M. Baj, L. Dmowski, J. Siwiec-Matuszyk, J. Przybytek, E. Janik, T. Wojtowicz, G. Karczewski (SS)
Wpływ grubości warstwy buforowej na polepszenie własności domieszkowanych modulacyjnie heterostruktur CdTe/CdMgTe hodowanych na podłożu z GaAs.D.
Effect of buffer layer thickness on improvement of modulation doped CdTe/CdMgTe heterostructures grown on GaAs substrate.

69. A. Wieczorek, R. Doradziński, T. Słupiński, M. Lefeld-Sosnowska, J. Jasiński, R. Dwiliński, M. Kamińska, E. Grzanka, W. Gębicki (SS)
Chemiczna stabilizacja i poprawienie jakości strukturalnej AlN - azotku aluminium - otrzymanego przez syntezę amonotermalną.
Chemical Stabibilisation and Structural Improvement of AlN Obtained by Ammono-synthesis.

70. A. Wysmołek, M. Potemski, R. Stępniewski, K. Pakula, J. M. Baranowski , G. Martinez, P. Wyder (SS)
Magneto - optyka ekscytonów swobodnych w warstwach heteroepitaksjalnch azotku galu.
Ground and Excited Excitonic Resonances in Heteroepitaxial GaN Layers: A Magnetooptical Study.

71. A. Wysmołek, V. F. Sapega, T. Ruf, M. Cardona, M. Potemski, P. Wyder, R. Stępniewski, K. Pakula, J. M. Baranowski, I. Grzegory, S. Porowski (SS)
Magneto-spektroskopia ekscytonów związanych na donorach w homoepitaksjalnym azotku galu.
Magneto-Spectroscopy of Donor-Bound Excitons in Homoepitaxial GaN.

72. M. Zając, R. Doradziński, J. Gosk, J. Szczytko, M. Palczewska, E. Grzanka, M. Lefeld-Sosnowska, M. Kamińska, A. Twardowski (SS)
GaMnN- Nowy półprzewodnik magnetyczny.
GaMnN - a new magnetic semiconductor.