中央研究院物理研究所年報

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Publisher
Yeong Der Yao

Editors
Chin Kun Hu
Ing Shouh Hwang
Kwan-tai Leung
Kiwing To
Granddon Deeyo Yen

Executive Editors
Shu Jan Chen
Su Ching Tsai

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Research Fellow, and Acting Director
Experimental Solid State Physics, Low Temperature Physics, Materials Science, Magnetism and Superconductivity.

王唯工
Wei-Kung Wang
Research Fellow
Biophysics, Hemodynamics, Chinese Medicine.

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Tien-Tzou Tsong
Distinguished Research Fellow
Surface Physics and Atomic Resolution Microscopy.

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Research Fellow
Atmospheric Physics and Meteorology.

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Erh-Kang Lin
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Experimental Nuclear Physics, Experimental Atomic Physics.

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Lai-Cen Chien
Research Fellow
Compressible Flow, Computational Mechanics.

何侗民
Tung-Min Ho
Research Fellow
Solid State Physics.

王建萬
Chang-Wan Wang
Research Fellow
Small Accelerator Based Physics (Low Energy Nuclear Physics, Atomic Physics, Material Analysis).

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Research Fellow
Computational Fluid Dynamics, Turbulence Modeling, Turbulent Diffusion, Experimental Fluid Mechanics.

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Statistical Physics, Computational Physics, Nonlinear Physics.

謝雲生
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Research Fellow
Experimental solid state Physics, Molecular Spectroscopy, Lattice Dynamics, Low Temperature Physics.

李世昌
Shih-Chang Lee
Research Fellow
Particle Physics and Field Theory.

楊維邦
Wai-Bong Yeung
Researach Fellow
Particle Physics and Field Theory.

曾詣涵
Yi-Harn Tzeng
Research Fellow
Theoretical Nuclear Physics
(Intermediate Energy Nuclear Physics, Nuclear Structures).

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Shien-Uang Jen
Research Fellow
Experimental Solid State Physics
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Research Fellow
Theoretical Nuclear and Particle Physics.

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Hai-Yang Cheng
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Theoretical High Energy Physics.

余海禮
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Research Fellow
Particle Physics and Field Theory.

李世炳
Sai-Ping Li
Research Fellow
Particle Physics and Field Theory.

陳志強
Chi-Keung Chan
Research Fellow
Light Scattering, Physics of Fluid, Computer Simulation.

陳洋元
Yang-Yuan Chen
Research Fellow
Experimental Solid State Physics, Low Temperature Physics.

鄧炳坤
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Research Fellow
Experimental Nuclear Physics.

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Condensed Matter Theory & Computational Physics

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Simon-C. Lin
Associate Research Fellow
Statistical Physics.

蕭葆義
Bao-Shi Shiau
Associate Research Fellow
Experimental Fluid Mechanics in Turbulence, Diffusion of Pollutants.

劉　鏞
Yung Liou
Associate Research Fellow
Thin Films and Surface Science.

仲國慶
Guo-Ching Jon
Associate Research Fellow
Nuclear Physics, Technique of Experimental Physics.

魏金明
Ching-Ming Wei
Associate Research Fellow
Low-Energy Electron Diffraction, Angle-Resolved X-ray Photoelectron Spectroscopy, Energy-Dependent Photoelectron Diffraction, etc.

張嘉升
Jason Chia-Seng Chang
Associate Research Fellow
Surface Science, STM, ISS.

梁鈞泰
Kwan-Tai Leung
Associate Research Fellow
Statistical Mechanics, Phase Transitions and Critical Phenomena, Nonequilibrium Steady States, etc.

余岳仲
Yueh-Chung Yu
Associate Research Fellow
Experimental Atomic and Nuclear Physics, Applied Physics.

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Kin-Wang Ng
Associate Research Fellow
Particle Astrophysics and Cosmology.

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Associate Research Fellow
Physics of Fluids, Hydrodynamics, Phase Transition and Critical Phenomena

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Yeu-Kuang Hwu
Associate Research Fellow
Synchrotron Radiation Application, Photoemission Spectroscopy, X-ray Surface Scattering.

黃英碩
Ing-Shouh Hwang
Associate Research Fellow
Surface Science, Scanning Tunneling Microscopy, Epitaxial Growth.

王明哲
Ming-Jer Wang
Assistant Research Fellow
High Energy Experiment.

顏迪佑
Granddon Dee-Yo Yen
Assistant Research Fellow
Nuclear Physics, Relativistic Heavy-Ion Physics

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Henry Tsz-King Wong
Assistant Research Fellow
Neutrino physics and astrophysics, astro-particle physics, particle physics instrumentation.

陳啓東
Chii-Dong Chen
Assistant Research Fellow
Experimental Solid State Physics, Electron Transport Properties in Nanostructures.

李尚凡
Shang-Fan Lee
Assistant Research Fellow
Experimental Solid State Physics, Thin Film Magnetism and Superconductivity.

葉　平
Ping Yeh
Assistant Research Fellow
High-Energy Experiment, Computational Physics.

章文箴
Wen-Chen Chang
Assistant Research Fellow
Nuclear Physics, Relativistic Heavy-Ion Physics

蔣　宜
Yi Chiang
Research Assistant
Biophysical Experimental.

Postdoctoral Research Associates

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C. S. Kuo	(郭忠賢)	M. L. Wu	(吳美玲)

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1. Atmospheric Physics

(1) Atmospheric corrections for the resources satellite images

Satellite visible images are unavoidably masked by the cloud, aerosol and water vapor existing in the atmosphere. These effects may be removed by some means, except the cloud. This is the so-called atmospheric correction. In this project we will estimate the atmospheric correction parameters for the resource satellite images by using the multi-spectral data from multiple satellites. Of all the meteorological parameters the aerosol optical thickness is believed to be the most important one for the atmospheric correction. The aerosol optical thickness may be retrieved from the VISSR visible channels data aboard the operational meteorological satellite GMS and the ocean color imager data of the ROCSAT-1. The latter is launched in December 1998. We developed new method of extracting the aerosol optical thickness and test its validity. (Chung-Yi Tseng)

(2) Application of the semi-Lagrangian method to cloud model

Recently the use of semi-Lagrangian method is extended to the meso- and small-scale models. The numerical efficiency in its application to the non-hydrostatic models is limited by fast moving acoustic and gravity waves. Furthermore, there exist overshoot and undershoot of the forecast variables during the integration formula used in the semi-Lagrangian scheme. Modified schemes have been proposed to improve the performance and efficiency. In this study we apply a quasi-monotone semi-Lagrangian scheme to a three-dimensional non-hydrostatic cloud model. The ice phase is considered in the microphysical parameterization in order to investigate its effects on the precipitation structure. The results indicate that the monotone scheme can suppress efficiently the noise generated in the model and simulate correctly the time change of water substances without increasing the computation time. In addition, the new model can simulate some important features of the development of a cumulus cloud. (Chung-Yi Tseng)

2. Basic Research in Hydrodynamics

(1) Research on bubble plume

The sea surrounds the Taiwan. So ocean is an important resource to our country. It is known that there is abundant in natural gas under Taiwan west offshore. The Chinese Petroleum Corporation set up the platform ship in the southwest offshore to drilling well for exploring natural gas. The gas blowout may be occurred in accident. Due to the gas containing of hydrocarbon that is harmful to marine life, the spread and diffusion of gas will cause offshore environment pollution. Thus,

spread and diffusion of gas blowout are worth to investigate thoroughly. We are trying to do the experimental study on the bubble plume that is conducted in a tank filled with density stratified water. The laser light sheet is created to illuminate the flow field. A CCD (Charge-Coupled Detector) is applied to take the picture. The digital image process skill is employed to analyze the picture to obtain the spread characteristics of the bubble plume in stratified water. The effects of the gas flow rate and ambient water stratification on the bubble plume behaviors are also investigated. Experimental results are used to compare the numerical model calculation. The developed numerical model and experimental method will be applied to investigate gas blowout in Taiwan southwest offshore gas well blowout. The results can be used as references for offshore environment pollution assessment and control. (Bao-Shi Shiau)

(2) Numerical simulations of surface wave propagation over a submerged obstacle

This study is to propose a numerical model simulating free surface flows. It will be used to investigate the interaction of travelling waves with a submerged obstacle, especially the vortex generation in the vicinity of the obstacle. The finite analytical method is the main numerical scheme employed. Ursell number and Keulegan-Carpenter (KC) number are two parameters of the free surface flows. Their effects will be explored in the study. (Robert R. Hwang, Ming-Jyh Chern)

(3) Direct Numerical Simulation study from laminar to chaotic flows

Following the rapid development of the chaos theory and computational methods, it is the best time to investigate phenomena of fluid dynamical system from transition to chaos in terms of direct numerical simulation. Transition processes in benchmark flow fields will be explored in terms of various Reynolds numbers. Cavity flows are currently being studied and some results are obtained. Channel flows and flow past a obstacle such as a square or cylindrical cylinder will be considered. (Robert R. Hwang, Yin-Ferng Peng, You-Shien Shiau)

(4) Two-dimensional soap film tunnel

A soap film tunnel is planed to establish for observation of two-dimensional turbulent flows. The soap film is extremely thin (about 1 μm). The drag reduction theory is planed to be investigated in the soap film tunnel. The main work of the study includes the measurement of the thickness of the soap film, flow visualization, the measurement of velocity field. (Robert R. Hwang, Ming-Jyh Chern)

(5) Effects of tidal variability and continuous stratification at estuary

Several effects in the flow field of an estuary including interaction of river current and ocean current has been studied. Other important mechanism such as density stratification and tidal variation are not touched. Hence, it is worth paying more attentions in these topics. This project is conducted using numerical simulation. The main goal is to establish a 3-D numerical model. The vertical density stratification and tidal variation will be considered. (Robert R. Hwang, Wen-Chang Yang)

(6) Liquid encapsulated floating zone

In liquid encapsulated floating zone configuration, the liquid column is concentrically surrounded by immiscible liquid encapsulant and creates a column of two concentric immiscible liquid. The shape of the volume of fluid is held between equal diameter solid disks by surface tension. The liquid bridge has been extensively investigated since the early publication of Rayleigh and Plateau more than a century. Recently, with the availability of the reduced gravity environment and the potential of containless processing, the problem has been widely studied and applied in industry applications. We have simulated the encapsulated floating zone by volume of fluid model with continuum surface formulation to take care liquid/liquid or liquid air interface. The two fluids, inner cylinder filled with FC-40 and outer 2 cSt silicon oil, are handled by unique system of governing equations and solved like single fluid problem with pressure based algorithm. The flow characteristics and the thermal properties of the liquid encapsulated floating zone in various gravity conditions are obtained. The micro-gravity effects on the crystal growth in liquid encapsulated floating zone process are simulated. (Lai-Chen Chien)

3. Physics of Complex Fluids

(1) Electromagnetic effects on material growth

Solidification material processes can be controlled by heat transfer, mass transfer, convection, thermodynamic and dynamic technique. The most popular one is applying an electromagnetic field during material processes. Besides the computational fluid dynamic equations, the Maxwell equations are coupled for the crystal growth facilities. The Maxwell equations are cast into conservative form similar to those of computation fluid dynamics. The applied electromagnetic forces reduces the convection. Thus the temperature distribution is more uniform compared with that of general condition. Furthermore, the effects of Lorentz force

on micro-gravity material process can improve the product quality. (Lai-Chen Chien)

(2) Surfactant driven instability in a Hele-Shaw Cell

The interfacial instability of a moving air-liquid interface moving in a Hele-Shaw cell is studied. From the classical Saffmann-Taylor result, the interface will become unstable only when the less viscous air is pushing on the more viscous liquid. However, in our experiment, we have observed that an instability will develop even when the liquid is pushing the air if the liquid used in an aqueous surfactant solution. Detailed analysis of the experiment has revealed that a wetting layer on the air side of the interface on the all of the Hele-Shaw cell is needed to produce the observed instability. Based on this observation, a phenomenological model is constructed to explain the observed experimental results. The main hypothesis of the model is that surfactants accumulated on the advancing interface will either dissolve into the bulk to form micelles or diffuse into the wetting layer on the wall. Instability of the interface will occur when the diffusing front of the surfactants in the wetting layer becomes unstable. In this aspect, the surfactant driven instability is very similar to that observed in directional solidification where the instability of the solidification front is controlled by the diffusion of impurities ahead of the front. Experiments are planned in the future to observe this diffusion front directly. (Chi-Keung Chan)

(3) Collapse of a granular pile

Usually, avalanches in granular systems are studied on granular piles by adding the granular material on the top of the piles either randomly or at a particular location to induce avalanches. However, in actual situations, another type of avalanches can also be produced in granular system by the removal of grains or collapse of structure close to the bottom of the pile. For example, in the landslide close to rivers, the collapses of nearby slopes are mainly due to the erosions of the river bed. Despite the practical importance of these avalanches, very little is known about the properties of these avalanches. An experimental investigation of the scaling properties of a collapsing rice pile induced by reducing the length of the base support of the pile is carried. It is found that two angles of repose are needed to describe the shape of the collapsing granular pile. Corresponding to these two angles of repose, the collapse of the granular pile can be characterized by local and global avalanches. Furthermore, it is found that the probability distributions of the

avalanches depend on the sizes of the avalanches under consideration. (Pei-Yen Lai, Chi-Keung Chan)

(4) Nonlinear phenomena in chemical and biological systems

As it is generally observed, nonlinear phenomena is a cross-discipline study. With the new laboratory facilities which will be finished next year in place of the old library, we will be able to conduct experiments in systems of chemical and biological nature. The chemical system we have in mind is the Belousov-Zhabotinsky (BZ) reaction in which nonlinear temporal and spatial behaviors can be observed. We will be interested in the dynamic control of the pattern formation properties of such a system. As for the biological system, we will begin by carrying out preliminary studies in the aggregation behaviors of the slime mold (Dictyostelium). Similar to other pattern formation systems, interesting patterns can be created during the aggregation of the slime mold. We are interested in the non-linear dynamics of the collective behaviors of the individual ameoba in the slime mold. (Chi-Keung Chan)

(5) Effect of polymer on the critical behavior of binary liquid mixture

We studied the effects of a high molecular weight polymer (Polyacrylic Acid, PAA) on the critical behavior of a binary liquid mixture (Lutidine + Water, LW). A high precision refractometer was built to measure the temperature dependence of the refractive indexes of the two coexisting phases after the sample has phase separated. From the refractive indexes we mapped out the coexistence curve in which composition difference $\Delta c \sim (T - Tc)^{\beta}$. Here β and Tc are, respectively, the sample temperature and the critical temperature of the sample. We found $\beta = 0.40 \pm 0.01$ for the LW with 0.7 mg/cc PAA which is different from that ($\beta = 0.31 \pm 0.01$) of pure LW. (Kiwing To)

(6) Flow properties of semi-conducting electrorheological fluids

An electrorheological (ER) fluid is one that exhibits reversible changes in rheological properties when acted upon by an electric field. Such fluids are usually made of particle suspension with large dielectric constant mismatch between the particles and the fluid in which the particles are dispersed. Because of the controllable viscosity and fast response, ER fluid is regarded as a smart material for active devices which transform electric energy to mechanical energy. It has been widely accepted that the ER effect is the result of the formation of internal structures such as chains and columns of the suspended particles in the presence of

an electric field. We have conducted experimental study of semi-conducting polyaniline ER fluids and found that the flow curves follow a scaling behavior at different applied electric field strength. We are trying to develop a model based on the electrical conductivity differences between different kind of polyaniline derivatives. (Hyoung J. Choi, Kiwing To)

NUCLEAR PHYSICS AND ACCELERATOR-BASED PHYSICS

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1. Experimental Nuclear Physics and Accelerator-Based Physics

(1) Laser electron photon experiment

Since 1998 we have been collaborating with the SPring-8 LEP (Laser-Electron Photon) experiment at RCNP, Osaka University. The objective is to study the vector meson photo-production. We have finished the design and construction of the TOF plastic scintillation detector arrays. A test on the performance of such a spectrometer has been finsished On the whole, the collaboration is going well.

Preparation of data analysis is going on. Work done at our laboratory, Nankang, Taipei includes both hardware and software. For the hardware, we have set up fully-operating DAQ system connected with a LINUX workstation which reads out the intrinsic radioactive spectra from a crystal via two PMTs. A prototype trigger crystal readout is built which can be used later in the project of studying TOF resolution. For the software, the Monte-Carlo GEANT framework is cloned into our local digital UNIX machine and has been modified to function well. We have been able to demonstrate the TOF resolution dependency on the determination of single kaon mass and reconstructed phi meson mass. At the same time, a "tracker" program is written which is shown to reconstruct single kaons from the fiducial NTUPLE generated from GEANT.

We expect that the commission of beam run at SPring-8 will start some time before the end of November, 1999. By then, we will participate in shift taking, the maintenance of TOF system, the calibration of raw data, and transferring the recorded data to Academia Sinica for analysis.

(2) (p,n) reactions on ^{6,7}Li at 35 MeV

An experimental study of the (p,n) reaction on ^{6}Li and ^{7}Li was carried out at Ep=35 MeV. In addition to the well investigated transitions to low-lying states in the residual nuclei, those to high-lying unbound states were investigated. Cross sections and their angular distributions were explained by microscopic distorted wave Born-approximation theory with transition densities obtained by shell model calculation. An effective nucleon-nucleon interaction M3Y gives reasonable results when it is used both in the shell-model and DWBA calculations. It has found that the dominant contribution for the 1^+ - 2^+ transition in the ^{6}Li(p,n)^{6}Be reaction are those from the spin-quadrupole type $\Delta J(\Delta L, \Delta S)$=1(2,1) ,2(2,1) and 3(2,1) components. A sizeable 1(0,1) GT-component is found for the $3/2^-$ - $5/2^-$ transition in the ^{7}Li(p,n)^{7}be reaction.

(3) Isovector part of optical potential studied by analog transitions through (p,n) reaction at 35 MeV

Quasielastic (p,n) reactions were studied at an incident proton energy of 35 MeV. Differential cross section for isobaric analog $\Delta J^{\pi}=0^+$ (fermi-type) transitions and their angular distributions were measured in twenty-seven N>Z target nuclei ^{7}Li, ^{9}Be, ^{13,14}C, ^{15}N, ^{50}Cr, ^{54,56}Fe, ^{58,60,62,64}Ni, ^{70}Zn, ^{71}Ga, ^{92}Zr, ^{110,112,114,116}Cd, ^{116,118,120}Sn, ^{140}Ce, ^{172,174,176}Yb, and ^{208}Pb. Pure $\Delta J^{\pi}=0^+$ fermi-type transitions were observed in twenty-three of them. As for the four light odd-A nuclei, Fermi-type transition strengths were evaluated with the microscopic DWBA by subtracting from the raw data the contributions from mixed $\Delta J^{\pi}\neq 0^+$ components. Thus twenty-seven $\Delta J^{\pi}=0^+$ angular distribution were obtained, and fitted by macroscopic DWBA calculations with the Lane-model optical potential to derive systematically the isovector part of the potential. The best-fit parameters for each target are presented. The present results combined with our previous analysis on thirteen other nuclei in the $17 \leqq A \leqq 48$ region cover almost the entire mass region. They were used to obtain A-dependent global parameters by least-squares fit.

(4) The nuclear microprobe facility at IPAS

A new dedicated high energy nuclear microprobe was installed at the Institute of Physics, Academia Sinica, in summer 1998. In this contribution we report on the main points of the installation procedure, the optical properties of the Oxford quadruple triplet lens system, and the results of the performance tests. Using a focused beam, the powerful techniques of ion beam analysis can be combined with spatial information to generate structure and elemental maps, line profiles or point composition analysis for elemental throughout the periodic table. This facility serves an adverse range of applications, from medical research to micro-electrons, in both academic and industry environments.

(5) Charge state dependence of the L-shell x-ray energy shifts and fluorescence yields in heavy ion-atom collisions

L-shell x-ray from ionization by energetic oxygen ions have been measured with a Si(Li) x-ray detector. The purpose of this study was to investigate the charge state dependence of x-ray energy shifts that are indicators of multiple ionization. In this work, L-shell x-ray energy shifts in collisions of $^{16}O^{q}$ ions (q=3+, 4+, 5+, 6+, 7+ and 8+) impinging on $_{29}$Cu target have been studied at 12 MeV. The data obtained are for vanishingly thin (less than 0.6 ug/cm^2) solid targets which approximate single

collision conditions. The characteristic target L-shell x-ray lines were shifted to higher energies and broadened as compared to the energies and peak shapes obtained by proton bombardment. This energy shift becomes dramatic for singly and fully-stripped oxygen ions because of electron capture from the target M-shell to the projectile K-shell. From the measured energy shifts, the average number of 3d vacancies is determined using the non-relativistic Hartree-Fock model for atomic energy levels of Froese Fischer's program [Comput. Phys. Commun., 43, 355 (1987)] and, in turn, the enhancement of fluorescence yields due to multiple ionization is calculated according to Fortner et al. [J. Phys. B5, L73 (1972)].

(6) PIXE analysis of ancient Chinese Changsha porcelain

In this work, proton induced X-ray emission (PIXE) method was applied for the analysis of ancient Chinese Changsha porcelain produced in the Tang dynasty (AD 618~907). A collection of glazed potsherds was obtained in the complex of the famous kiln site at Tongguan, Changsha city, Hunan province. Studies of elemental composition were carried out on ten selected Changsha potsherds. Minor and trace elements such as Ti, Mn, Fe, Co, Cu, Rb, Sr, and Zr in the material of the porcelain glaze were determined. Variation of these elements from sample to sample was investigated. Details of results are presented and discussed.

(7) PIXE analysis of Chinese chicken-blood stone

This paper reports the chemical compositions of chicken-blood stone measured by Proton Induced X-ray Emission (PIXE). The experimental results show that for the red portion of chicken-blood stone, the concentration of Hg is as high as 20 wt%, and the concentration of S can be above 10 wt%. For the non-red portion the main chemical compositions are Al_2O_3 and SiO_2. The obtained chemical compositions are close to those of kaolinite for Balin chicken-blood stone, and of pyrophyllite for Changhua chicken-blood stone, respectively. So far many Changhua chicken-blood stones and Balin chicken-blood stones were found in China, the PIXE method can be used to explore the provenance of available chicken-blood stones.

(8) Ellipsometric study of carbon nitride thin films with and without silicon addition

Optical properties of carbon nitride thin films, with and without silicon addition, grown by magnetron sputtering, have been studied by ellipsometry. The composition, structure and bonding structure of the films were analyzed by Rutherford

backscattering (RBS), transmission electron microscopy (TEM), atomic force microscopy (AFM), X-ray photoelectron spectroscopy (XPS), Raman and Infraded spectroscopy (IR). CN and SiCN films exhibiting predominantly sp^3 and sp^2 bonding structures with nitrogen content up to 55 at.% can be obtained. It was found that the index of refraction, n, is a strong function of the nitrogen and silicon content. The highest value of n that we can achieve is about 2.12~2.16 in the visible, comparable with that of pure diamond like carbon (DLC) film. The index of refraction decreases with increasing nitrogen content in the film, suggesting an increase in the bond polarizability of the material. On the other hand, a significant increase of the index of refraction is observed with the addition of silicon.

(9) Microstructure and corrosion resistance of room-temperature RF sputtered Ta_2O_5 thin films

The connection between the chemical corrosion resistance and the microstructure of the Ta_2O_5 thin films prepared at room temperature by a rf magnetron sputtering technique on Si substrates has been investigated. We find that the microstructure of the films changes with different rf sputtering power, and is responsible for the degradation of the corrosion resistance in HF solution. The deposited films are amorphous and porous when the rf power is low. A preferred orientation toward (200) β-Ta_2O_5 can be observed when the rf power is increased to 150 W. In addition, the films deposited under this condition are dense and are consequently more resistant to the attack of chemicals. At an rf power of 300 W the corrosion resistance of the films declines due to an increase of the exposed pore surface to the HF solution.

2. Theoretical Nuclear Physics

(1) A local density approximation treatment for the pauli exclusion operator in hypernuclei

An attempt is made to simplify the complications of computing hyperon-nucleon G-matrix elements arising from the Pauli exclusion operator contained in the integral equation. We perform a two-frequency shell model folded-diagram calculation on hypernuclei using two different treatments for the Pauli exclusion operator Q_2, namely, a local density approximation where Q_2 is replaced by a nuclear-matter Pauli operator $\bar{Q}(\rho)$ with ρ being a density parameter, and an exact calculation where Q_2 is expressed in terms of shell model wave functions.

With a proper choice of ρ, it is possible to reach a reasonable accuracy by using the local density approximation Pauli operator. For heavy hypernuclei, this $\bar{Q}(\rho)$ can be used to save tremendous computing time.

(2) Two-frequency shell model for hypernuclei and meson-exchange hyperon-nucleon potentials

A two-frequency shell model is proposed for investigating the structure of hypernuclei starting with a hyperon-nucleon potential in free space. In a calculation using the folded-diagram method for ${}^{16}_{\Lambda}O$, the Λ single particle energy is found to have a saturation minimum at an oscillator frequency $\eta\omega_\Lambda \approx 10$ MeV, for the Λ orbit, which is considerably smaller than $\eta\omega_N = 14$ MeV for the nucleon orbit. The spin-dependence parameters derived from the Nijmegen NSC89 and NSC97f potentials are similar, but both are rather different from those obtained with the *Jülich— B* potential. The ΛNN three-body interactions induced by ΛN - ΣN transitions are important for the spin parameters, but relatively unimportant for the low-lying states of ${}^{16}_{\Lambda}O$.

(3) Nonperturbative determination of heavy meson bound states

We obtain a heavy meson bound state equation from the heavy quark equation of motion in heavy quark effective theory (HQET) and the heavy meson effective field theory we developed very recently. The bound state equation is a covariant extension of the light-front bound state equation for heavy mesons derived from light-front QCD and HQET. We determine the covariant heavy meson wave function variationally by minimizing the binding energy $\bar{\Lambda}$. Subsequently the other basic HQET parameters λ_1 and λ_2, and the heavy quark masses m_b and m_c can also be consistently determined.

(4) Effective field theory of heavy mesons

In this work we present a detailed formulation for a recently proposed effective field theory to describe the nonperturbative QCD dynamics of heavy mesons. This effective theory incorporates heavy quark symmetry (HQS) and heavy quark effective theory (HQET). Heavy mesons in this theory are constructed as composite particles of a heavy quark bounded with the light degrees of freedom. The heavy meson properties in the heavy quark limit and the $1/m_Q$ corrections can then be explicitly calculated from this effective theory. All the basic parameters of HQET, namely, the heavy quark mass Λ, the heavy meson residual mass $\bar{\Lambda}$, and the HQS

breaking mass parameters λ_1 and λ_2, are consistently determined. λ_1 is founded to be small due to a large cancellation between the heavy quark kinetic energy and the chromo-electric interaction between the heavy and light quarks. We also evaluate the Isgur-Wise function, the decay constant, and the axial vector coupling constant of heavy mesons.

(5) Hadron gas model in heavy ion collisions

The experimental data taken at NBL AGS, CERN SPS and future RHIC will provide the opportunity to explore the physics of hadron to quark gluon plasma phase transition. A thermodynamically consistent volume excluded hadron gas model is used, as the first step in this study on heavy-ion collisions, in an attempt to understand the particle number ratios in all reactions performed at AGS and SPS. As a result, the freeze-out temperature, baryonic chemical potential, baryon number density, meson number density, etc. can be estimated. One can then determine whether the systems at freeze-out reach thermodynamical and/or chemical equilibrium. Afterwards, the gas of bag model approach shall be attempted in the study of hadron to quark gluon plasma phase transition.

For equal values of the hadron hard-core parameters the excluded volume model gives essentially the ideal gas predictions for the particle number ratios. However, a systematic excess of experimental pion abundances compared to the ideal gas results have been observed. This effect can be explained in our model by a smaller pion hard-core volume compared to those of other hadrons. Recent analysis of BNL AGS and CERN SPS data with a thermodynamically consistent hadron gas model with repulsive hard-core volume corrections (VDWHG) has produced very interesting results. We studied the possible effects of pion enhancement due to different hard-core repulsion for pions from other hadrons and strangeness suppression because of incomplete chemical equilibrium in the hadron gas. Each of these two modifications improve the results. The combined effect of these two mechanisms leads to and extremely good agreement with data. An interpretation of the obtained results in terms of the possible quark-gluon plasma formation at the early stage of the Pb+Pb collisions at SPS energies is proposed.

In our future study, we shall take one step forward to investigate the hadron gas to quark-gluon plasma (HG-QGP) phase transition. The QGP phase is described by the perturbative QCD with nonperturbative bag-pressure effects. On the other hand, the HG phase is described by the above mentioned realistic van der Waals hadron gas model. We expect to map out the phase transition region on the T-μ_B

plane, and to further estimate the energy density and baryonic number density discontinuities, viz. to calculate the size and location of the mixed phase on ε-n_B plane. We believe this study is of crucial importance in searching for the phase transition signatures in experimental observables of A+A collisions. We are also hopeful that these signatures might eventually lead to new interesting physical phenomena.

PARTICLE PHYSICS

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1. Experimental High Energy Physics

(1) Joining the ATLAS Experiment

The "Large Hadron Collider" (LHC) is now under construction at CERN and is scheduled to start operating in July 2005. By that time, it will be the world's largest hadron collider while the CDF experiment, which we are participating now, is expected to end.

An LHC committee was set up by the National Science Council to explore the best way for Taiwan to join the LHC experiments in late 1998. Acting upon recommendation of the committee, we submitted an expression of interest to join the ATLAS experiment in June, 1999 and was approved as a member of the collaboration in September, 1999. A proposal was submitted to the National Science Council and a major review was conducted in November, 1999 with favorable conclusions. The main content of the proposal is included below where pictures and tables are suppressed.

A. Motivation and background information

The High Energy Physics Group of Academia Sinica has joined the CDF experiment at Femilab since February of 1993 which resulted in Taiwan being one of the five countries finding the evidence of the top quark in the Spring of 1994. We helped in the installation of SVX', improved the simulation program of SVX' and participated in developing a new b-tagging algorithm which played a major role in the discovery of the top quark at CDF.

Our major hardware responsibility in CDF, however, is to design and construct the Dense Optical Interface Module (DOIM) used in parallel optical readout of SVXII, the new double sided silicon vertex detector to be used in RunII. The 700 pairs of DOIM needed will be delivered by the end of this year. This will be the first time parallel optical link is used in high energy experiments. As we expected, optical link is now the main stream of readout techniques and will be employed by both ATLAS and CMS, the two major all purpose experiments at LHC.

In the DOIM project, we collaborated with the Telecommunication Laboratory of the Chung Hwa Telecommunication Company (TL) and the Radiantech Inc. to develop the packaging and quality control procedures, including all the test equipments and fixtures needed, suitable for mass production. For components which are not commercially available such as the laser and photo-diode arrays, the driver and receiver chips, we produced ourselves. This makes us a unique team in the high energy physics community having extensive experiences in optical link

design, production and most importantly, in quality control.

CDF RunII will start in 2000 and will last until 2005 when ATLAS and CMS are expected to take data. Evidences accumulated in the analysis of RunI data hint on a high probability of discovering new physics in RunII. The Academia Sinica team is responsible for data production, employing parallel processing by a PC-farm, for RunII. We are interested in developing simulation and b-tagging algorithm for SVXII to search for new physics and to study various interesting phenomena in b-baryons.

Since CDF experiment will terminate in 2005, it is natural for our team to continue search or study interesting new physics phenomena in an LHC experiment. Moreover, it is also natural for us to continue to collaborate with the industry and the industrial research institutes in Taiwan to develop high speed optical link and Linux-based PC-farm parallel processing technologies to be used in LHC experiments. Both of these technologies possess high potentials in the opto-electronics and information industries under development in Taiwan.

We chose to join ATLAS after many contacts with both CMS and ATLAS collaborations, consultation with prominent high energy physicists such as Professor S.C.C.Ting, and most importantly, after consultation with our collaborators in the industry, President Robert Ching of Radiantech Inc. and Professor K.F. Huang of National Chiao Tung University and chief technical consultant of True Light Inc., both of whom participated in an optical link workshop of LHC held recently at Oxford, England and visited CERN afterwards. The general consensus is that the ATLAS optical link project, which employs 850nm VCSEL based digital link technology uniformly over all subdetectors, is more in line with possible future application and with the interests of our industry. CMS will use analog optical readout for inner detectors and is more advanced in their development works so that less role may be played by the Academia Sinica team. However, with the National Central University (NCU) team joining CMS, our industry may still provide VCSEL's and PIN's and work on packaging and quality assurance for the CMS optical links through the NCU team. Both our industrial partners Radiantech and True Light strongly favor the current recommendation of the LHC planning committee of NSC to support AS to join ATLAS and NCU to join CMS.

Besides CDF, some of our group members are participating in the "Alpha Magnetic Spectrometer" (AMS) experiment to search for antimatter and dark matter in Space. The first version of the detector, AMS-01, was flown by shuttle Discovery (STS-91) from June 2 to June 12, 1998. The trigger, data acquisition, silicon tracker front end readout, and the monitor and control electronics systems were designed and

built at the Chung-Shan Institute of Science and Technology (CSIST), the military research institute of Taiwan, under close collaborations among AS, NCU and CSIST teams. The Taiwan team also collaborated with the MIT team in developing the trigger and data acquisition softwares for the systems. We are actively involved in the data analysis for the first flight.

Through the AMS project, we learned how to build space electronics where long term reliability and single event errors are major concerns. Interestingly, these are also two of the major concerns of the electronics systems to be built for the LHC experiments.

The Alpha Magnetic Spectrometer is having a major upgrade to version 2 (AMS-02).

Taiwan will build the upgraded electronics systems and will play a major role in developing the softwares again.

B. ATLAS detector and optical links

ATLAS, like CMS, is a general purpose detector to search for new physics in the high energy and high luminosity collisions of protons at LHC. The inner detector consists of three subdetectors:

a. Pixel Detector: closest to the beam pipe with two dimensional readout totaling 140 million readout channels.

Academia Sinica team proposed to take the responsibility of design and construction of the optical readout links for the Pixel Detector.

b. Silicon Central Tracker (SCT): single-sided silicon microstrip detectors with 6 million readout channels.

Pixel and SCT are the key detectors for precision vertex finding. Radiation hardness of detectors, electronics and all material used are required.

c. Transition Radiation Tracker (TRT): straw tube tracker embedded in polyethylene radiators for both tracking and particle identification. 0.42 million readout channels. Need 270K digital links. Copper links were chosen because optical links are not affordable.

The inner detectors of the ATLAS are enclosed in superconducting magnet which provide a 2T axial field. Outside detectors are liquid argon calorimeter for both electromagnetic and hadronic calorimetry, a tile calorimeter for hadronic calorimetry and a stand-alone precision muon counter with a toroidal magnetic field.

Except the transition radiation tracker, all subdetectors will use optical links to readout the front-end signals and send in the control signals. The front-end signals are sent to the readout driver (ROD) using optical links running at 40 MHz (system

clock rate). Data from ROD, which is underground, are sent to the readout buffer (ROB) on the surface by high speed optical links for level 2 trigger and further processing.

The total number of optical links needed for outer detectors and inner detectors is about 20 to 30 times the number of links we are producing for CDF.

C. Proposal for Academia Sinica to join ATLAS

We propose to join the ATLAS experiment now. Our main hardware responsibilities will be the following.

a. Optical links:

(i) Design and develop packaging and quality assurance procedures for the optical links of the inner detectors, in particular, the pixel detector. The Oxford team in SCT had contracted with GEC-Marconi to develop a packaging solution for the frontend optical links. Before one evaluates the prototypes which are still not available, it is not clear to us if that will be a viable solution suitable for mass production. We shall develop an alternative solution based on our experience in DOIM. The frontend links will run at 40 MHz which is relatively low speed in the standard of optical transmission. The driver and receiver chips that we designed for DOIM can be used but need to have a rad-hard version. Since Oxford, Siegen and Ohio State University teams had invested in R&D for the rad-hard drivers and receivers, we shall adopt their chips if they can be used with VCSEL and PIN provided by True Light Inc. This will allow us to focus our efforts in developing chips for gigabit transceivers which will be used in readout links of the ATLAS detectors and possess commercial industrial applications.

(ii) Design and develop parallel links for the outer detectors. The links should transmit the frontend signals (32bit @ 40 MHz) to the readout buffer. The current solution was suggested by the Stockholm team which use Glink chip by HP to transmit data at 16bit @ 80 MHz. This solution requires a rad-hard multiplexer to multiplex 32bit data into 16bit and also requires rad-hard gigabit transceivers which are not available. The most serious problem, however, is the single event errors (SEE, flip of a bit or sending a transistor into a large current state due to radiation). Once an error happens, it takes milli-seconds to re-establish the synchronization and a lot of data will be lost. This serious problem can be resolved by using parallel transmission. We can use two 9-channel VCSEL DOIM to transmit data at 16bit @ 80 MHz (sending data at both the rising and falling edge of a clock cycle to achieve 80 MHz transmission on 40 MHz clock rate so that no multiplexer is needed).

(iii) Design and develop high speed links for connecting the readout drivers and

the readout buffers (the readout links). This matches perfectly with the interest of Taiwan industry such as the Radiantech Inc. Driving VCSEL's above gigabits is not a trivial task and is an area of intense global competitions for viable commercial solutions. We shall develop chips with multiplexer (demultiplexer) and communication control built in.

b. Computing: we shall participate in the development of PC-farm based on-line and off-line computing. Computing is an area which is less developed in ATLAS. As a result, we have more opportunities but less can be specified at this moment. Our experience in Linux based PC-farm off-line computing at CDF should allow us to make significant contribution in ATLAS computing. In this case, our industrial partner is the Soliton Technologies Co. Ltd. who is interested in developing real time Linux-based software and hardware systems for commercial applications.

According to ATLAS rules, 44 percent of hardware contribution has to be in the "Common Projects", such as superconducting magnets and cryogenics. It is possible that PC's related to computing will be listed among the "Common Projects". In that case, we may contribute PC's made in Taiwan as part of the 44 per cent required.

c. Electronics: We can collaborate in electronics modules and chips design and produce them in Taiwan for ATLAS. Since Taiwan is one of the manufacturing centers in the world for electronics modules and chips, it is quite possible that both ATLAS and CMS may want to exploit our capabilities in this area.

Through the CDF and the AMS projects, we have established closed working relation with many electronics companies and with all the major industrial research institutes in Taiwan such as the Industrial Technology Research Institute (ITRI), the Chip Implementation Center (CIC) and the CSIST.

d. Physics and Simulations: during the construction phase of ATLAS, our physicists will mainly concentrate on data taking and searching for new physics at CDF and AMS. Physics analysis at CDF will provide leads to what to look for at ATLAS.

The hadronic environment at ATLAS, however, will be different from that at CDF. While for each beam crossing at the Tevatron, an average of 1.6 events are produced at CDF detector, for each beam crossing at the LHC, an average of some 20 events will be produced at ATLAS detector. Moreover, while we are familiar with silicon microstrip vertex detector, the pixel detector will be new to us. In this respect, it is good for us to be in the pixel detector group and we shall participate in developing the simulation program for the inner detectors, particularly the pixel detector, as early as we can.

D. Schedule

The ATLAS detector is now under construction. "Module zero", the final full size prototype module, of the liquid argon calorimeter as well as, the precision muon chamber had been finished and had gone through extensive beam test. The construction of other detector systems are also progressing on schedule. The construction phase is expected to end in 2005. The construction of the optical links should start in 2000 and finish in 2003 followed by installation. It is clear that the funding for hardware construction should concentrate in a period of four to five years (2000~2004).

From 2005 on , we shall enter the physics phase. The detector is expected to run for 10 years before major upgrades. During this phase, we should be responsible for operation and maintenance of the optical links. With 15~20% of spares built in the construction phase, the maintenance cost is expected to be low and will be covered under the operation costs.

E. Manpower and Task Sharing

a. Overview

The Academia Sinica (AS) group in CDF consists of two faculties (Dr. P.K. Teng and Dr. M. J. Wang), five to seven postdoctors and one to three research assistants. Besides CDF, we also participate in the "Alpha Magnetic Spectrometer" (AMS) experiment to search for antimatter in space. The AMS group consists of two faculties (Dr. S. C. Lee and Dr. P. Yeh), two to three postdoctors and two to three research assistants. The Alpha Magnetic Spectrometer is scheduled to be placed on the International Space Station Alpha in May, 2003 and will take data for three years. Physicists in the CDF and the AMS group of AS are expected to join ATLAS. The time they spend on ATLAS related works will gradually increase as we approach and enter the physics phase.

During the construction phase, our main focus will be on the design and construction of the optical links. Since the DOIM project for CDF is in its final production phase and the production is expected to finish before end of the year (1999), the AS optical link group together with the Telecom. Lab., the Radiantech and the True Light teams are starting to work on the optical link project for ATLAS and will be able to work full time on the project as soon as our proposal is approved by the ATLAS collaboration and by the National Science Council.

b. Optical Links

(i) AS will be responsible for overall coordination of the project. A steering committee chaired by S.-C. Lee and consisting of P. K. Teng and M. L. Chu from AS,

Dr. T. C. Shih, leader of the Opto-electronics Division of the Application Research Lab. of TL, Dr. Robert Chiang, President of Radiantech, and Professor K. F. Huang, pioneer of the VCSEL technology and chief consultant of True Light, had been formed with weekly meetings for the CDF DOIM and the ATLAS optical link projects.

Dr. M. L. Chu, who designed the bipolar driver and receiver chips for DOIM, will be responsible for chip design, evaluation, production and procurement for our ATLAS optical link project. Both Radiantech and True Light are interested in IC related R&D.

Dr, M. L. Chu, Dr. P. K. Teng from AS and Dr. C. Y. Wang, Dr. H. L. Chang from TL together with engineers and technicians from the Opto-electronics Lab. of the Radiantech will be responsible for design and development of the packaging procedures.

Besides S.-C. Lee, P. K. Teng and M. L. Chu, AS will have one postdoctor and one to three full time assistants to work on the project.

(ii) Opto-electronics Division of the Applied Research Lab. of Telecommunication Lab. will be responsible for quality assurance of the components and the modules. This includes the specification of various test protocols and procedures. Dr. C. Y. Wang and Dr. H. L. Chang were the key persons for quality assurance in the DOIM project. TL is experienced and well-equipped for this kind of job.

(iii) Opto-electronics Lab. of the Radiantech will be the place where packaging is done. They will be responsible for carrying out the integration, tests and quality control.

By working closely with the AS and TL teams, Radiantech has built up experience and expertise in optical links through the DOIM project. They have the resources needed to construct production lines for the quantities of optical links that the ATLAS detector will need.

(iv) True Light Inc. will be our source of VCSELs and PINs. They will collaborate closely with us to provide VCSEL and PIN arrays that we need and help to integrate with the driver and receiver chips that we will use. True Light had provided samples of VCSEL arrays for IBM and they are a provider of VCSEL for gigabit transceivers. They have the capacity of producing all the VCSELs and PINs and the arrays for use in the optical links of the ATLAS detector.

c. Computing

Dr. Ping Yeh was responsible for data production for RunI of CDF. Together with Dr. Yen Chu Chen and Dr. Antonio Wong Chan, they are now responsible for design and developing software for data production of RunII using Linux-based PC-

farm parallel processing.

Besides data production, Dr. Ping Yeh plays a major role in design and implementation of the on-line DAQ software for AMS while Dr. Yen Chu Chen was the key person in developing DAQ software for the Fermilab fixed target experiment HyperCP.

During the construction phase, all our physicists at CDF and AMS will concentrate on data analysis since both experiments possess great dicovery potentials. As a result, we need to hire one new postdoctor and one to two full time assistants to work on ATLAS computing project with the guidance from experienced physicists mentioned above. Moreover, we will collaborate closely with the Soliton Technologies Co. who had worked with us in developing DAQ systems for HyperCP and Neutrino projects, set up the PC-farm that our group is using and is also responsible for the maintenance of the computer system of our group.

d. Physics and Simulation

Dr. M. J. Wang, who improved the simulation program for SVX' and participated in developing a new b-tagging algorithm leading to the discovery of top quark at CDF, Dr. Paul Chang and Dr. Ping Yeh are all experienced in simulation for silicon vertex detectors. As before, during the construction phase of ATLAS, physicists will concentrate on searching for new physics at CDF and AMS. We will hire one postdoctor and one or more assistants to work on physics and detector simulation for ATLAS.

Our experience with physics analysis at CDF will help us to continue searching for or studying new physics phenomena at ATLAS. The physicists in the AS team will consist of 4 faculties, five to seven postdoctors and a few research assistants to analyse data during the physics phase of the ATLAS experiment.

F. Budget

a. Request Funding

We request a support of US$2M for hardware and an annual operation budget averaging US$300K from National Science Council for ATLAS project which will last 15 years or more from now on.

Of the $2M, 0.5M will be used for design and development of the packaging procedures suitable for mass production of the optical links for both the inner and outer detectors of ATLAS experiment. The other 1.5M will allow us to produce 2500 links + 500 spares for the Pixel Detector and a portion of the parallel optical links for the outer detectors. We shall negotiate with ATLAS for special arrangements so that some of the optical links that we produced for the outer detectors

or for SCT will be counted as a contribution to the "Common Projects".

As for the operation cost, our experience with CDF indicates that at least $160K per year is needed for travel for a team of 10 faculties and postdoctors and $80K is needed for sharing the experimental cost and for day-to-day onsite operation. The remaining $60K is needed for hiring research assistants, both full time and part time, and for day-to-day operation in Taiwan.

For DOIMs which we are producing for CDF, the laser diode and PIN arrays were provided by TL at their own cost. TL also absorbed a large part of the cost in developing the packaging and quality assurance procedures and in carrying out the quality assurance processes for the DOIMs. Hence it is not possible to estimate the production cost of each pair of DOIM. We did purchase samples made by Hitachi in the early stages of the development of DOIM for a discount price of $6000 a pair. Hitachi no longer produces DOIMs.

For ATLAS, we are aiming at producing optical links at a cost of $100~200 per link not including the cost of fibers, fiber cables and connectors. To achieve this goal, a lot of development efforts as well as managing skills during the production stage are needed.

b. Funding profile

Although the ATLAS project will last for 15 years or more, the funding for hardware as requested has to be distributed in the first five years, from 2000 to 2004, and peaking around 2001~2002. It is particularly important for the National Science Council to address the issue of funding profile facing major international collaboration projects.

G. Conclusion: what could be achieved?

For the coming twenty years, LHC no doubt will be the most powerful machine for mankind to explore phenomena happening at 1 TeV energy scale, an order of magnitude improvement, in terms of linear scale, over what we can achieve at the Fermilab Tevatron. Evidences are mounting by analyzing RunI data at CDF that new discoveries are around the corner. Careful analysis of the b-tagged events at CDF showed inconsistencies with the Standard Model predictions. Analyses of the excess of W + 1jet and W + 2jets events by Dr. M.J. Wang and many others in the Collaboration exhibit anomalies beyond our current understanding. *Joining ATLAS will provide our physicists with a great opportunity to continue participating in the frontier researches of the high energy physics.* If new physics are found at RunII of CDF in the next few years, joining ATLAS will allow us to study these phenomena in detail which may lead to further important discoveries. If new physics were not

found at CDF due to limited available energy or statistics, our team will be in a great position to make discoveries at ALTAS based on our experiences and leads from data analysis at CDF.

It is well recognized that opto-electronics and information industries will play an important role in shaping the world in the 21th century. These industries are still at their infancy in Taiwan and deserve strong support from the government. One of the best way to do that is to support companies like Radiantech, True Light and Soliton Technologies to get involved in an international collaboration project like ATLAS and to collaborate with major research institutes such as Academia Sinica, Telecommunication Laboratory etc. to design and develop a *product* leading to its application in the ATLAS experiment at first and commercially in the end. *Through such a project, they will collaborate with leading research laboratories in Europe, in US and in Japan, and will compete directly with companies possessing leading technologies in the opto-electronics and information industries around the world.* Indeed, even before we join ATLAS, samples of VCSEL from True Light provided through the AS team were tested by optical link groups at CERN and compared favorably with samples from Honeywell.

Close collaboration between AS and the industrial companies in Taiwan is the key to the manpower problem for the ATLAS project in the construction phase. There is no possibility, not to mention cost effectiveness, for AS to keep a team of high quality engineers needed to accomplish what we want to contribute for ATLAS. *By involving technicians and engineers from the collaborating companies, AS gets the things done and the companies get the experience, technology transfer, credibility and international exposure.* This collaboration also opens a channel for our physics students, postdoctors and research assistants to work in potentially important industries.

According to our discussion with Peter Jenni, the Spokesperson of ATLAS, for a team of 10~15 people from non-member states of CERN like Taiwan, a hardware contribution of $2~3M is reasonable and acceptable to CERN when there are two teams from Taiwan joining ATLAS and CMS with similar contributions.

We believe this is the right time for Taiwan to join LHC projects. It will be increasingly difficult to find suitable projects where our team, together with our industries, can make significant contributions as the construction phase progresses. In view of the physics potential for our physicists and the development potential for our opto-electronics and information industries, the requested funding for hardware of $2M over the course of 15 years of the project is a worthy investment for the National Science Council.

(2) Review of IPAS/CDF Project (by the Academia Sinica IPAS/CDF group)

A. Introduction

The CDF Collaboration at FNAL has been upgrading its detectors, data acquisition systems, and computing facilities in order to cope with the Tevatron RunII running goals with a peak instantaneous luminosity of 2 x 10^{32} $cm^{-2}s^{-1}$, the bunch spacing reduced from 396 to 132 ns, an integrated luminosity of $2fb^{-1}$ on tapes, and $\sqrt{s} = 2.0$ TeV.

The overall CDF strategy to reach its various physics goals is to have excellent tracking, vertex detection, a calorimeter with good energy resolution, muon detection and a flexible multi-level trigger system. The scope of this upgrade project includes detector hardwares, data links, data acquisition systems, triggering systems, production farms, physics analysis computing facilities and associated software projects.

The current schedule is to roll in the CDF detector in the first two weeks of August 2000 and to have the commissioning run between Aug-15-00 and Oct-31-00. The physics data run will start on Mar-01-01 with both CDF and D0 detectors.

B. IPAS/CDF hardware and software projects

The IPAS/CDF group have been making contribution to this CDF upgrade project in both the optical data link for the silicon detector (SVXII and ISL) readout system and the production farm which consists of hundreds of PC's for the first pass to filter raw data.

a. DOIM project

We are responsible for the optical readout system for the silicon detector. A total of 700 pairs of Dense Optical Interface Module (DOIM) is needed. From 1998 to 1999, the DOIM project for the SVXII readout system has come to its production stage.

The final version of bipolar driver and receiver chips designed by Ming-Lee Chu was submitted to AMS through CMP in France for fabrication in the end of 1997. The 0.8/μm BiCMOS DPDM technology was used.

While we were waiting for the IC's, we vigorously searched for an industrial partner for DOIM production. Radiantech Inc., a high-tech company in the Hsin-Chu Science based Industrial Park, specialized in fiber optics test and measurement equipment, expressed great interest in this project and agreed to collaborate with us.

In March 17-21, 1998, SVXII project manager, Prof. Paul Shepard and Dr. Jeff Spalding, and Dr. Slawomir M Tkaczyk visited Taiwan. A pre-prodcution review was held at Radiantech to examine the SIP, SOP, as well as the assembly line and the test

station. It was suggested that a small quantity of DOIM TX and RX modules should be made first and subjected to the environmental test to ensure the packaging processes. It was also suggested that all components should be ready by mid-June, 1998.

The placement of IC on the ceramic substrate and the attachment of the substrate to the carrier board was done by Tong-Hsin Electronic Industries Ltd. The IC sub-assembly was completed and delivered to Radiantech for packaging in late July, 1998. However, later it was found that it is hard to detach the substrate from the carrier board for the TX module due to a serious mistake made in IC sub-assembly. As a result, a new bach of substrate (with gold bonding pad) and carrier board had to be made.

The project was further slow down due to the low yield rate of Laser Diode Array (LDA) produced by the Chung Hua Telecommunication Laboratory. On the other hand, the Photo Diode Array (PDA) production was going smoothly and on schedule.

After the visit of Vince Pavlicek and Slawomir Tkaczyk from Fermilab in Dec. 7-11, 1998, the collaboration gave a green light for the RX module production. It was also requested that all the module to be sealed in a low humidity (<10% RH) chamber flashed with nitrogen gas.

Intensive study of TX module assembly procedures using the new substrate had been done in March and April, 1999. The UV glue was replaced with one which has higher glassy temperature to assure the alignment of V-groove stays the same during the rework.

Paul Shepard and Slawomir Tkaczyk visited us again in May 17-20, 1999. The TX production processes were reviewed and well accepted. An immediate goal and long term schedule was set.

Currently the DOIM production is going smoothly. We expect to finish the packaging of the 700 pairs of DOIM's and deliver to Fermilab at the end of the year for system integration.

b. PC farm project

The production farm is the first path of data analysis. In the production farm, events are reconstructed and split into a few tens of physics data streams based on the trigger type. The major request to this production farm is that it must be able to handle data at a maximum throughput of 20 MB/s. To reach this goal, it is estimated that two hundred dual Pentium II 500 MHz computers are needed. This farm should also be reliable, efficient and expandable.

The IPAS/CDF group members joined the production farm project in August of 1998. That included A. W. Chan, P. Chang, P. Yeh and Y.C. Chen. Y.C. Chen takes

charge the overall management of this project as a co-leader with S. Wolbers of the Fermilab computing division. P. Yeh, Y.C. Chen, and P. Chang worked on the conceptual design of this system. A.W. Chan installed and debugged the CDF RUN II software environment on a PC farm with 18 nodes and later compiled, linked, and ran the production code successfully. He also did the stress test of the prototype farms and carried out a Root I/O performance study with the help from P.S. Chang.

For the PC farm control package, P. Yeh finished a module called Coordinator, Y.C. Chen finished a module called Bookkeeper, A.W. Chan finished modules called Dispatcher, Reconstructor and Collector. A.W. Chan integrated all these modules together. This package is currently running on the prototype farm. It will be used in the first Mock Data Challenge of the CDF experiment of this coming November.

C. IPAS/CDF analysis projects

Since CDF has demonstrated the ability to carry out various b physics measurements by taking both the advantages of the unique aspect of a large hadron production cross section and the data recorded from successful secondary vertex detector (SVX). Many of the CDF results are very competitive with measurements of LEP or CLEO. B hadron lifetime measurement is one of the areas in which CDF detector could produce either competitive or best results. On the other hand, the properties of Λ_b baryon were not understood well. It is a good analysis topic to measure the lifetime with CDF data.

After the top discovery, one started to search for either new physics beyond SM or information on Planck-scale physics, motivated by its large mass of 175 GeV. Not only these theoretical interests motivated us to study the top samples in more details but also the present top samples themselves show some signs of deviations from SM.

a. Λ_b life time measurement

The preliminary result of Λ_b lifetime from the decay channel $\Lambda_b \to \Lambda_c^+ e^+ \nu_e$, $\Lambda_c \to \Lambda\pi^+\pi^+\pi^-$ was obtained. P.S. Chang observed 57± 12 signal events from the inclusive electron data collected at CDF RunI. The corresponding integrated luminosity is about 110 pb^{-1}. With the help from P. Chang on the Maximum Likelihood fitter, The fitting result obtained by P.S. Chang after the side band subtraction is c-tau $=1.36^{+0.39}_{-0.51}$ (stat.)$^{+0.19}_{-0.20}$ (syst.). This result is limited by the statistics of signal event.

P.S. Chang had attempted to search for the signals from the decay channel $\Lambda_c \to pK_S$ and also to look for more events from the inclusive muon sample. M.J. Wang also developed a Maximum Likelihood Ratio(MLR) method to reduce the faked proton in the A sample and expect to reduce the combinatory backgrounds.

b. Search for new phenomena in top samples

M.J. Wang have been working on the search of new physics in top samples. Based purely on observations of the present top samples of 110pb^{-1} without any prior assumption, he found some statistically unlikely deviations in top counting experiment, cross section, and mass results. It provided us some valuable clues in searching for new physics. Moreover, some anomalous events were revealed in the tagged W+2,3 jet samples. It is important to explore this possibility for new physics with the RunII data which will be at least 20 times more than that of RunI

(3) Neutrino Physics Group

Group Members :

Chen Chin-ping (陳晉平), Chen Ya-Ping (陳雅萍), Jon Guo-Ching (仲國慶)
Kiang Ge-Cheng (江紀成), Lai Wai-Lien (賴韋良), Lai Wen-Ping (賴文彬)
Lee Shih-Chang (李世昌), Li Hau-Bin (李浩斌), Li Jin (李金)[1], Liu Yan (劉延)[1]
Luo Chine-Shan (羅青山). Sheng Hua-Yi (盛華義)[1], Teng Ping-Kun (鄧炳坤)
Wang Chang-Wan (王建萬), Wang Pei-Liang (王佩良)[1], Wang Sun-Chong (王孫崇),
Wang Tsan-Fu (王讚富), Wong Tsz-king (王子敬)[2], Zhao Di-Xin (趙棣新)[1]
Zhao Ping-ping (趙平平)[1], Zhuang Bao-An (莊保安)[1]

[1] Visitor from Institute of High Energy Physics,Beijing
[2] Pincipal Investigator

The principal focus of the TEXONO(**T**aiwan **EX**periment **O**n Neutrin**O**) Collaboration in 1998-1999 is the formulation and the implementation of the "pilot" experiment. The experiment will be based on a 500-kg CsI(TI) crystal scintillator detector to be placed at 30 m from a reactor core at the Nuclear Power Plant II (NP2) at the northern coast. The scientific motivations are the studies of neutrino interactions at low energy and the investigations of the prospects of using scintillation crystal detectors in low-energy low-background experiments for neutrino and astro-particle physics.

The experiment is a collaborative effort between institutes/universities from Taiwan (Academia Sinica, Institute of Nuclear Energy Research, National Taiwan University, National Tsing Hua University, and Nuclear Power Plant II), Mainland China (Institute of High Energy Physics, China Institute of Atomic Energy, Institute of Radiation Protection, Nanjing University, Shandong University) and the United States (University of Maryland), with the AS group playing the leading role.

By the end of 1999, the prototype studies of CsI(TI) as well the design of the electron-ics and data acquisition systems have been successfully completed. Construction of the crystal detectors, low-background photo-multiplier tubes,

electronic modules, online data acquisition and monitoring systems, as well as the offline analysis and simulation software tools, are underway in full swing. The 50-ton shielding structure has successfully passed the NP2 safety review and is being constructed by an external contractor. The AS group is intensely involved in every aspect of the experiment. A 16-channel system has been in stable operation at the AS laboratory. Detector performance parameters are measured while the calibration procedures are worked out. We expect to move the experiment with a 100-channel system to the NP2 site in mid-2000 after the shielding is completed.

The pilot experiment, besides having its independent scientific motivations, provides a framework to build up the Collaboration and a "launch-pad" for more ambitious project beyond. Starting from 1998, the Collaboration has been exploring various future possibilities. Workshops on the detection of Dark Matter and Low-Energy Solar Neutrinos were organized. Several RfcD projects are initated, including: (a) development of Lil(Eu) crystals for solar neutrinos, (b) development of GSO crystals for solar neutrinos and electro-magnetic calorimeters, (c) feasibility studies of using Csl(TI) for Dark Matter searches, (d) use of the Accelerator Mass Spectroscopy (AMS) technique for measuring radioactive impurities of samples. Other topics related to the improvement of the scintillating crystal technique are also considered.

Our efforts has been presented in numerous international meetings, and are in general well-received. Several articles have been published in SCI-Journals including both the pilot experiment and crystal scintillator approach as well as the RfeD efforts in 1997 on boron-loaded liquid scintillator. A Technical Design Report and an article on our directions give detailed discussions for our present and future activities. In addition, there are two review-level articles by our PI for proceedings in international meetings.

The various TEXONO publications and reports can be downloaded directly from our Web-site at http://www-ep.phys.sinica.edu.tw/EXONO/index.html/TEXT/TEXONO/.

(4) IPAS/AMS group

The Alpha Magnetic Spectrometer (AMS) group consists of the following members: Shih-Chang Lee, Ping-Kun Teng, Ping Yeh (faculties), Ming-Huey Alfred Huang, Zhongliang Ren (postdoctors), Yao-Li Chuang, Bowen Ke, Fang-Chang Kang, and Pei-Jieh Hong (assistants).

In the year 1999, the data taken during shuttle flight STS-91 occured during 2 June 1998 to 12 June 1998 were extensively analyzed. Our group made the following progress within the AMS collaboration.

A. The acceptance of the AMS detector

The AMS detector is a large spectrometer immersed in a magnetic field produced by a large-bore permanent magnet made of alloys of Nd-Fe-B. The acceptance is a crucial factor for the success of the experiment. The larger the acceptance, the larger the event sample in a given time period. Getting a large event sample is essential for anti-matter search.

The acceptance is also a factor in measuring particle flux, which can be calculated as

$$F = \frac{N}{A t_{eff}}$$

where F is the flux in units of $m^{-2} \cdot sr^{-1} \cdot sec^{-1}$, N is the number of measured events (in a bin of energy or solid angle or other variables), A is the acceptance in units of $m^2 \cdot sr$, t_{eff} is the effective data taking time, which is the exposure time of the detector subtracted by the dead time of the detector and read-out system.

The active area of the detector as a function of momenta and direction of incoming particles were estimated by firing particles uniformly distributed in position and direction in the AMS detector simulation program, and calculate the ratio of particles that triggers the detector. As expected, the acceptance increases with particle momentum in the low-momenta region as lower momenta particles are bent more by the magnet and can not penetrate the apparatus. Soon the acceptance reaches a plateau of about 0.17 m^2 sr.

The detailed study can be found in an internal report written by Zhongliang, Ping and Alfred.

B. Particle classification

Charged particles moving in the earth's geomagnetic field are bent by the field. When viewed from a point far away from earth, the geomagnetic field works like a barrier such that charged particles with low rigidity R can not penetrate deep into the field. Here the rigidity is defined as

$$R \equiv \frac{momentum \quad p}{charge \quad q}$$

The geometric properties of the trajectory of a charged particle can be uniquely determined by its rigidity vector $\vec{R} = \vec{p}/q$ and its initial position $\vec{r}$ with respect to the earth center, independent of the particle mass.

For a particle to penetrate into a lower earth orbit like the shuttle orbit, it must have a rigidity higher than a threshold value R_c, hereby called *it rigidity cutoff*. The value of R_c varies with the arrival position and arrival direction. For a given detection position and a restricted field of view of the detector, the traditional wisdom is that

one expects to see two types of particles:

•$R > R_C$: primary cosmic rays,

•$R < R_C$: trapped particles.

The trapped particles are particles that are ``trapped" within the vicinity of the earth because they don't have enough rigidity to escape the geomagnetic field and fly to infinity. The only viable source of the trapped particles is the product of the collision of primary cosmic rays with the atmosphere. However, since the discovery of the trapped particles in the late 1950s, the exact mechanism of the propagation of trapped particles from atmosphere to the altitude that they populate is still unknown. There have been many proposed mechanisms to explain it. But there is still a lack of evidence to quantitatively support any of these mechanisms over the other.

The above categorization is a simple-minded one with only the particle-field interaction put into the picture. In reality, there is atmosphere and a solid earth beneath the geomagnetic field. Some thought-to-be-trapped particles may not live for long after they are produced in the atmosphere: they leave atmosphere, fly for a short time, and fly back to atmosphere and disappear into the air due to collision. They can't really be called trapped radiation.

In order to determine if an under-cutoff particle is trapped, tracing out its trajectory is necessary before more sophisticated classification criteria are discovered. Our group decided to pursue this direction in September 1998 after a brief analysis of the AMS data that shows both above-cutoff and below-cutoff particles are present.

a. Geomagnetic Field Model

To study the trajectories of particles, a computer model of the geomagnetic field is a key ingredient. We have studied a few models available on the market. Alfred and Yao-Li made a subroutine interface to the International Geomagnetic Reference Field (IGRF) model and U.S. Department of Defense (DoD) model. The IGRF model is used as the official model of the AMS collaboration. An internal report on the geomagnetic field model is written by Alfred.

b. Tracing Algorithm

We have developed a C language program to perform tracing of particles in the geomagnetic fields with the earth surface modelled as a ellipsoid. We have gone through an extensive testing procedure to validate the program. An internal report written by Yao-Li Chuang, Ping Yeh and Ming-Huey Huang on this topic has more details.

The numerical error caused by the tracing algorithm is studied with a sample of proton events below 3 GeV/c collected by the AMS detector, and was found to follow the form

$$\lambda(t) = 0.050t^2$$

With this formula in hand, we know the applicability of the tracing program in determining particle types.

c. Particle Category

There are three categories of particles: cosmic, trapped, and secondary. With forward tracing in addition to backward tracing, the fate of the particle can be known and the lifetime of the secondary particles can be determined. We found two populations of secondary particles with distinct lifetimes: *it short-lived* and *it long-lived* particles. The short-lived particles can only travel at most ≈ 200ms before they hit atmosphere. The long-lived ones can often stay in space for seconds. The following observations are made:

•For particles with very low rigidity, their motion can be approximated by a gyration around a gyration center moving along the surface with constant L value --- the L-shell. For this type of particles to fly through a detector at shuttle altitude, we found that it has to be produced near the South Atlantic Anomaly (SAA) where the L-shell goes down to atmosphere altitude. Our results show that such particles can drift around the earth before hitting the atmosphere near the other side of SAA. These are the long-lived particles. There is no correlation between the detection site of such particles and their production site.

•For particles with higher rigidity, but still lower than the cutoff, their large gyration radius make it easier to fly to shuttle altitude to be detected, so the detection site and production site are not too far from each other. However, these particles hit atmosphere in less than 200ms ---the short-lived particles.

•For particles with rigidity significantly above cut-off, they fly to outer space with rather simple trajectories.

•For particles with intermediate rigidities, they exhibit complex and sometimes chaotic trajectories. All candidates of trapped particles, i.e., particles that fly for a long time without hitting the atmosphere, belong to this category.

C. Measurement of the e^+/e^- ratio

Our collaborator, Prof. Yuan-Hann Chang of National Central University, was responsible for the measurement of the e^+/e^- ratio in the AMS collaboration. He found the ratio is around 1:1 in high latitude sample, consistent with the results from high latitude balloon experiments. But the same measurement with data sample taken near magnetic equator shows a totally unexpected ratio of about 3:1 or more.

Since most e^+ and e^- are secondary, Zhongliang classified them according to lifetime and found that the ratio is around 3.7 for long-lived particles and 1.7 for

short-lived ones.

Alfred proposed a simple yet somewhat quantitative explanation:

•Assume that the positrons and electrons near the equator are entirely secondary particles produced by the air showers resulted from the collision of primary protons with the atmosphere molecules.

•The number of electrons and positrons produced in an air shower is proportional to the energy of the primary proton. This is an established result from observations of ultra-high cosmic rays.

•Put in the well-known east-west effect of rigidity cutoff into account. For the 0th order, assume that all positrons are produced by protons coming from the west (with lower cutoff) and all electrons are produced by protons coming from the east (with much higher cutoff).

•Integrating over the spectra of primary proton $(dN/dE \propto E^{-2.7})$ to find out the e^+/e^- ratio.

With this simplified calculation, one can arrive at a e^+/e^- ratio around 3:1 to 4:1.

Our group is studying the air shower simulation and transportation of particles from atmosphere to shuttle altitude to make the above picture convincing.

D. Data acquisition with PowerPC and real-time Linux

The AMS detector is being upgraded for the next shuttle flight scheduled in May 2003. The upgraded detector will have about 3 times more channels and post a challenge to the data acquisition (DAQ) and trigger system. A powerful level-3 trigger and DAQ electronics is called for. Two options are being considered at this moment: an Analog Device Digial Signal Processor ADSP-21020 based circuit board, and an IBM PowerPC 750 based one. There is a radiation-tolerant version of ADSP-21020, but it is much slower than PowerPC 750. The electronics team in CERN is evaluating ADSP-21020 and our group is responsible for evaluating PowerPC 750.

When the system gets more complex, a robust and modest sized operating system can make the system easier to develop and maintain. Our group is pursuing using real-time Linux (rtLinux) on the PowerPC chip. So far we have installed Intel Pentium flavor of rtLinux, and we'll get our hands on PowerPC once we gained enough experience with rtLinux.

2. Particle Phenomenology

(1) Charmless Hadronic Two-body Decays of *B* Mesons

Two-body charmless nonleptonic decays of B mesons are studied within the framework of generalized factorization in which the effective Wilson coefficients c_i^{eff} are renormalization-scale and -scheme independent while factorization is applied to the tree-level hadronic matrix elements. Contrary to previous studies, our c_i^{eff} do not suffer from gauge and infrared problems. Nonfactorizable effects are parametrized in terms of $N_c^{eff}(LL)$ and $N_c^{eff}(LR)$, the effective numbers of colors arising from *(V-A)(V-A)* and *(V-A)(V+A)* four-quark operators, respectively. Tree and penguin transitions are classified into six different classes. The data of $B^-\to\rho^0\pi^-$ and $B^-\to\phi K^-$ clearly indicate that $N_c^{eff}(LR)\neq N_c^{eff}(LL)$: The first measurement of the $b\to u$ mode $B^-\to\rho^0\pi^-$ and the experimental information on the tree-dominated mode $B^-\to\omega\pi^-$ all imply that $N_c^{eff}(LL)$ is less than 3, whereas the CLEO measurement of $B^-\to\phi K$ shows $N_c^{eff}(LR)>3$. For given input parameters, the prediction of $B(B\to\eta' K)$ is largely improved by setting $N_c^{eff}(LL)\sim 2$ and $N_c^{eff}(LR)>N_c^{eff}(LL)$; in particular, the charm content of the η' contributes in the right direction. The decay rate of $B\to\phi K^*$ is very sensitive to the form-factor ratio A_2/A_1; the absence of $B\to\phi K$ events does not necessarily invalidate the factorization approach. If the branching ratio of $B^-\to\omega K^-$ is experimentally found to be significantly larger than that of $B^-\to\rho^0 K^-$, we argue that inelastic final-state rescattering may account for the disparity between ωK^- and $\rho^0 K^-$. By contrast, if $B(B^-\to\rho^0 K^-)\sim B(B^-\to\omega K^-)$ is observed, then W-annihilation and/or spacelike penguins could play a prominent role. The decay modes $\bar{B}_d^0\to\phi\pi^0,\phi\eta,\phi\eta',\phi\rho^0,\phi\omega$, $B^-\to\phi\pi^-,\phi\rho^-$ involving a vector meson ϕ are dominated by electroweak penguins. We show that a unitarity angle γ larger than 90° is helpful for explaining the $\pi^+\pi^-$, πK and $\eta' K$ data. The relative magnitudes of tree, QCD penguin and electroweak penguin amplitudes are tabulated for all charmless $B\to PP,VP,VV$ decays. Our favored predictions for branching ratios are those for $N_c^{eff}(LL)\approx 2$ and $N_c^{eff}(LR)\sim 5$. (Y.H. Chen, H.Y. Cheng, B. Tseng, K.C. Yang)

(2) Phenomenological Analysis of *D* Meson Lifetimes

The QCD-based operator-product-expansion technique is systematically applied to the study of charmed meson lifetimes. We stress that it is crucial to take into account the momentum of the spectator light quark of charmed mesons, otherwise the destructive Pauli-interference effect in D^+ decays will lead to a negative decay width for the D^+. We have applied the QCD sum rule approach to estimate the hadronic matrix elements of color-singlet and color-octet 4-quark operators relevant to nonleptonic inclusive D decays. The lifetime of D_s^+ is found to be longer than that of D^0 because the latter receives a constructive W-exchange contribution, whereas the

hadronic annihilation and leptonic contributions to the former are compensated by the Pauli interference. We obtain the lifetime ratio $\tau(D_s^+)\ \tau(D^0)\approx.1.08\pm0.04$, which is larger than some earlier theoretical estimates, but still smaller than the recent measurements by CLEO and E791. (H.Y. Cheng, K.C. Yang)

(3) The ΔI=1/2 Rule and CP Violation in Kaon Decays

The ΔI=1/2 rule and direct CP violation ε'/ε in kaon decays are studied within the framework of the effective Hamiltonian approach in conjunction with generalized factorization for hadronic matrix elements. We identify two principal sources responsible for the enhancement of ReA_0/ReA_2: the vertex-type as well as penguin-type corrections to the matrix elements of four-quark operators, which render the physical amplitude renormalization-scale and -scheme independent, and the nonfactorized effect due to soft-gluon exchange, which is needed to suppress the ΔI=3/2 K→ππ amplitude. Contrary to the chiral approach which is limited to light meson decays and fails to reproduce the A_2 amplitude, the aforementioned approach for dealing with scheme and scale issues is applicable to heavy meson decays. We obtain ReA_0/ReA_2=13-15 if m_s(μ=1GeV) lies in the range (125-175)MeV. The bag parameters B_i, which are often employed to parametrize the scale and scheme dependence of hadronic matrix elements, are calculated in two different renormalization scehemes. It is found that $B_8^{(2)}\sim B_6^{(0)}$, which are of order 1.5 at μ=1GeV, are nearly scheme independent, whereas $B_{3,5,7}^{(0)}$ as well as $B_7^{(2)}$ show a sizable γ_5-scheme dependence. Moreover, only $B_{1,3,4}^{(0)}$ exhibit a significant m_s dependence, while the other B-parameters are nearly m_s independent. For direct CP violation, we obtain $\varepsilon'/\varepsilon=(0.7\text{-}1.1)\times10^{-3}$ if m_s(1GeV)=150MeV and $\varepsilon'/\varepsilon=(1.0\text{-}1.6)\times10^{-3}$ if m_s is as small as indicated by some recent lattice calculations. (H.Y. Cheng)

(4) Nonspectator Effects and *B* Meson Lifetimes from a Field-theoretic Calculation

The B meson lifetime ratios are calculated to the order of $1/m_b^3$ in the heavy quark expansion. The predictions of those ratios are dependent on four unknown hadronic parameters B_1, B_2, ε_1 and ε_2, where B_1 and B_2 parametrize the matrix elements of color singlet-singlet four-quark operators and ε_1 and ε_2 the matrix elements of color octet-octet operators. We derive the renormalization-group improved QCD sum rules for these parameters within the framework of heavy quark effective theory. The results are $B_1(m_b)=0.96\pm0.04$, $B_2(m_b)=0.95\pm0.02$, $\varepsilon_1(m_b)=-0.14\pm0.01$, and $\varepsilon_2(m_b)=-0.08\pm0.01$ to zeroth order in $1/m_b$. The resultant B meson lifetime ratios are $\tau(B^-)/\tau(B_d)=1.11\pm0.02$ and $\tau(B_s)/\tau(B_d)\approx1$ in SU(3) symmetry limit. (H.Y. Cheng, K.C. Yang)

(5) Higher Twist Effect in Transversely polarized DIS

Recently, results in the deep inelastic scattering transversely polarized structure function were reported and have shown a non-negligible contribution. The transversely polarized structure function contains a chiral even part which measures the quark transverse spin asymmetry and a chiral odd part which is described by the quark transversity distribution in nucleon. Quak transverse spin is fameous for its conceptual difficulties and confusions in the literature. To measure the quark transverse spin in deep inelastic scattering requires the inclusion of quark masses and hence is of high twist in nature. We have clarified the quark mass effect in parton model approach to the transversely polarized nucleon structure function. We develop the massive special propagator technique to obtain manifestly gauge invariant results. Our result offers natural scheme to extract the buried short-distance contribution inside the soft part after momentum factorization in the collinear expansion approach. We have also been able to identify the corresponding matrix elements of the transversely polarized structure function in deep inelastic scatterings by using the massive propagator technique.(Hoi-Lai Yu, Kwei-Chou Yang)

(6) PQCD study of Inclusive B decays

Conventionally, the inclusive B meson decays are described by a systematic HQEFT based Euclidean space operator expansion(OPE) of relevant hadronic matrix elements in the inverse power of b-quark mass. Instead, we develop perturbative QCD factorization theorems to analyze inclusive B meson decays. We then apply perturbative QCD factorization theorems to inclusive heavy hadron decays, and obtain simultaneously a low semileptonic branching ratio $B(B\to X\lambda\nu)$=3D10.16, the average charm yield $\langle n_C\rangle$=3D1.17 per B decay, a small lifetime ratio $\tau(\Lambda_b)/\tau(B_d)$=3D0.78, and the correct absolute decay widths of the B meson and of the Λ_b baryon.(Hoi-Lai Yu, We-Fu Chang and Hsiang-nan Li)

3. Gravitation and Cosmology

(1) The SPOrt project: cosmological and astrophysical goals

We present the cosmological and astrophysical objectives of the SPOrt mission, which is scheduled for flying on the International Space Station (ISS) in the year 2002 with the purpose of measuring the diffuse sky polarized radiation in the microwave region. We discuss the problem of disentangling the cosmic background polarized signal from the Galactic foregrounds. (R. Fabbri, S. Cortiglioni, S. Cecchini, M.

Orsini, E. Carretti, G. Boella, G. Sironi, J. Monari, A. Orfei, R. Tascone, U. Pisani, K.-W. Ng, L. Nicastro, L. Popa, I. A. Strukov, and M.V. Sazhin)

(2) Cosmic microwave background temperature-polarization correlation

We give a full analysis of the auto- and cross-correlations between the Stokes parameters of the cosmic microwave background. In particular, we derive the windowing function for an antenna with Gaussian response in polarization experiment, and construct correlation function estimators corrected for instrumental noise. They are applied to calculate the signal to noise ratios for future anisotropy and polarization measurements. While the small-angular-scale anisotropy-polarization correlation would be likely detected by the MAP satellite, the detection of electric and magnetic polarization would require higher experimental sensitivity. For large-angular-scale measurements such as the being planned SPOrt/ISS, the expected signal to noise ratio for polarization is greater than one only for reionized models with high reionization redshifts, and the ratio is less for anisotropy-polarization correlation. Correlation and covariance matrices for likelihood analyses of ground-based and satellite data are also given. We reexamine the temperature-polarization correlation function of the cosmic microwave background induced by tensor mode with a scale-invariant spectrum in reionized standard cold dark matter models. It is found that the sign of the correlation function is positive on all angular scales even in a model with substantial reionization.(K.-W. Ng and G.-C. Liu)

(3) Photon production of axionic cold dark matter

Using the non-equilibrium quantum field theory, photon production from the coherently oscillating axion field in a flat Robertson-Walker cosmology is re-examined. First neglecting the Debye screening of the baryon plasma to photons, we find that the axions will dissipate into photons via spinodal instability in addition to parametric resonance. As a result of the pseudo-scalar nature of the axion-photon coupling, we observe a circular polarization asymmetry in the produced photons. However, these effects are suppressed to an insignificant level in the expanding universe. We then briefly discuss a systematic way of including the plasma effect which can further suppress the photon production. We note that the formalism of the problem can be applied to any pseudo-scalar field coupled to photon in a thermal background in a general curved spacetime. (D.-S. Lee and K.-W. Ng)

(4) Neutrino-photon scattering and its crossed processes in a background magnetic field

We study the neutrino-photon processes such as $\gamma\gamma \to \nu\bar{\nu}$ and $\nu\gamma \to \nu\gamma$ in a background magnetic field smaller than the critical magnetic field $B_c \equiv m_e^2 / e$. Using Schwinger's proper-time method, we extract leading magnetic-field contributions to the above processes. Our result is valid throughout the kinematic regime where both neutrino and photon energies are significantly smaller than m_W. We briefly discuss the astrophysical implications of our result. (T.-K. Chyi, C.-W. Hwang, W. F. Kao, G.-L. Lin, K.-W. Ng, and J.-J. Tseng)

(5) Nonequilibrium photons as a signature of quark-hadron phase transition

We study the nonequilibrium photon production in the quark-hadron phase transition, using the Friedberg-Lee type solitons as a working model for quark-hadron physics. We propose that to search for nonequilibrium photons in the direct photon measurements of heavy-ion collisions may be a characteristic test of the transition from the quark-gluon to hadronic phases. (D.-S. Lee and K.-W. Ng)

SOLID STATE PHYSICS AND BIOPHYSICS

1. Surface Science and Thin Films

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(2) Structure and diffusion of small Ir and Rh clusters on Ir(001) surface
(3) Geometrical dependence of conductance quantization in metal point contacts
(4) Large Fermi density waves on the reconstructed Pt(100) surface
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6. Biophysics

1. Surface Science and Thin Films

(1) Energetics of surface atomic processes near a lattice step

An atomic step of a solid surface can act as not only a reflective or nonreflective boundary but also as an atom-trapping boundary. Using the field ion microscope, we have probed in detail the behavior of Ir adatoms at and near the steps of Ir(001) and Ir(111) surfaces. Activation barrier heights of various atomic processes at step boundaries and the atom-trapping strengths of step-edge sites have been measured. These two surfaces exhibit entirely different step properties. At the terrace near the steps of Ir(111), an empty zone of adatom occupation is found the width of which depends on the terrace size. The difference in the reflective barrier heights of A-type and B-type step edges of Ir(111) layers is also derived. This result has been published in Phys. Rev. B. (T. -Y. Fu, H. -T. Wu and T. T. Tsong)

(2) Structure and diffusion of small Ir and Rh clusters on Ir(001) surface

It is known that Ir adatoms diffuse on Ir(001) surface by atomic-exchange mechanism, whereas Rh adatoms diffuse on this surface by atomic-hopping mechanism. The question is how about their clusters, and how the mechanisms can affect their diffusion behavior and energetics. Using the field ion microscope, we have measured diffusion parameters of individual Rh and Ir adatoms and small clusters on Ir(001) surfaces. We also show how the activation energy changes as a function of the cluster size and shape. From the probability of observing different atomic configurations during diffusion, different diffusion mechanisms are investigated. By considering the energetics of different atomic processes, it appears that atomic-exchange is still favored for Ir dimers. But for clusters larger than trimers, the exchange mechanism is no longer favored. This result has been published in Surf. Sci. (T. -Y. Fu and T. T. Tsong)

(3) Geometrical dependence of conductance quantization in metal point contacts

A scanning tunneling microscope with low-frequency modulation in the Z piezo is used to study conductance quantization of Au points contacts at ambient pressure and room temperature. Conductance up to 40 multiples of $2e^2/h$ can be repeatedly generated by pressing and pulling a Au tip against a Au sample with a sinusoidal distance modulation. By applying a symmetric double-cone model, only one parameter, the cone angle, is needed to describe the overall geometry of the contact. A conductance histogram in the low-conductance range is then tabulated as a function of the cone angle. The value of the conductance is found to decrease from the idealized value, nG_0, by an amount which increases with the angle of the cone. The

distribution of the first conductance peak is analyzed to study the effect of the modulation speed. The peak width broadens as the speed is increased from 400 Å/s to 1000 Å/s. This result has been published in Phys. Rev. B. (W. B. Jian, C. S. Chang, W. Y. Li and T. T. Tsong)

(4) Large Fermi density waves on the reconstructed Pt(100) surface

Several long-range superstructures have been observed with the scanning tunneling microscopy on the reconstructed Pt(100) surface at room temperature. They are present in strained domains and involve both the Fermi electrons and the concomitant lattice distortions. A first-principles calculation shows that the top layer expanded ~ 18% on average and the Fermi surface for a single hexagon layer displays some nesting portions, which can be related to the wavevectors of the observed superstructures. Thus, these superstructures existing in the local domains of the reconstructed surface have the likely origin of incipient charge density waves. This result has been published in Phys. Rev. Lett. (C. S. Chang, W. B. Su, C. M. Wei and T. T. Tsong)

(5) Dynamics of oxygen molecules on Si(111)-7x7 surfaces

We study the dynamic behavior of single O_2 molecules on Si(111)-7x7 surfaces using a variable-temperature scanning tunneling microscope.. We have found the hopping motion of a molecular species between neighboring adatom sites, which is mediated by two intermediate states. We also determine the activation energies of different hopping paths and the relative binding energies of different states. We have also observed the chemical reaction process of two adsorbed O_2 molecules to form an atomic species. These results were published in Phys. Rev. Lett. and Surf. Sci. (I. -S. Hwang, K. -L. Lo and T. T. Tsong)

(6) Diffusion of single hydrogen atoms on Si(111)-7x7 surfaces

We observe the hopping motion of atomic hydrogen on Si(111)-7x7 surfaces using a variable-temperature scanning tunneling microscope. Hydrogen atoms are found to adsorb preferentially on rest-atom sites rather than adatom sites with a binding energy difference of ~0.2 eV. Above ~280℃, atomic hopping between two rest-atom sites within a half-cell can occur, which is mediated by an adatom site. Above ~330℃, H atoms start to hop across the cell boundary via two adatom sites. The activation energies for different hopping paths and the relative binding energies are determined. The dynamic behavior of two to three H atoms inside a half-cell is also investigated. These results were published in Phys. Rev. Lett. and Phys. Rev. B. (R. -L. Lo, I. -S. Hwang, M. -S. Ho and T. T. Tsong)

(7) Epitaxial growth of Ge on Si(111) surfaces mediated by Pb

We use a scanning tunneling microscope to study the initial stage of nucleation and growth of two-dimensional (2D) Ge islands on Pb covered Si(111) surfaces. There is a critical deposition time above which the observed island density increases sharply while the average island size decreases. This cannot be explained by the traditional nucleation theory. We also observe a fractal to compact island shape transition at higher deposition fluxes, lower substrate temperatures, and longer deposition times, contrary to existing theories and experimental observations of other systems. We find that Ge atoms are highly mobile on the Pb covered surface. Their exchange with Pb atoms on flat terraces (nucleation) and at island edges (growth) is the rate-limiting step. We believe the nucleation and growth processes are hindered by the high energy barriers needed for the Ge clusters to exchange with the Pb atoms. A compact-to-fractal island shape transition is observed as the deposition flux is lowered, as the temperature is raised, or at a low Ge coverage, which is completely opposite to predictions based on diffusion-limited aggregation and previous experimental observations. Energy barriers are found to exist for the nucleation and growth of Ge islands, indicating that their growth behavior is exchange-reaction rate limited. Our results may shed much needed light on the fundamental mechanism in surfactant-mediated epitaxy. Some of them were published in Phys. Rev. Lett. and the rest will be presented in other journals.

We also study surface morphology in epitaxial growth of Ge on Pb covered Si(111). We find that the growth is close to perfect layer-by-layer for the first two bilayers. Surface roughness increases gradually with the film thickness, but no 3D islands are found at room temperature. For growth at ~200℃, 3D Ge islands appear after completion of the second bilayer. At room temperature, we believe, the Pb layer enhances surface diffusion and the descending-step motion of Ge adatoms, but the ascending-step motion is hindered and thus 3D island growth is suppressed. This model is different from the mechanisms proposed previously. The result was published in Surf. Sci. Lett. (Ing-Shouh Hwang, T. -C. Chang Tien T. Tsong)

(8) Dynamic behavior of Si magic clusters on Si(111) surfaces

In a STM study of Si(111) surfaces from room temperature (RT) to 600℃, we find a special type of clusters which are not only stable with respect to surface diffusion, but are also the fundamental unit in mass transport phenomena, step fluctuations, and epitaxial growth. We characterize the structure of these magic clusters at various tunneling biases. These clusters are mobile at temperatures above ~400℃. Most of the time, the cluster hops within a half-cell of Si(111)-(7×7). Sometimes it hops

out of its original half, and moves to a spot usually a few hundred Å away. Using Arrhenius analysis, we derive path specific hopping rate parameters for these clusters. We also find that Si(111) steps fluctuate at elevated temperatures through detachment and attachment of magic clusters. We also find that the filling of 2D Si craters and the decay of 2D Si islands at elevated temperatures also proceed through attachment and detachment of Si magic clusters at step edges. When a 2D islands decay below a threshold size, it will suddenly decompose into several Si magic clusters. We believe the concept of magic clusters may have important implication on the fundamental mechanism in epitaxial growth of many covalently bonded semiconductors. Some results have been published in Phys. Rev. Lett.

Even more interestingly, we find that, in the long jumps of Si magic clusters on Si(111)-(7x7), the magic clusters tend to diffuse along the current direction. Also, in the filling of 2D craters and in the decay of 2D islands, there is a strong preference for their occurrence at the cathode side. The results have been submitted to Phys. Rev. Lett. (I.-S. Hwang, M.-S. Ho, and T.T. Tsong)

(9) Using Kikuchi electron holography as a growth technique

Starting from January 1995, Prof. Y. C. Chou and I began to perform a series of experiments on Kikuchi electron holography. We obtained very convincing artifact-free atomic images of √3x√3 Au/Si(111), √3x√3 Sb/Si (111), and (7x7) Si(111) surfaces; therefore, prove Kikuchi electron holography is a useful direct method. These fascinating results of Kikuchi electron holography have opened up a new direction in the surface structural determination. Due to the simplicity of Kikuchi electron holography, it is easy to use it as a structural tool to monitor the growth mechanism. We have demonstrated this application by studying the hydrogen adsorption on Si(113) (3x2) surface [Phys. Rev. **B**59, **R**10453 (1999)]. (Ching-Ming Wei)

(10) Patterson inversion of CTDS patterns

With a close collaboration with Dr. T. Abukawa and Prof. S. Kono at the Tohoku University, Sendai, Japan, a new structural tool based on Patterson inversion of correlated thermal diffuse scattering (CTDS) in low to medium energy electron diffraction is developed. Using the Si(100)-(2x1) surfaces as an example, we obtained high quality three-dimensional images, with a resolution better than 0.5 **Å**, of both surface dimer atoms and bulk atoms from Patterson inversion of CTDS patterns, and thus proved that it is a new surface structural tool [Phys. Rev. Lett. **82**, 335 (1999)]. (Ching-Ming Wei)

(11) Patterson inversion of low energy electron diffraction curves

With a close collaboration with Dr. C. Y. Chang and Prof. Y. C. Chou, we proposed a Patterson-like scheme for direct inversion of low energy electron diffraction **I(E)** (i.e., LEED-IV) curves, which is in contrast with the previously suggested holographic scheme. Using the Si(111)-(7x7) and Si(113)-(3x2) surfaces as examples, we obtained high quality three-dimensional images, with a resolution better than 0.5 **Å**, of both surface atoms and bulk atoms from direct Patterson inversion of LEED-I(E) curves with IEPSM, and thus proved that it is a new surface structural tool [Phys. Rev. Lett. **83**, 2580 (1999)]. (Ching-Ming Wei)

(12) Phase-contrast ultra-high resolution X-ray imaging

Using the synchrotron radiation as the x-ray source, new detecting systems were developed which enable us to perform X-ray radiography in the sub-micron resolution scale. The technique has been applied to various type of samples ranging from industrial materials to biological samples. The high penetration of x-ray allow us to examine the samples in their most natural state, for example, the living biology samples.(Yeukuang Hwu)

(13) High energy and lateral resolution synchrotron spectromicroscopy

High energy resolution (0.1eV) and lateral resolution (200nm) spectromicroscopy has been developed using the Taiwan synchrotron source, SRRC. The facility has been routinely operated and applied to study the surface chemical inhomogeneity, the size dependent solid state chemistry and magnetic domain imaging.(Yeukuang Hwu)

(14) Characterization of nanostructured materials with synchrotron techniques

The small sizes of nanostructured materials created much difficulty in the characterization of structure as well as electronic properties. We introduced several synchrotron radiation techniques, such as anomalous X-ray scattering, to the characterization of nanostructured materials such as nanocrystalline powders and thin textured films and found them provide many informations which are otherwise hard to obtain with other techniques. Several experiments in the direction of in-situ study of chemical reactions on the nanostructured materials have also been successfully implemented. Further studies are expected to continue in the next years. (Yeukuang Hwu)

(15) Diamond thin films

The Liquid phase metal enhanced diamond growth has been studied. Ag, Cu, Pd,

Fe, Co, Ni etc. have been used as catalysts. Microwave and hot-wired plasma CVD method have been used for melting those metal catalysts. Carbon source-graphite powder in different ratios. These samples then were heated by either microwave or hot-wire in pure hydrogen gas environment at pressures about few torr. At the melting point of the metal catalyst, carbon molecules were dissociated and diffused into the molten metal, then recombined inside the molten metal as diamond structure. Hydrogen was also acted as one of the catalyst to stabilize the diamond structure and etch the non-diamond carbon off. From the results we have found that Ag is the best catalyst instead of Fe, Co or Ni, and hydrogen gas is necessary for diamond growth. It is concluded that gas phase reaction is still important in this process. (Y. Liou)

(16) Metal thin film and superlattices

Co thin films and Co/Au superlattices with different Co layer thickness have been grown on different substrates, such as Si, Ge, GaAs and MgO, by molecular beam epitaxy. The surface and crystal structures of the films or superlattices have been characterized by reflection high energy electron diffraction and x-ray diffraction. Textural growth instead of epitaxial growth was observed. Surface magnetism on the film surface and magnetic coupling between each Co layer were studied by magneto-optical Kerr effect and super conducting quantum interference device. Perpendicular magnetization was observed with Co layer thickness less than 10A. Magnetic coupling was ferromagnetic in these Co/As superlattices. (Y. Liou)

2.Magnetism

(1) The structural and magnetic properties of Co-Pd films made by oblique incidence deposition

Co-Pd alloy films were made by the oblique deposition method, with the angle of incidence α = 0, 15, 30, and 45 degrees respectively, in vacuum. X-ray rocking tests were performed on these samples to find out the orientation (angles θ_o and ϕ_o) of the (111) fiber texture axis of each film. Due to the geometrical shadowing effect on the substrate and the symmetry effect from the source, the film samples may become either isotropic or anisotropic. Both the electrical resistivity and the optical reflection methods have been employed to check the degree of the structural anisotropy in the sample. Because of different ways of bundling of columns, it was concluded that (1) when α was small, the structure of the film was plate-like, and (2) when α was large, it was rod-like. However, the degree of texturing was not much affected by the angle α. In regard to the magnetic properties, a vibrating sample magnetometer was used to study the hysteresis loops with the external fields oriented

in the longitudinal, the transverse, and the normal directions of the sample respectively. I t was found that when t was larger than a certain critical thickness, the film exhibited the distinct feature of the normal anisotropy. The dispersion of the easy axis might become larger for larger α. (S. U. Jen)

(2) Magnetostriction of Fe-rich Fe-Co and Fe-V alloys

Fe-rich Fe-Co-V alloys were prepared for the saturation magnetostriction and the anisotropic magnetoresistance measurements. In particular, the attention was focused on these magnetic properties of the two series of binary alloys: Fe-Co an Fe-V. The zero-magnetostriction compositions of the alloys were found to be at 5 at.%V and 3.5 at.%Co respectively. Magneostriction changed sign from negative to positive, as the iron concentration is decreased from 100at.%. In addition to the split-band model, we have discussed the magnetostriction data based on the one-ion model. In the latter model, it was concluded that magnetostriction of the Fe(100-x)M(x) alloy, with M=V or Co, is closely related to the magnitude of the local moment of the impurity atom M, but independent of its direction. We also showed the concentration x dependence of the saturation magnetostriction of the Fe-M alloy. By using all the relevant data from this study, we have discussed the suitability of the two models for the case of the Fe-Co-V alloys in various concentration regions. (S. U. Jen)

(3) Magnetic, optical and electric properties of magnetic films and multilayers

Magnetic thin films have been intensively studied during recent years in our Institute. We will continue to study the magnetic, optical and electrical properties of various magnetic thin films prepared by MBE, evaporated, and sputtering etc. techniques. The spin vale effect has been the most promising candidate for a high density recording read head etc.. However, the antiferromagnetic biasing layer used in the spin valve structure to date is either easily oxidized, corrosive, or has a Neel temperature lower than the working temperature. We proposed to use antiferromagnetically coupled Fe/Si/Fe trilayer to replace the biasing layer. Because the Curie temperature of Fe is much higher than the usual Neel temperature, it is much promising for the industry. Thus, we studied the structure and coupling effect of Fe/Si trilayers and multilayers and determined the different phase of silicide and nature of coupling for different structure and thickness. (Y. D. Yao, Y. Liou, and S. F. Lee)

(4) Physical property of phase change materials

Optical recording technology has developed rapidly over the past few years,

encouraging a renewed interest in phase change materials for use as erasable media. These materials, usually chalcogenide thin films, are switched between amorphous and crystalline states using the heat of a focusde laser beam. In general , roughly 20% reflectivity differences between the amorphous and crystalline states are required for recording purpose. Various phase change materials will be febricated, and their physical properties will be investigated under this research topic. (Y. D. Yao)

(5) Tunneling Magnetoresistance

Two magnetic materials separated by a thin insulating layer can form a magnetic tunnel junction. Although this phenomenon was first reported over twenty years ago, it is difficult to make good quality insulating layer on ferromagnetic materials. We try different materials and different deposition procedures, including deposit insulting layer from sputtering a target directly, sputter thin metal layer then oxidize it, etc. We now have a good recipe to make reproducible junctions and will start to study the details of oxidizing process. (Y. D. Yao, Y. Liou, and S. F. Lee)

(6) Surface Magneto-Optical Kerr Effect

A surface magneto-optical Kerr effect system has been built by modifying a surface analytical system –VG ESCA Lab.. The surface analytical system includes XPS, AES and LEED functions. The modification includes several deposition instrument—e-beam evaporator, filament evaporator , and a Moke instrument with a magnetic inside the vaccum chamber. Ultrathin films of Co deposition on Si or Ge surface have been studied. Perpendicular magnetization and alloy formations have been analyzed. Magnetic dead layers for different substrates and temperatures have been measured. A buffer layer between Co and substrate in order to prevent alloy formation will influence the Co layer magnetic property from perpendicular to in-plane magnetization. Co deposited on Si ore Ge at room temperature shows no clear crystal structure observed from LEED. Since the crystal structure of Co thin film is undefined, we have difficult to determine the relationship between the structure and the magnetic property. Co thicker films (>5 monolayers) have only in-plane magnetization but thinner films (<5 monolayers) have both in-plane and perpendicular magnetization. (Y. D. Yao, Y. Liou, and S. F. Lee)

(7) Magnetic fluid study

In recent years, a great deal of efforts has been made on the understanding of the physical phenomena in various magnetic fluids. Magnetic field induced optical transmission studies in some magnetic fluid system have been investigated by us recently. In this year, we will continue to study magnetic and optical properties of

some magnetic ferrofluids and magnetic fluids of colloidal particles as functions of the macro-size magnetic colloidal particles, the concentration of SDS, incident optical wavelengths, and applied magnetic fields etc.. (Y. D. Yao)

(8) Electronic properties of metallic thin films

A SQUID (Superconducting Quantum Interference Device) based small resistance bridge is in place. A resolution of 10^{-10} Ohm is expected and being tested. We will measure very small resistance in metallic thin films and multilayers when current is applied perpendicular to the film plane. This so-called CPP technique was used to determine relative importance between bulk and interface effects of Giant Magnetoresistance effect. We will measure CPP resistance in Ferromagnet/ Superconductor multilayers to study the interplay between cooper pair and ferromagnetic exchange field. (S. F. Lee)

(9) Physical properties of Ferromagnet/Superconductor trilayers

Electric and magnetic properties of trilayers of Nb/Co/Nb and Co/Nb/Co are studied in details. The variation of superconducting transition temperature Tc and magnetic hysteresis loop around Tc are measured systematically. Determination of superconducting coherence length and magnetic penetration depth of Co into Nb are performed. More studies on different materials will reveal the effect of spin-orbit coupling and exchange field on proximity effect. (Y. D. Yao, Y. Liou, and S. F. Lee)

(10) Calorimetric Evaluation of Magnetic Ordering and Spin Reorientation in Er3Ge4

Calorimetric measurements have been made on orthorhombic Er3Ge4 having two crystallographically distinct Er sites. The temperature dependence of specific heat shows a peak near 7 K, confirming the antiferromagnetic ordering of both Er sublattices as suggested by neutron diffraction. A spin reorientation in one of the Er sublattices of the highly canted magnetic structure prevails as a second peak in specific heat around 3.5 K. Both magnetic transitions exhibit no thermal hysteresis. By further taking into account the relatively small contributions from lattice and crystal field effect, as well as 3Rln2 for the ordering of all Er3+ with a ground state doublet, entropy analysis results in a 30 J/mol energy associated with the spin reorientation process (Y. Y. Chen).

3. Quantum Size Effects and Nanostructures

(1) Size-Induced Transition from Magnetic Ordering to Kondo Behavior in (Ce,Al) Compounds

Magnetic ordering and Kondo behavior coexist in three (Ce,Al)-based compounds, CeAl2, Ce3Al, and Ce3Al11. A common feature apparently independent of crystal structures also prevails in terms of the size-induced transition between these two magnetic phenomena. Calorimetric data show that, as the particle sizes are reduced to nano-scale, the specific heat anomaly associated with the magnetic ordering diminishes. Meanwhile, an increased coefficient $f\times$ of the linear term in specific heat indicates a large enhancement of the Kondo behavior. In 80Å-CeAl2, for example, magnetic ordering completely disappears and the extrapolated $f\times f$nreaches 9500 mJ mol-Ce-1 K-2 at absolute zero. This value falls in the highest range ever reported for heavy fermion compounds. (Yang-Yuan Chen)

(2) Single electronics

Our major research interest is on electron transport properties of mesoscopic structures. Single electronics made of normal metals, conventional superconductors, magnetic materials is our main subject, III-V semiconductor nanostructures are also of interest. Our main experiment facilities include an SEM-based electron beam writer and a high vacuum e-gun evaporator for nano-scale device fabrication and a dilution refrigerator for low temperature transport measurement. (ChiiDong Chen)

4. Crystal Growth and Optical Properties of Non-linear Crystals

(1) Single crystal growth and their optical properties

Crystal growth is a science of high application. The various crystals can be used in manufaturing electronic, semiconductor as well as solid state laser devices and also are important materials for optical and instrument industry. Eighty decade is the period of rapid expanding in tunable laser materials. After the successful growing of $Cr:BeAl_2O_3$ and $Ti:Al_2O_3$ laser crystals, there were found more than thirty laser crystals that can produce tunable laser light. In this project we are going to study the doping gannet family about their crystal growth and optical properties measurement.

Due to small and hardy requirement, the laser crystals are usually pumped by LD so that the efficient stability and reliability obtained great improvements. The aim of the first year project is to study the growth and optical properies of Nd: YAG crystal. The remaining time is then go to the study of those tunable doped YAG laser crystal and also other tunable laser materials.

The doped gannet crystals of large diameter can be grown by Czochralski pulling technique. X-ray deffraction and other optical measurments are employed to identify the structure and to inspect the quality of different doped garnet laser rods. It is hoped that the final outcome of this project can successfully manufacture some tunable solid state lasers for application usage. (W. -S. Tse)

(2) Semiconductor spectra study

Recently, we have added a high resolution Fourier Transform infrared spectrometer. We propose to measure the electronic excitation spectra of various donor and acceptor impurities in silicon and germanium. The measurements will be made mostly with the sample cooled to liquid helium temperature. Due to the very high resolution of the spectrometer, the positions of the peaks of the absorption lines could be determined precisely. Weak lines could also be resolved and observed. The shape and the width of the absorption lines from the high resolution measurements are also going to be used to study the possible reasons for the line broadening phenomenon.

Right now we are studying the behavior of a novel impurity center, i.e. magnesium-oxygen complex in silicon, which has never been reported in the literature before. Magnesium is well-known to be interstitial donor impurities in silicon. When diffused into silicon containing oxygen, the excitation spectrum observed clearly demonstrates for the first time that magnesium can complex with dispersed oxygen in silicon to form magnesium-oxygen complex donors. In addition, an interesting time-dependent effect on the absorption spectrum has been found clearly demonstrating that, even at room temperature, the gradual time. The ionization energy of neutral magnesium-oxygen complex donor has also been obtained indicating that it is a slightly deeper donor compared with neutral magnesium impurity in silicon. (T. -M. Ho)

5. Strongly Correlated Electronic Systems

(1) d-Wave Pairing Correlation in the *t-J* Type Models

There are two papers, one published in Phys. Rev. Lett. 81, p1294, 1998; and the second one is to appear in Chinese Journal of Physics as part of the Proceedings for the TICS'99 Conference in Kenting.

In the PRL paper we studied the pair-pair correlation function of the two-dimensional *t-J* model by using a particular numerical method, the power-Lanczos method, under the assumption of monotonic behavior. The power-Lanczos method was invented by us. In comparison with the results of the ideal Fermi gas, we

conclude that the 2D *t-J* model does not have long range d-wave superconducting correlation in the interesting parameter range of $J/t \leq 0.5$ which is the range believed to be relevant for high temperature superconductors. This is the first calculation done on large enough lattices to examine the pairing correlation. It is also the first reliable calculation to challenge the common belief that the mechanism of high temperature superconductivity is already contained in the two-dimensional *t-J* model.

In the second paper the assumption used in the first paper is further tested. Results calculated for the one-dimensional model and the two-leg ladder are compared with the exact solutions and results obtained by the density matrix renormalization group method. Very good agreement has been obtained. It reconfirms the reliability of our conclusion that in pure two dimensions, the pairing correlation is very weak in the *t-J* model.

(2) Phase Diagram of the Two-chain Hubbard Model

This paper is published in Phys. Rev. B(vol 59, p2587, 1999). We have calculated the charge gap and spin gap for the two-chain Hubbard model as a function of the on-site Coulomb interaction and the inter-chain hopping amplitude. We used the density-matrix renormalization group method to calculate separately the gaps numerically for the symmetric and antisymmetric modes with respect to the exchange of chain indices. We have found very different behaviors for the weak and strong interaction cases. There is significant difference between our calculated phase diagram and the one obtained by using the weak renormalization group technique. (Youngho Park and T.K. Lee)

(3) Effect of Fermi Surface Destruction on Transport Properties in Underdoped Cuperates

Motivated by recent experimental measurements on the Fermi surface(FS) destruction in underdoped high-T_c cuperates, we examine its effect on the transport properties based on the Boltzmann equation approach. The effect is modeled by simply taking the density of states for electrons in the gapped regions to be zero. Within the nearly antiferromagnetic Fermi liquid model, we calculate the temperature dependences of the dc resistivity, the inverse Hall angle and the Hall coefficient. It is shown that the effect of the FS destruction on transport properties is sensitive to the existence and the range of the flat band near $(0,\pm\pi)$ in the dispersion of electrons, and the anistropy ofthe relaxation rate along the Fermi surface. We find that the experimental data are better described by the cold spot model, i.e., the transports are determined mainly by the contribution of the electrons near the Brillouin-zone diagonals. (J.X. Li and T.K. Lee)

(4) Stripe Stability in the Extended *t-J* model on planes and four-leg ladders

This paper is published in Phys. Rev. B Rapid Comm. 59, R11649 (1999). We are in collaboration with a number of US and Japan Physicists. Recently we have begun to look at the stripe phase. We show that the stripe tendencies are considerably weaken when we include the next nearest hopping term in the *t-J* model. (T.K. Lee).

(5) A Single Unitary Impurity in a d-wave Superconductor

In this paper we study the quasiparticle resonant states around a single nonmagnetic impurity with unitary scattering in a d-wave superconductor by solving the Bogoliubov-de Gennes equations based on a *t-J* model. We find that a particle-hole symmetric system has a single symmetric zero energy peak in the local density of states regardless of the size of the superconducting coherence length. For the particle-hole asymmetric case, an asymmetric splitting of the zero-energy peak is intrinsic to a system with a small value of $k_F\xi_0$, in qualitative agreement with experiments. (T.K. Lee)

6. Biophysics

Organs influence on the blood pressure wave propagation:

Rats will be used as the experimental animal to study the effect of organ on the blood pressure wave and flow.

Energy in the circulatory system is mainly in the form of pressure. Kinetic energy is only a few percent. The pressure wave is the main energy source to push the blood flow. This project will study the relation between blood pressure wave and blood flow especially the blood pressure wave and the blood flow into organs. The main organ is kidney.

We will study the change of its elasticity and resistance effect on the blood pressure wave as well as the blood flow.

Besides, we have derived the transverse wave propagation equation in the artery and is studying the wave propagation property at the branch point. Organ or vascular bed will be included in this equation. Studies of the flow in the renal artery aorta and microcirculation in the kidney have been performed to evaluate the accuracy of the equation. In clinical application, blocking of the small artery, changing of elasticity of the arterial wall... all will be shown in the resonant frequency of this organ. This model is closely related to Chinese Medicine which also emphasizes the pressure pushes the blood flow(氣行血). (W.-K. Wang)

STATISTICAL AND COMPUTATIONAL PHYSICS

1. Equilibrium Phase Transitions

(1) Universal scaling functions for percolation models.
(2) Universal scaling functions and quantities in percolation models.
(3) Monte Carlo Approach to Percolation Problems.
(4) Universal scaling functions for critical systems with tilted boundary conditions.
(5) Universal finite-size scaling functions for the Ising model.
(6) Finite-size corrections for the number of clusters in the critical Potts model.
(7) Exact phase diagrams for an ultrathin magnetic film.
(8) Exact phase diagram for hydrogen-bonded crystals with bond defects.
(9) Partition function zeros of the Q-state Potts model for non-integer Q.
(10) Universal amplitude ratios in the Ising model on the Bethe lattice.

2. Nonequilibrium Statistical Physics

(1) Formation of crack patterns in quasi-static fracture.
(2) Novel stochastic resonance temperature in kinetic Ising model.
(3) Critical behavior of driven diffusive systems.

3. Nonlinear Dynamics

(1) Synchronization and coherence in thermodynamic coupled map lattices with intermediate-range coupling.
(2) Multistability and symmetry breaking in the 2-d flow around a square cylinder.
(3) Multistability and high dimensional chaos in a semiconductor microwave device with time-delay feedback.
(4) Bifurcation, scaling and universality in a bouncing ball system.
(5) Some scaling behaviors in a circle map with two inflection points.
(6) The diffusion behavior of simple map with periodic quenched disorder.
(7) Inversion symmetry and critical exponents of dissipative waves in the Sandpile Model.
(8) Synchronous Chaos in Coupled Map Lattices with Extensive Interactions.

4. Random Medium

(1) New mechanism of X-ray radiation from a relativistic charged particle in a dielectric random medium.

(2) Crossover phenomena in a two-dimensional phase-separating binary fluid containing surfactants.

5. Theoretical Biological Physics

(1) Parallel calculation of protein energy in a pentium cluster.
(2) The helix-coil transition in DNA.
(3) Monte Carlo dynamics in global optimization for macromolecules.
(4) Study of Monte Carlo Dynamics in optimization using statistical methods.
(5) Percolation in the small world.
(6) Population Dynamics and Disease Spread.

6. X-ray Crystallography and General Optimization Problems

1. Equilibrium Phase Transitions

(1) Universal scaling functions for percolation models.

Many problems in mathematics, physical sciences, and life sciences may be described by percolation models. In this paper, we review our recent work in universal quantities and universal finite-size scaling functions (UFSSF's) of percolation models. The quantities we consider include the existence probability (also called spanning probability), E_p, the percolation probability, P, and the probability for the appearance of n percolating clusters, W_n. The topics under discussion include: 1. boundary conditions, aspect ratios, and finite-size scaling functions, 2. UFSSF's of E_p and P in lattice percolation models, 3. UFSSF's of W_n in lattice percolation models, 4. UFSSF's of E_p and W_n in continuum percolation models, 5. UFSSF's of the q-state bond-correlated percolation model and q-state Potts model without nonuniversal metric factors, and 6. boundary conditions and average number of percolating clusters. Some other related developments and problems for further research are also discussed. (C.-K. Hu)

(2) Universal scaling functions and quantities in percolation models.

We briefly review recent work on universal finite-size scaling functions (UFSSF's) and quantities in percolation models. The topics under discussion include: (a) UFSSF's for the existence probability (also called crossing probability) E_p, the percolation probability P, and the probability W_n of the appearance of n percolating clusters, (b) universal slope for average number of percolating clusters, (c) UFSSF's for a q-state bond-correlated percolation model corresponding to the q-state Potts model. We also briefly mention some very recent related developments and discuss implications of our results. (C.-K. Hu, J.-A. Chen and C.-Y. Lin)

(3) Monte Carlo Approach to Percolation Problems.

Using a Monte Carlo method, Hu, Lin and Chen found that bond and site percolation models on planar lattices have universal finite-size scaling functions for the probability W_m for the appearance of m percolating clusters, which implies that the average number of percolating clusters, C, is a universal quantity. Hu and Lin found that C increases linearly with the aspect ratio, R, of the lattice for large R, i.e. in this case $C=aR$ with a constant a. Hu and Lin also found that a is apparently independent of the boundary conditions. For the periodic boundary conditions in both horizontal and vertical directions, Ziff et al. found that the number of clusters per lattice site, n, for percolation on planar lattices of linear dimensions L can be written as $n=n_c+b/N$, where n_c is n in the limit L

$\rightarrow\infty$, b is a constant, and N is the number of lattice sites. Ziff et al. found that b is niversal and argued that b is the number of percolating clusters so that its universality may be related to the universality of C. Hu found that for large R, $b=b_cR$, but $b_c\neq a$. In this paper, we use a cluster Monte Carlo simulation method to calculate the number of clusters per site, n, of a q-state bond-correlated percolation model (QBCPM) which is equivalent to the q-state Potts on $L\times L$ square lattices. We find that for $q\geq 2$ the slopes of n as a function of $1/L^2$ are negative. For $q=2$, i.e. the Ising model, we find that our data can be well represented by $n=n_c-c/L+b/L^2+\ldots$, where b can be calculated exactly from conformal field theory, $c > 0$ and can be calculated exactly from the critical internal energy of the Ising model. (C.-K. Hu, J.-A. Chen, N. Sh. Izmailian, and P. Kleban)

(4) Universal scaling functions for critical systems with tilted boundary conditions.

We calculate finite-size scaling functions (FSSF) of Binder parameter g and magnetization distribution function $p(m)$ for the Ising model on $L_1\times L_2$ square lattices with periodic boundary conditions in the horizontal L_1 direction and tilted boundary conditions with parameter c in the vertical L_2 direction. For appropriate sets of (a,c) with $a=L_1/L_2$, the FSSFs of g and $p(m)$ are universal and in such cases $a/(c^2a^2+1)$ is an invariant. (Y. Okabe, K. Kaneda, M. Kikuchi, and C.-K. Hu)

(5) Universal finite-size scaling functions for the Ising model.

Based on the connection between the Ising model and a correlated percolation model, we calculate the distribution function for the fraction (c) of lattice sites in percolating clusters in subgraphs with n percolating clusters, $f_n(c)$, and the distribution function for magnetization (m) in subgraphs with n percolating clusters, $p_n(m)$. We find that $f_n(c)$ and $p_n(m)$ have very good finite-size scaling behavior and they have universal finite-size scaling functions for the model on square, plane triangular, and honeycomb lattices when aspect ratios of these lattices have the proportions 1: $\sqrt{3}/2$:$\sqrt{3}$. The many-peak structure of the magnetization distribution function $p(m)$ for the system with large aspect ratio could be understood from the independent orientations of two or more percolation clusters in such system. (Y. Tomita, Y. Okabe, and C.-K. Hu)

(6) Finite-size corrections for the number of clusters in the critical Potts model.

We establish a new and intriguing connection between geometry and thermodynamics in the critical q-state Potts model on two-dimensional lattices, using the q-state bond-correlated percolation model (QBCPM) representation. We find that the number of

clusters $\langle N_c\rangle$ of the QBCPM has an energy-like singularity for $q\neq 1$, which is reached and supported by exact results, numerical simulation, and scaling arguments. We also establish that the finite-size correction to the number of bonds, $\langle N_b\rangle$, has no constant term and explain the divergence of related quantities as $q\rightarrow 4$, the multicritical point. Similar analyses are applicable to a variety of other systems.(C.-K. Hu, J.-A. Chen, N. Sh. Izmailian, and P. Kleban)

(7) Exact phase diagrams for an ultrathin magnetic film

Using iteration technique, we obtain exact expressions for the free energy and the magnetization of an Ising model on a two - layer Bethe lattice with intralayer coupling constants J_1 and J_2 for the first and the second layer, respectively, and interlayer coupling constant J_3 between two layers; the Ising spins also couple with external magnetic fields, which are different in two layers. We obtain exact phase diagrams for the system and find that when $|J_3|\rightarrow 0$, $\Delta Tc\equiv|T_c(J_3)-T_c(0)|/T_c(0)\sim J_3/J_1|^{1/\phi}$, where $T_c(J_3)$ is the phase transition temperature for the system with interlayer coupling constant J_3 and the shift exponent ϕ is 1 for $J_1 = J_2$ and is 0.5 for $J_1\neq J_2$. Such results are consistent with predictions of a scaling theory. We also derive equations for ΔT_c when $|J_3|$ approaches ∞. Our result is useful for understanding phase diagrams of ultrathin magnetic films. (C.-K. Hu, Sh. Izmailian, and K. B. Oganesyan)

(8) Exact phase diagram for hydrogen-bonded crystals with bond defects.

It is shown that the percolation model of hydrogen-bonded crystals, which is a 6-vertex model with bond defects, is completely equivalent with an 8-vertex model in an external electric field. Using this equivalence we solve exactly a particular 6-vertex model with bond defects. The general solution for the Bethe-like lattice is also analyzed. (N. Sh. Izmailian, C.-K. Hu, and F. Y. Wu)

(9) Partition function zeros of the Q-state Potts model for non-integer Q.

The distribution of the Fisher zeros of the Q-state Potts model in the complex temperature plane is studied for non-integer Q. As Q approaches unity we find the zeros rapidly converge to the ferromagnetic self-dual unit circle in the complex p plane where $p=(e^{\beta J}-1)/\sqrt{Q}$ and we verify the Den Nijs formula for the thermal critical exponent y_t of the Potts ferromagnet. The critical point and the thermal exponent of the Potts antiferromagnet are discussed using the same distribution of the Fisher zeros. (S.-Y. Kim, R. J. Creswick, C.-N. Chen, and C.-K. Hu)

(10) Universal amplitude ratios in the Ising model on the Bethe lattice.

For the Ising systems in the same universality class, it is believed that the ratio of the high- and low-temperature amplitudes for the correlation length and for susceptibility are universal quantities. Using recently developed methods we have calculated exactly the correlation length amplitude ratios for Ising model on the Bethe lattice and found that this ratio is independent of the coordination number of the lattice. (N. Sh. Izmailian and C.-K. Hu)

2. Nonequilibrium Statistical Physics

(1) Formation of crack patterns in quasi-static fracture

Fracture in quasi-statically driven systems is studied by means of a discrete spring-block model. Developed from close comparison with desiccation experiment, it models crack formation from relieving the stresses induced by a frictional substrate. Competition between stick-slip action and cracking leads to a cellular, hierachical pattern of cracks. We characterize such patterns by the progressive damage exhibited by the number of broken bonds and energy released. Consistent with experimental observations, fragment size is found to be linear in the sample thickness. Scaling behaviors with respect to the substrate coupling and thickness suggests why morphologically similar patterns are so ubiquitous over very diverse length scales (K.-t. Leung and Z. Neda).

(2) Novel stochastic resonance temperature in kinetic Ising model

The kinetic Ising model in a weak time-dependent oscillating magnetic field is studied in the context of stochastic resonance. The signal-to-noise ratio calculated with simulations is found to peak at a nontrivial resonance temperature above the equilibrium critical temperature T_c. We argue by a scaling argument and show by simulations that its appearance is closely related to the vanishing of the kinetic coefficient at T_c. Comparisons with various theoretical results in one and higher dimensions are made (K.-t. Leung and Z. Neda).

(3) Critical behavior of driven diffusive systems

We study the standard three-dimensional driven diffusive system on a simple cubic lattice where particle jumps along a given lattice direction are biased by an infinitely strong field, while those along other directions follow the usual Kawasaki dynamics. Our goal is to determine which of the several existing theories for critical behavior is valid.

We analyze finite-size scaling properties using a range of system shapes and sizes far exceeding previous studies. Four different analytic predictions are tested against the numerical data. We conclude that Leung's field-theoretic prediction based on the effects of a dangerous irrelevant variable appears to be satisfactory, while the isotropic finite-size scaling recently proposed by Marro et al. is not (K.-t. Leung and J.-S. Wang).

3. Nonlinear Dynamics

(1) Synchronization and coherence in thermodynamic coupled map lattices with intermediate-range coupling.

In spatially extended systems, intermediate-range interactions arise naturally in some physical contexts. To study them, we investigate a model of coupled map lattices (CML's) with intermediate-range coupling and derive analytic conditions for its synchronization. We find that in these CML's, if the range of coupling is fixed, the law of large numbers applies for the mean field. The total normalized power in nonzero components of the power spectrum of the mean field goes to zero in the thermodynamic limit. We also show that in the same limit the relevant parameter for synchronization and coherence is the fraction of sites coupled and not their number. (P. M. Gade and C.-K. Hu)

(2) Multistability and symmetry breaking in the 2-d flow around a square cylinder.

We use numerical methods to study two-dimensional (2-d) flow passing a square cylinder at low Reynolds numbers and observe period-one and period-three vortices behind the cylinder at the same Reynolds number, R_e. When R_e increases from small number to a critical value $R_c \approx 320$, the system could change from bistability, which maintains the spatial symmetry, to tristability, which breaks the spatial symmetry. Our results suggest many interesting problems for further studies. (Y.-H. Shiau, Y.-F. Peng, R. R. Hwang, and C.-K. Hu)

(3) Multistability and high dimensional chaos in a semiconductor microwave device with time-delay feedback.

We propose a tunable microwave device consisting of a Gunn diode with time-delay feedback, which will emit high-dimensional chaotic waves. The wavelength is controlled by two incident laser beams which trigger the moving multiple Gunn-domains. Predicted phenomena include the coexistence of stationary and chaotic states, complicated hysteresis loops, persistent bistabiliy, transient and high-dimensional chaos, *etc.*. This device is potentially useful for secure microwave communications, memory devices,

applications involving photorefractive effects, *etc.* (Y.-H. Shiau, H.-P. Chiang, Y.-C. Cheng, and C.-K. Hu)

(4) Bifurcation, scaling and universality in a bouncing ball system.

The period-doubling bifurcation of bouncing ball system is investigated numerically. We found that the numerical values of the scaling factors δ and α which characterize the scaling structure of the period-doubling bifurcation agree with the Feigenbaum constants. This implies that the bouncing ball system, on certain parameter ranges, can be effectively reduced to one-dimensional unimodal map $x_{n+1}=1-ax_n^2$ and they belong to the same universality class. (J.-A. Chen and C.-K. Hu)

(5) Some scaling behaviors in a circle map with two inflection points.

By investigating numerically a circle map with two cubic inflection points, we find that the fractal dimension D of the set of quasiperiodic windings at the onset of chaos has a variety of values, instead of a unique value like 0.87. This fact strongly suggests that a family of universality classes of D appears as the map has two various inflection points. On the other hand, at the quasiperiodic transition with the golden mean winding number, the ratios δ_n of the width of the mode lockings when going from one Fibonacci level to the next do not converge to a fixed value or a limit cycle in most cases. In this sense, local scaling is broken due to the interaction of the two inflection points of the map. Based on the above observations, it seems that the global scaling is more robust than the local one, at least for the maps we considered. (H.-C. Tseng, M.-F. Tai, H.-J. Chen, P.-C. Li, C.-H. Chou, and C.-K. Hu)

(6) The diffusion behavior of simple map with periodic quenched disorder.

To explore the effect of quenched disorder on chaotic diffusion, we investigate the diffusion properties of a simple map with periodic quenched disorder. As the period N approaches infinity, the map will exhibit sublinear diffusion behavior, the same as that revealed by G. Radons, such that the corresponding diffusion coefficient D vanishes. For N=140, we find, the system varies with the configuration of disorder to exhibit a great diversity of diffusion behavior, including normal diffusion with diminished D (about less than two or three orders of magnitude), the crossover from large D diffusion to very small D diffusion, and the crossover from normal diffusion to completely suppressed diffusion. Based on the decomposition formalism, we find that the correlation behavior of the sequences of +1 or -1, which are determined by the kinds of disorder (represented by +1 or -1) visited by the trajectories of the map, is responsible for the different diffusion processes. We also show that the connection between the diffusion behavior and the disorder configuration is dominated by the variance and the power spectrum of the associated potential. (H.-C. Tzeng, P.-R. Huang, H.-J. Chen, and C.-K. Hu)

(7) Inversion symmetry and critical exponents of dissipative waves in the Sandpile Model.

Statistics of waves of topplings in the sandpile model is analyzed both analytically and numerically. It is shown that the probability distribution of dissipating waves of topplings that touch the boundary of the system obeys the power-law with critical exponent 5/8. This exponent is not independent and is related to the well-known exponent of the probability distribution of last waves 11/8 by exact inversion symmetry $s\rightarrow 1/s$. Probability distribution of those dissipating waves that are also last in an avalanche is invariant under the inversion transformation and has asymptotic behavior s^{-1}. Our extensive numerical simulations not only support these predictions, but also indicate that inversion symmetry is also useful for the analysis of the two-wave probability distributions. (C.-K. Hu. E.V. Ivashkevich, C.Y. Lin, and V.B. Priezzhev)

(8) Synchronous Chaos in Coupled Map Lattices with Extensive Interactions.

In certain physical situations, extensive interactions arise naturally in physical systems. We consider two such situations which have received attention in certain contexts recently, namely small world couplings and local-global interactions. We show that synchronous chaos is possible in the thermodynamic limit in these case. We point out that randomness helps synchronization in small world lattices. We also discuss nature of transition to synchronization in presence of local-global interaction. (P. M. Gade and C.-K. Hu)

4. Random Medium

(1) New mechanism of X-ray radiation from a relativistic charged particle in a dielectric random medium.

We have considered X-ray radiation of a relativistic charged particle moving in a system consisting of microspheres distributed randomly in a dielectric material. A new mechanism based on the diffusional scattering of pseudophotons is suggested. The result leads to a stronger dependence of radiation intensity on the particle energy, $\gamma = E/mc^2$, than that predicted by the traditional transition radiation theory, and explains a recent

experiment on such a system of randomly distributed superconducting granules. (Zh. S. Gevorkian, C. P. Chen, and C.-K. Hu)

(2) Crossover phenomena in a two-dimensional phase-separating binary fluid containing surfactants.

Extensive simulations are carried out to investigate the crossover between the hydrodynamic regime at intermediate stage and the thermal fluctuating regime at late stage in a phase-separating binary fluid/surfactant system in two dimensions. Simulations show that the crossover is a function of surfactant concentration. The existence of the crossover and its dependence on surfactant concentration are analyzed using Kawasaki and Ohta's interface kinetic equation. The analysis also shows that there exists a critical surfactant concentration above which thermal fluctuations overwhelm hydrodynamics and dominate phase separation at all times. Simulations also show that the trapped surfactants seen in a previous study by Roan and Shakhnovich have extremely long life time in spite of the presence of significant thermal fluctuations. This implies that it is possible to enhance the formation of micelles and vesicles of amphiphilic molecules in a phase-separating binary fluid. (J.-R. Roan and C.-K. Hu)

5. Theoretical Biological Physics

(1) Parallel calculation of protein energy in a pentium cluster.

It is well known that the potential energy function of protein molecule has very complicated landscape with multiple minima and maxima. Computer simulations of such systems encounter certain problems and the search for more sophisticated algorithms and simulation techniques has been extensively done. Multicanonical ensemble method is one of the most successful steps in this direction. Parallel computation technique is also widely exploited and has lead to many important results. In this paper we combine both multicanonical and parallel computation techniques within a unique approach to Monte Carlo simulations of protein molecules. We report on the simple strategy of parallel calculation of the protein energy function. Two small peptides are used for the testing of the algorithm for one of which the known data are reproduced accurately. (S. Hayrian, C.-K. Hu, S.-Y. Hu, and R.-J. Shang)

(2) The helix-coil transition in DNA.

A model Hamiltonian for double-strand polynucleotides is suggested to discribe the phenomenon of helix-coil transition. The Hamiltonial is constructed using solely the

microscopical, pure physical quantities, charachterizing the molecular chain, namely the energy of hydrogen-bond formation and the number of conformations of repeated unit. Realistic constraints are imposed on the conformations of chain in the case of loop formation. The advantage of suggested approach is that the parameters of the model can be obtained independent calculations or experiments. An important problem of the non-local feature of the cooperativity parameter of heterogenous biopolymers is discussed. (V. F.Morozov, E.SH. Mamasakhlisov, Shura Hayrian, C.-K. Hu)

(3) Monte Carlo dynamics in global optimization for macromolecules.

Several very different optimization problems are studied by using the fixed-temperature Monte-Carlo dynamics and found to share many common features. The most surprising result is that the cost function of these optimization problems itself is a very good stochastic variable to describe the complicated Monte-Carlo processes. There is no need to introduce other variables. Hence a multi-dimensional problem is mapped into a one dimensional diffusion problem. This problem is either solved by direct numerical simulation or by using the Fokker-Planck equations. Above certain temperatures, the first passage time distribution functions of the original Monte-Carlo processes are reproduced. At low temperatures, the first passage time has path dependence and the single-stochastic-variable description is no longer valid. This analysis also provides a simple method to characterize the energy landscapes. (C.N. Chen, C.I. Chou, C.R. Hwang, J. Kang, T.K. Lee, and S.P. Li)

(4) Study of Monte Carlo Dynamics in optimization using statistical methods

When one uses Monte Carlo algorithms to optimization problems, there is always an optimal temperature for the Boltzmann factor which allows the system to go to the global minimum with the fewest time steps. We employ here statistical methods to locate the optimal temperature by extracting information in some pre-run tests. We also introduce ways to modify the Monte Carlo algorithms in order to speed up the process. (S.P. Li, Y.H. Wong)

(5) Percolation in the small world

In most physical systems, there is a small degree of randomness somewhere between totally order and totally random. Such small degree of randomness can drastically change the behvior of many physical systems. We are using the simple percolation models to study the effect of such small randomness on their critical phenomena. (C.N. Chen, S.P. Li)

(6) Population Dynamics and Disease Spread

My research is focused on dynamical models of populations, with a particular (but not exclusive) interest in the propagation of infectious diseases. I have three major areas of ongoing research. The first is a framework for approximating the effects of heterogeneity of hosts on the spread of infectious diseases. The second is an application of this framework to the special case of viral diseases of insects, focussing on the important pest the gypsy moth. The third is an exploration of approximation frameworks for stochastic models of populations, which have important implications for conservation and biodiversity. (Jonathan Dushoff)

6. X-ray Crystallography and General Optimization Problems

In the last couple of years we are searching for a numerical method to speed up the determination of protein structures by using x-ray diffraction data. For large molecules like proteins it is very time consuming and sometimes impossible to use x-ray diffraction data to determine the structure. Recently it was proposed that using the simulated annealing (SA) method we may speed up this process. We have verified that the method can resolve the structures of molecules with less than 60 atoms but very difficult for larger molecules. After analyzing the energy landscapes with the fixed-temperature Monte Carlo dynamics, we realized that simple SA method won't be able to solve this problem. The result is published in Phys. Rev. E60, 2388 (1999).

We have now developed a successive refinement method. First we use low resolution and long wavelength diffraction peaks to identify high charge density region in a rather coarse scale. Then these regions are used as the nucleation center for charge structures to grow while better resolution and shorter wavelength data are used to get more finer structure of charge density distribution. These steps are repeated until the structure is solved with the desired accuracy. The method has been successfully used to resolve structures that were not able to be resolved by the SA method. A manuscript is now in preparation. (Chi-Ning Chen, C.I. Chou, S.P. Li and T.K. Lee).

III

List of Ongoing Research Projects

List of Ongoing Research Projects

中研院物理所八十八年度計劃清單一覽表

（1998 年 7 月～1999 年 6 月）

主持人	計畫名稱	執行期限	計畫編號
王子敬	台灣核電廠微中子導航實驗(續)	87.08.01-89.04.30	NSC88-2112-M-001-007
王明哲	重夸克及強作用物理之實驗探討(Ⅱ)(子計劃四)-CDF 實驗之電腦模擬與數據分析	87.08.01-88.07.31	NSC88-2112-M-001-040
王建萬	在 Spring-8 研究光致向量介子產生	87.08.01-88.10.31	NSC88-2112-M-001-033
王唯工	以脈診研究中醫藥之歸經原理	87.07.01-88.06.30	CCMP88-RD-010
王唯工	穴診儀之基礎研究	87.07.01-88.06.30	NRICM88-103
王唯工	以血液波共振方程式探討器官對主動脈血壓波形之影響	87.08.01-88.07.31	NSC88-2112-E-001-009
王唯工	生物能場—脈波診斷與腎臟異常-脈波頻譜與腎臟微循環之關聯	87.08.01-88.07.31	NSC88-2314-B-001-021-M08
任盛源	斜鍍方式製成鈷鈀膜之磁性與電性研究	87.08.01-88.07.31	NSC88-2112-M-001-027
何侗民	矽中鎂氧複合雜質紅外線吸收光譜之研究(2/2)	87.08.01-88.10.31	NSC88-2112-M-001-002
余岳仲	重離子-原子碰撞中 L-層 X 射-線能量移與螢光產額之研究	87.08.01-88.10.31	NSC88-2112-M-001-008
余海禮	微擾 QCD 與小 X 物理(Ⅱ)	87.08.01-88.10.31	NSC88-2112-M-001-009
吳建宏	有限溫度規範場論之行爲及其宇宙學之應用-(子計畫三):-宇宙早期相變的非平衡動力學(2/3)	87.08.01-88.07.31	NSC88-2112-M-001-042
李世昌	以精密質譜儀探測宇宙中反物質及暗物質(Ⅲ)(子計劃二)-探測反物質及暗物質(Ⅲ)	87.08.01-88.10.31	NSC88-2112-M-001-034
李世昌	重夸克及強作用物理之實驗探討(Ⅱ)-總計畫及子計畫一：頂夸克搜尋及強作用之非微擾現象及其相關物理之研究	87.08.01-88.10.31	NSC88-2112-M-001-041
李定國	t-J 模型與高溫超導體研究(2/3)	87.08.01-88.07.31	NSC88-2112-M-001-004

主持人	計畫名稱	執行期限	計畫編號
李尚凡	以電流垂直平面方法研究鈮/鈷多層薄膜超導溫度振盪及介面電阻之測量	87.08.01-88.07.31	NSC88-2112-M-001-018
杜其永	可溶性高分子聚合物對二元混合液的臨界特性之影響(Ⅱ)	87.08.01-88.07.31	NSC88-2112-M-001-010
姚永德	奈米尺寸金屬之物理特性研究(Ⅱ)	87.08.01-88.07.31	NSC88-2112-M-001-038
姚永德	多層膜磁電組特性研究	87.08.01-88.07.31	88S13-J3
胡宇光	利用同步輻射相關技術進行臨場超微粒過渡金屬氧化物觸媒之表面催化性質研究	87.08.01-88.07.31	NSC88-CPC-M-001-017
胡宇光	應用同步輻射光電子能譜顯微術之磁區研究	87.08.01-88.12.31	NSC88-2112-M-001-036
胡宇光	燃料棒之鋯合金表面缺陷之同步輻射光電子能譜顯微化學研究	87.08.01-88.07.31	NSC87-TPC-M-001-001
胡進錕	展透與相變研究(1/3)	87.08.01-88.10.31	NSC88-2112-M-001-011
張志義	重強子結構及形狀因子之研究	87.08.01-88.10.31	NSC88-2112-M-001-012
梁鈞泰	斷裂現象模型之引申	87.08.01-88.07.31	NSC88-2112-M-001-013
陳志強	排水現象對表面活性劑引發不穩定性之影響	87.08.01-88.07.31	NSC88-2112-M-001-014
陳洋元	從量子侷限到量子尺寸效應研究	87.08.01-88.10.31	NSC88-2112-M-001-026
陳洋元	液態氮冷凍工法應用於地下湧水開挖	87.08.01-88.07.31	CCO-01
陳啓東	高動作溫度的單電子電晶體的製作與評估	87.07.01-88.06.30	NDL-88-C-001
陳啓東	單電子三極體之電荷效應(2/2)	87.08.01-88.07.31	NSC88-2112-M-001-001
陳啓東	高動作溫度的單電子電晶體的製作與評估	87.08.01-88.07.31	NDL-89-C-002
曾忠一	半拉格朗日法在雲模式上的應用(Ⅲ)	87.08.01-88.09.30	NSC88-2112-M-001-001
曾忠一	應用多元多頻道衛星資料推估大氣效應訂正參數(1/3)	87.08.01-88.07.31	88 遙測-04-05
曾詣涵	介子系統與超核之理論研究(Ⅲ)	87.08.01-88.10.31	NSC88-2112-M-001-015

主持人	計畫名稱	執行期限	計畫編號
黃榮鑑	海洋水污染擴散環境影響評估技術之研究	87.07.01-88.06.30	FPA-88-U1E1-03-001
黃榮鑑	含自由液面、流過障礙物複雜紊流場之數值研究	87.08.01-88.07.31	NSC88-2611-E-001-001
黃榮鑑	海洋污染及防治(Ⅲ)-重密度污染物海洋放流之擴散研究	87.08.01-88.07.31	NSC88-2611-E-001-002
齊正中	第一屆海峽兩岸物理與材料科學研究推動研討會	87.08.01-88.07.31	NSC88-2114-M-001-001
劉鏞	磁性耦合對自旋極化穿隧磁阻的影響研究	87.08.01-88.07.31	NSC88-2112-M-001-028
鄭天佐	奈米及低維結構之物理性質、製作與應用(1/3)	87.08.01-88.07.31	NSC88-2119-M-001-003
鄭海揚	粒子物理現象之探討(3/3)	87.08.01-88.10.31	NSC88-2112-M-001-006
鄭海揚	「高能物理實驗」學門規劃修訂	87.08.01-88.12.31	NSC88-2114-M-001-002
鄧炳坤	重夸克及強作用物理之實驗探討(Ⅱ)(子計劃)-CDF 及相關實驗粒子偵測器之研製	87.08.01-89.4.30	NSC88-2112-M-001-037
鄧炳坤	重夸克及強作用物理之實驗探討(Ⅱ)(子計劃三)-奇異重子衰變中 CP 不守恒現象之探討	87.08.01-88.07.31	NSC88-2112-M-001-039
謝雲生	可調諧雷射晶體之生長與研究(2/3)	87.08.01-88.07.31	NSC88-2112-M-001-003
顏迪佑	探討能量介於 AGS 與 SPS 間之原子核-原子核碰撞	87.08.01-88.07.31	NSC88-2112-M-001-016
魏金明	氫分子解離吸附在氧原子覆蓋鎳(Ⅲ) 表面的加強效應(Ⅱ)	87.08.01-88.07.31	NSC88-2112-M-001-025

List of Ongoing Research Projects

中研院物理所八十八下半年度計劃清單一覽表

（1999 年 7 月～1999 年 12 月）

主持人	計畫名稱	執行期間	計畫編號
王子敬	台灣核電廠微中子導航實驗(Ⅱ)	88.08.01-89.07.31	NSC89-2112-M-001-028
王明哲	重夸克及強作用物理之實驗探討(Ⅱ)(子計畫四):-CDF 實驗之電腦模擬與數據分析	88.08.01-89.07.31	NSC89-2112-M-001-025
王建萬	在 SPRING-8 研究光致向量介子產生(Ⅱ)	88.08.01-89.07.31	NSC89-2112-M-001-052
王唯工	體外聲波對主動脈血壓波形之影響(1/3)	88.08.01-89.07.31	NSC89-2213-M-001-019
王唯工	正常鼠與高血壓之鼠腎臟脈動微循環與主動脈血壓波關聯之異同(1/3)	88.08.01-89.07.31	NSC89-2320-B-001-035-M08
王唯工	穴診儀之動物實驗	88.08.01-89.12.31	NRICM-89103
任盛源	鐵鈷鎳合金膜材之磁伸縮與磁阻研究	88.08.01-89.07.31	NSC89-2112-M-001-041
何侗民	矽與鍺中新雜質中心之形成及其特性之研究(1/3)	88.08.01-89.07.31	NSC89-2112-M-001-034
余岳仲	發展核微探針設備	88.08.01-89.07.31	NSC89-2112-M-001-022
余海禮	微擾 QCD 與小 X 物理(Ⅲ)	88.08.01-89.07.31	NSC89-2112-M-001-019
吳建宏	有限溫度規範場論之行爲及其宇宙學之應用-(子計畫三):-宇宙早期相變的非平衡動力學(3/3)	88.08.01-89.07.31	NSC89-2112-M-001-001
李世昌	重夸克及強作用物理之實驗探討(Ⅱ)(總計畫)及(子計畫一):-頂夸克搜尋及強作用之非微擾現象及其相關物理之研究	88.08.01-89.07.31	NSC89-2112-M-001-027
李世昌	以精密質譜儀探測宇宙中之反物質及暗物質(Ⅱ)(總計畫)-以精密質譜儀探測宇宙中之反物質及暗物質(Ⅱ)	88.08.01-89.07.31	NSC89-2112-M-001-042
李定國	t-J 模型與高溫超導體研究(3/3)	88.08.01-89.07.31	NSC89-2112-M-001-050
李尚凡	鈮/鈷薄膜的磁性與超導性質研究	88.08.01-89.07.31	NSC89-2112-M-001-036
杜其永	電流變液體之動力行爲	88.08.01-89.07.31	NSC89-2112-M-001-017

主持人	計畫名稱	執行期限	計畫編號
姚永德	超薄磁性金屬膜之物理性質研究	88.08.01-89.07.31	NSC89-2112-M-001-037
姚永德	編碼用磁性感測元件之研發設計之研究	88.08.01-89.12.31	89S15-J3
胡宇光	EXAFS 能譜顯微術之發展與應用	88.08.01-89.07.31	NSC89-2112-M-001-044
胡進錕	展透與相變研究(2/3)	88.08.01-89.07.31	NSC89-2112-M-001-005
張志義	強子結構與非微擾量子色動力學(1/3)	88.08.01-89.07.31	NSC89-2112-M-001-010
梁鈞泰	斷裂現象之圖型形成(1/2)	88.08.01-89.07.31	NSC89-2112-M-001-015
陳志強	局部反饋下可激發介質圖形產生之研究	88.08.01-89.07.31	NSC89-2112-M-001-018
陳洋元	量子點量子線中 3 維與 2 維之量子尺寸效應研究	88.08.01-89.07.31	NSC89-2112-M-001-031
陳啓東	高動作溫度的單電子電晶體的製作與評估	88.07.01-89.12.31	NDL-89-C-002
陳啓東	單電子電晶體的量子效應研究(1/3)	88.08.01-89.07.31	NSC89-2112-M-001-033
曾忠一	半拉格朗日法在雲模式上的應用(Ⅳ)	88.08.01-89.07.31	NSC89-2111-M-001-001
曾詣涵	奇異數 1 或 2 之超核系統(1/3)	88.08.01-89.07.31	NSC89-2112-M-001-011
黃榮鑑	含自由液面、流過障礙物複雜紊流場之數值研究	88.08.01-89.07.31	NSC89-2611-E-001-001
黃榮鑑	以直接數值模擬方柱體之渦漩逸出流場	88.08.01-89.07.31	NSC89-2611-E-001-002
葉平	以精密質譜儀探測宇宙中反物質及暗物質(Ⅱ)(子計畫一)-探測反物質及暗物質	88.08.01-89.07.31	NSC89-2112-M-001-043
劉鏞	金屬氧化物多層膜(鐵磁層/非鐵磁層)結構的磁性交互耦合作用	88.08.01-89.07.31	NSC89-2112-M-001-035
鄭天佐	奈米及低維結構之物理性質、製作與應用(2/3)	88.08.01-89.07.31	NSC89-2112-M-001-049
鄭海揚	B 物理與 CP 破壞(1/3)	88.08.01-89.07.31	NSC89-2112-M-001-016
鄧炳坤	重夸克及強作用物理之實驗探討(Ⅱ)(子計畫二): CDF 及相關實驗粒子偵測器研製及(子計畫四):-奇異重子衰變中 CP 不守恒現象之探討	88.08.01-89.07.31	NSC89-2112-M-001-024
謝雲生	可調諧雷射晶體之生長與研究(3/3)	88.08.01-89.07.31	NSC89-2112-M-001-047

主持人	計　　畫　　名　　稱	執 行 期 限	計　畫　編　號
顏迪佑	重離子碰撞中強子物質至括子膠子電漿之相變(1/2)	88.08.01-89.07.31	NSC89-2112-M-001-012
魏金明	單原子在面心立方晶體(100)表面的擴散機制(1/3)	88.08.01-89.07.31	NSC89-2112-M-001-038
章文箴	2-4GEV/C 能量區域之光致向量介子產生及反應機制探討	88.10.01-89.07.31	NSC89-2112-M-001-053
李世昌	以精密之太空質譜儀觀測宇宙射線	88.07.01-89.12.31	本院主題計劃 12
胡進錕	統計物理與數值模擬	88.07.01-89.12.31	本院主題計劃 5
姚永德	超微小物質結構之物性研究	88.07.01-89.12.31	本院主題計劃 29
鄭天佐	表面介面及薄膜科學	88.07.01-89.12.31	本所主題計劃
鄭天佐	掃描探針式顯微術之發展與應用	88.07.01-89.12.31	本所主題計劃

IV

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2. L. C. Jia, P. Y. Lai and C. K. Chan, *Non-equilibrium Phenomenon in the Segregation of Granular Binary Mixtures*, Chin. J. Phys. 36, 658 (1998).
3. L. C. Jia, P. Y. Lai and C. K. Chan, *Empty Site Models for Heap Formation in Vertically Vibrating Grains*, Accepted for publication in Phys. Rev. Lett. 83, Nov 08, (1999).
4. C. K. Chan, *Surfactant Wetting Layer Driven Instability in a Hele-Shaw Cell*, To appear in Physics A (1999/2000).
5. L. C. Jia, P. Y. Lai and C. K. Chan, *Scaling Properties of Avalanches from a Collapsing Sandpile*, To appear in Physica A (1999/2000).
6. C. K. Chan and H. J. Choi, *Drainage of Surfactant Films with Polymer Additives*, Preprint, Submitted to Journal (1999).

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V

Supporting Facilities

Computer Facilities

After years of development and devotion by a few colleagues, starting with a few desktop computers, our institute now enjoys the services of a well-equipped computer room with knowledgeable staffs.

The primary tasks of the computer room are three-fold: (i) to provide high-speed computing environment for research using numerical simulations and symbolic manipulations; (ii) to maintain a network connection inside the institute and to the Internet; (iii) to maintain automation in the administrative office and the library.

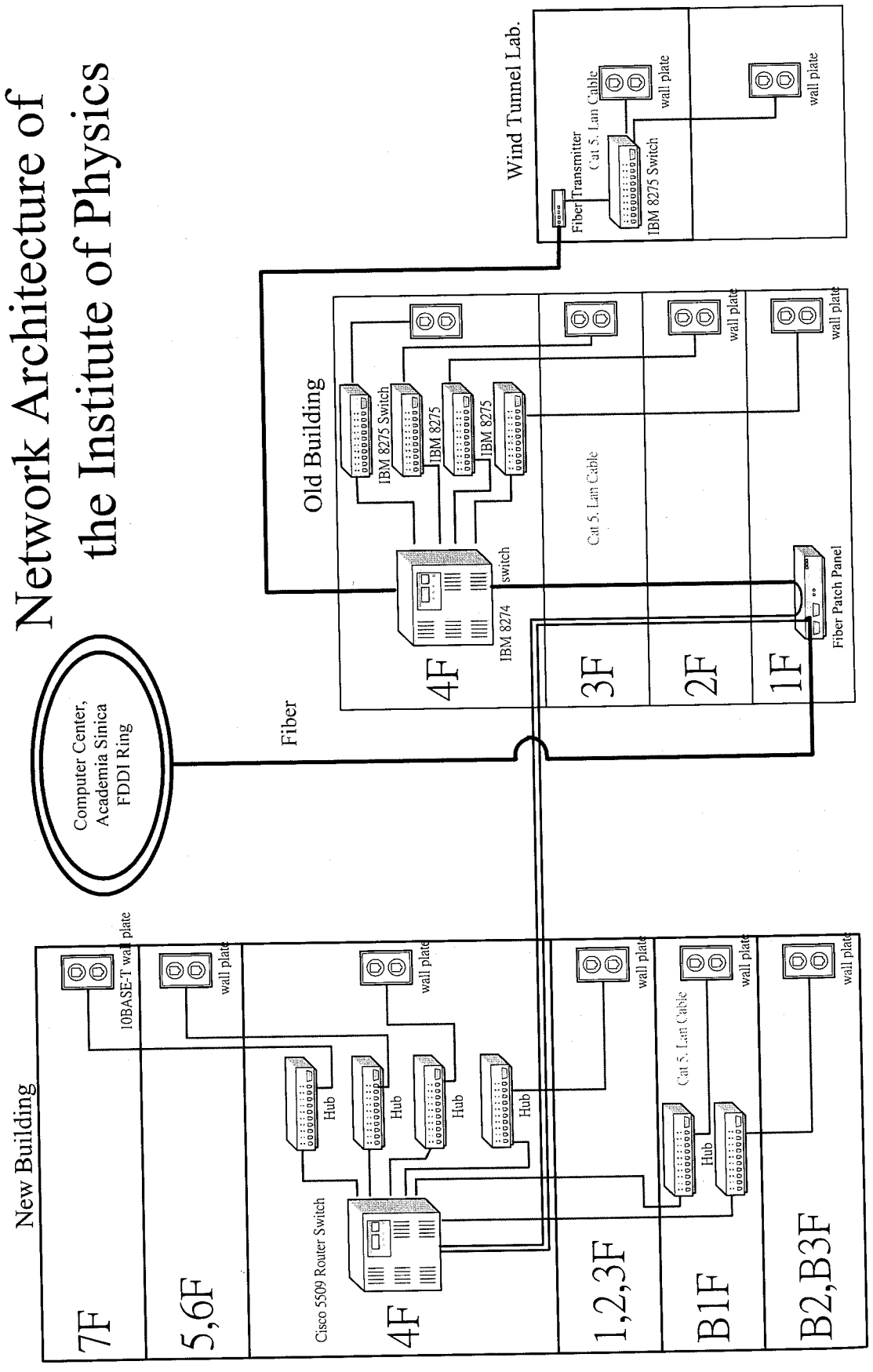
Over the past few years, our computing facilities have been growing steadily. Currently we have the following computing facilities :

- 12 Sun SPARC workstations.
- 5 IBM RISC 6000 workstations.
- 2 DEC Alpha workstations.
- 12 Linux PC workstations.
- dual-pentium PC Farm with 500MHz cpus.

The network of the new building was designed when the building itself was designed. To minimize inter-dependency of network connectedness among different offices and laboratories, the star topology was chosen and each office is equipped with 3 network sockets for twisted pair cables with speed up to 100 Mbits per second. There are more ports in laboratories. All sockets are connected to hubs located in B1 or 4F with category 5 twisted pair cables, which are in turn connected to the gateway of the institute to the campus network, a Cisco 5509 router switch.

The network of the old building is being renovated. With great help and guidance from network experts in the computing center, a similar network with star topology will replace the old RG-58 cable. The sockets in each building will be connected to IBM 8275 switches purchased by the computing center. The IBM 8275 switches are connected to the Cisco router switch through an IBM 8274 Switch. The network topology is depicted in the following figure.

Network Architecture of the Institute of Physics



Library

INTRODUCTION

The physics library was founded in 1962 as an academically specialized library. Its mission is to provide a perfect research environment for colleagues who are affiliated with the institute and scholars from the physics community in Taiwan.

There are over 30,000 library books (including more than 15,000 bound volumes of journals) and about 300 journals. The subscribed journals cover a wide range of areas in physics, mathematics and applied sciences.

SERVICE

These include:

---All library materials such as books, journals, CD-ROMs are open to the public. Members of the institute can check out most materials with a library card. Users not belong to the institute are limited to the use of these materials within the library.

---Library users can consult the librarians either on-site, through telephone, fax or by mail.

---Inter-library cooperative services. The Physics Library is a member of the "Interlibrary Cooperation Association". Besides assisting our institute colleagues to get the scientific papers from other libraries, we also provide our library materials to other libraries through the "Inter-Library Cooperative Services".

---DDS (Document Delivery Service) is available. Users can obtain the research papers they need through the internet.

---Photocopying services. There are two photocopiers and one "reader/printer" machine. Library user can photocopy materials he/she needs as long as it does not violate the copyright law of the R.O.C.

---There are now more and more journals which have "on-line" versions. Examples are: Physical Review A-E and Letters (started1985), Nuclear Physics A, B and Nuclear Physics B Supplement etc. The Physics Library has made subscriptions of all the above mentioned "on-line" journals and will continue to do so whenever new "on-line" versions of other subscribed journals are available.

---All library news are now sent to the library users through their e-mail account.

Machine Shop

We have a machine shop in our institute for supporting our research activities. The machine shop provides the following services: fabrication and assembly of mechanical parts; making sample cells and testing tools; support of vacuum facilities; management and supplies of gases and liquids; operation and maintenance of complex and specialized research facilities; and management and handling of radioactive materials. It has been seven years since the machine shop was established. At this moment we have two technicians and one assistant in the workshop. To meet the increasing need of our institute, we have to expand the number of technical staff in the workshop by hiring a work-student. This year we purchased a lathe(Yang CL-4070G made in Taiwan), a Milling and Drilling machine(Fehlmann PICOMAX 54 TOP made in Swiss) and a Wire cut electric discharge machine(Fanuc Robocut α-0iA made in Japan). In this year, we have designed and made numerous parts that worth more than two million dollars. In addition we also helped our research faculties to solve their problems in various laboratories of our institute. We have upgraded our technical support for vacuum systems. These include design, fabrication and assembly of vacuum chambers, maintenance and repair works of vacuum pumps. We are improving our stock for commonly used vacuum parts and materials especially those used in UHV system. The staffs in the mechanical workshop are always service-oriented and work under safety-first guidelines. We hope that we can support our research staff and improve ourselves towards the goal of high precision and high efficiency.

To summarize, the work in the machine shop has been heavy and high-tech related. We are still evolving towards maturity and the main hurdle is lack of manpower. However, under the present regulations, it is rather difficult to recruit the right technical personnel. We are glad that Academia Sinica has recognized this problem and has been working to improve the salary and promotion system for the technical staff. In the meantime, we are trying to train our technical personnel by giving them chances to practice in famous laboratories abroad.

Electronic Workshop

The main purpose of the electronic workshop at present is to provide service to maintain and repair the electronic instruments of the Institute. We provide the first aid to malfunctioning apparatus to minimize the led time of shutdown of experiment. And responsible for the regular maintenance work of the 3MV Tandem Van der Graaff Accelerator of the nuclear physics group.

Service for PC board fabrication is also supported. A good relationship with Chung-Shan Institute of Science and Technology has been established to provide service for high quality PCB layout and fabrication.

To further improve the service to our colleagues, a computer controlled drilling machine made by Bungard Elektronik has been purchased and installed recently. The machine is determined for drilling and milling printed circuit boards and for milling (routing) and engraving aluminum plates.

Protel 99 for Windows NT/98/95 is also available. It includes the complete package of

a. Advanced Schemiatic

b. Advanced PCB Design

c. Advanced Routing

d. Advanced Simulation

e. Advanced PLD

VI

Academic Activities

Attendance in International Conference

中研院物理所八十八年度出席國際會議表

（1998 年 7 月～1999 年 6 月）

會議名稱	會期	舉辦地點	出席人員	經費來源
行政長官特設創新科技委員會	87.07.03-87.07.03	香港	張立綱	自理
第三屆國際生物能與整合醫學國際研討會	87.07.05-87.07.10	美國 College Park	王唯工	本所
1998 固態薄膜及表面國際會議	87.07.06-87.07.10	丹麥哥本哈根	黃英碩	主題
第一屆冷太平洋及第四屆中日微重力科學會議	87.07.08-87.07.11	日本東京	簡來成	本所
第三十二屆 COSPAR 太空研究委員會科學會議	87.07.12-87.07.19	日本名古屋	簡來成	國科會
展透與秩序系統國際會議	87.07.14-87.07.17	德國 Giessen	胡進錕	主題+自理
第二十屆國際統計物理會議	87.07.20-87.07.24	法國巴黎	梁鈞泰	國科會
第廿屆國際統計物理會議	87.07.20-87.07.24	法國巴黎	胡進錕	主題+自理
第廿屆 IUPAP 統計物理國際會議	87.07.20-87.07.25	法國	柯松仁	本所+自理
第二十屆國際統計力學及自相似系統國際研討會	87.07.20-87.08.7	法國 俄國	伊士麥林尼可	主題+自理
第廿九屆國際高能物理會議	87.07.23-87.07.29	加拿大溫哥華	鄭海揚	國科會
第八屆國際半導體內淺能階中心會議	87.07.27-87.07.30	法國蒙貝列市	何侗民	國科會+本所
水及水溶液郭登研究會議	87.08.02-87.08.07	美國 New Hanpshire	胡進錕	主題+自理
第三屆世界生物力學大會	87.08.02-87.08.08	日本札幌	王唯工	國科會
微重力流體物理會議	87.08.12-87.08.14	Cleveland Ohio	簡來成	自理
創新科技委員會會議	87.08.21-87.08.21	香港	張立綱	自理
1998 年國際原子核會議	87.08.23-87.08.28	法國巴黎	曾詣涵	本所+自理

會議名稱	會期	舉辦地點	出席人員	經費來源
微中子振盪研討會	87.09.07-87.09.09	荷蘭	王子敬	本所
Hadron98 會議	87.09.07-87.09.20	斯洛伐克	陳彥竹	本所
開發中國家太空科技增進使用者在生活應用研討會	87.09.24-87.09.27	澳洲墨爾本	簡來成	本院
第十九屆國際太空聯盟 IAF 年會	87.09.28-87.10.02	澳洲	簡來成	本院
烏克蘭-台灣雙邊科學會議	87.10.05-87.10.09	烏克蘭	鄭天佐	國科會
亞太物理學會評議會及 1998 年國際先端物理研討會	87.10.24-87.10.29	馬來西亞	鄭天佐	國科會+本所
原子核分析方法應用於生命科學國際會議	87.10.25-87.11.07	中國	林爾康	本所
第十五屆國際加速器在研究及工業應用會議	87.11.04-87.11.07	美國德州	余岳仲	國科會
第八屆東和大學國際複雜系統緩慢動力研討會	87.11.08-87.11.15	日本	陳志強	國科會+本所
第四十三屆磁學及磁性材料研討會	87.11.09-87.11.12	美國佛羅里達	蔡志申	國科會+本所
第四十三屆磁學及磁性材料研討會	87.11.09-87.11.12	美國佛羅里達	柯松仁	本所+自理
第四十三屆磁學及磁性材料研討會	87.11.09-87.11.12	美國佛羅里達	姚永德	本所+國科會
第八屆東和大學國際複雜系統緩慢動力研討會	87.11.09-87.11.14	日本福崗	杜其永	國科會
表面及介面國際研討會	87.11.19-87.11.21	日本	魏金明	本所+自理
材料研究學會 1998 年秋季年會	87.11.30-87.12.04	美國麻州	黃英碩	國科會
亞太表面及介面分析會及 First Harima Conference	87.11.30-87.12.06	新加坡 日本	鄭天佐	本所
第五屆國際近場光學及相關技術研討會	87.12.06-87.12.10	日本 Shirahana	陸念華	國科會
第二屆國際環境水力學術研討會	87.12.16-87.12.18	香港	黃榮鑑	本所

會議名稱	會期	舉辦地點	出席人員	經費來源
第二屆 ATLAS 實驗之光纖讀出系統研討會	88.01.05-88.01.08	英國	朱明禮	本所
1999 年美國物理學會粒子與場國際會議	88.01.05-88.01.09	美國洛杉機	鄭海揚	國科會
奈米結構材料研討會	88.01.10-88.01.15	香港	李尚凡	香港+自理
第十三屆美國航空太空學會年度會議	88.01.11-88.01.14	美國	簡來成	自理
第十三屆強子對撞物理會議	88.01.13-88.01.18	印度孟買	張寶棣	本所
掃瞄探針技術在觀察及製作毫微米結構上之應用研討會	88.02.08-88.02.14	日本筑波	張嘉升	日本交流會
掃瞄探針技術在觀察及製作毫微米結構上之應用研討會	88.02.08-88.02.14	日本筑波	黃英碩	日本+國科會
掃瞄探針技術在觀察及製作毫微米結構上之應用研討會	88.02.08-88.02.18	日本	鄭天佐	本所主題+日本
TMS 國際會議之衛星會議	88.02.27-88.03.04	美國加州	胡宇光	本所
全球華人物理會議及美國物理學會百年紀念大會	88.03.17-88.03.26	美國亞特蘭大	李定國	主題+自理
華人物理學會會議	88.03.18-88.03.20	美國亞特蘭大	王子敬	國科會+本所
美國物理學會百年紀念大會及海外華人物理學會亞特蘭大會議	88.03.18-88.03.26	美國亞特蘭大	姚永德	國科會+本所
美國物理年會百年紀念大會	88.03.18-88.03.26	美國亞特蘭大	張添智	主題
海外華人物理學會會議及美國物理年會百年紀念大會	88.03.18-88.03.26	美國亞特蘭大	魏金明	自理+國科會
美國物理學會百年紀念會議	88.03.20-88.03.26	美國亞特蘭大	李世炳	本所+自理
美國物理學會百年紀念大會	88.03.20-88.03.26	美國亞特蘭大	王子敬	國科會+本所
美國物理學會百年紀念大會	88.03.20-88.03.26	美國亞特蘭大	何侗民	本所+自理
美國物理學會百年紀念大會	88.03.20-88.03.26	美國亞特蘭大	張嘉升	主題+本所
美國物理學會百年紀念大會	88.03.20-88.03.26	美國亞特蘭大	黃英碩	主題

會議名稱	會期	舉辦地點	出席人員	經費來源
美國物理學會百年紀念會議	88.03.21-88.03.26	美國亞特蘭大	魏金明	國科會
美國物理學會百年紀念大會	88.03.21-88.03.27	美國亞特蘭大	陳昭安	主題+自理
美國物理學會百年紀念大會	88.03.21-88.03.27	美國亞特蘭大	林財鈺	主題+自理
美國物理學會百年紀念大會	88.03.22-88.03.26	美國亞特蘭大	胡進錕	國科會+自理
1999 春季材料研究年會	88.04.04-88.04.09	美國舊金山	鄭秀蘭	主題
1999 春季材料研究年會	88.04.04-88.04.09	美國舊金山	蔡振水	主題
材料研究學會 1999 年春季研究會	88.04.05-88.04.09	美國舊金山	傅祖怡	國科會
1999 年春季材料研究年會	88.04.05-88.04.09	美國舊金山	任盛源	國科會
1999 春季材料研究年會	88.04.05-88.04.09	美國舊金山	傅祖怡	國科會+本所
1999 春季材料研究年會	88.04.05-88.04.09	美國舊金山	任盛源	本所
第五屆國際海岸及港口工程研討會	88.04.17-88.04.25	南非開普敦	蕭葆羲	本所
1999 年國際海洋科技會議	88.04.27-88.04.29	新加坡	黃榮鑑	本所
1999 年國際磁學研討會	88.05.18-88.05.21	韓國	姚永德	本所+工研院
1999 年國際磁學研討會	88.05.18-88.05.21	韓國	洪東興	主題
對稱及反映(楊振寧榮退)研討會	88.05.21-88.05.22	美國紐約	鄭海揚	本所
第十五屆粒子及原子核國際會議	88.06.10-88.06.16	瑞典	張志義	本所+自理
國際材料學會聯合會 1999 年先端材料會議	88.06.12-88.06.19	中國北京	鄭天佐	主題
第十三屆美國工程力學會議	88.06.13-88.06.16	美國巴爾提摩	黃榮鑑	國科會
第八屆表面物理研討會	88.06.26-88.07.02	布拉格	鄭天佐	國科會+本所
強關聯系統數值運算研討會	88.06.28~88.07.08	義大利 Trieste	李定國	本院主題
北大西洋公約組織高階研討會	88.06.28~88.06.30	希臘	胡宇光	自理

Attendance in International Conference

中研院物理所八十八下半年度出席國際會議表

（1999 年 7 月～1999 年 12 月）

會議名稱	會期	舉辦地點	出席人員	經費來源
宇宙與人類文明的未來國際會議	88.07.02~88.07.07	匈牙利	吳建宏	本所+國科會
第十九屆太平洋科學會議	88.07.04~88.07.09	澳洲雪梨	黃榮鑑	本院學審
亞太動力日第一屆非線性科學國際會議	88.07.13~88.07.16	香港	曾玄哲	本院主題
第一屆亞太區非線性科學會議	88.07.13~88.07.16	香港	陳志強	本所+國科會
Dynamic Days 國際會議	88.07.13~88.07.16	香港	梁鈞泰	本院主題
亞太區非線性會議	88.07.13~88.07.16	香港	黃仲仁	自理
歐洲高能物理國際會議	88.07.15~88.07.21	芬蘭 Tampere	鄭海揚	本所+國科會
第一屆國際非線性科學會議	88.07.18~88.08.08	香港	余海禮	本所
第十屆掃描穿隧顯微術國際會議	88.07.18~88.07.25	韓國漢城	黃英碩	本所
第十屆國際掃描穿隧顯微術會議	88.07.18~88.07.22	韓國漢城	張嘉升	本所
第十四屆國際離子束分析會議	88.07.26~88.07.30	德國德勒斯登	余岳仲	國科會
第六屆國際表面結構會議	88.07.26~88.07.30	加拿大溫哥華	鄭天佐	本所
第六屆國際表面結構研討會	88.07.26~88.07.30	加拿大溫哥華	魏金明	本所
一九九九泛太平洋星體天文物理會議	88.08.03~88.08.06	香港	吳建宏	本所
第二十二屆國際低溫物理研討會	88.08.04~88.08.11	芬蘭赫爾辛基	柯松仁	本所+主題
第二十二屆低溫物理國際研討會	88.08.04~88.08.11	芬蘭赫爾辛基	陳洋元	本院主題+國科會
國際無線電科學聯合會第十六屆大會	88.08.13~88.08.22	加拿大多倫多	王唯工	國科會
1) 在英國台灣學者協會年會 2) 亞太地區物理的未來發展研討會	88.08.13~88.08.15 88.08.16~88.08.16	1)英國 2)新加坡	李定國	自理

會　　議　　名　　稱	會　　期	舉 辦 地 點	出席人員	經 費 來 源
第二十六屆國際宇宙射線研討會	88.08.17~88.08.25	美國	葉平	本院主題+國科會
第二十四屆國際紅外線及毫波會議	88.09.05~88.09.10	美國加州	何侗民	本所
天文粒子物理與地下實驗會議	88.09.05~88.09.11	法國巴黎	王子敬	本所+國科會
第一屆亞澳真空與表面科學會議	88.09.08~88.09.10	日本東京	鄭天佐	本所
第二屆海峽兩岸計算流體力學學術研討會	88.09.20~88.09.28	中國	黃榮鑑	本所
第十八屆歐洲表面科學會議	88.09.21~88.09.24	奧地利維也那	鄭天佐	本所
海峽兩岸顆粒技術研討會	88.10.11~88.10.17	中國珠海	姚永德	本所+主題
美國真空學會第四十六屆國際研討會	88.10.22~88.10.31	美國西雅圖	鄭天佐	本所
第八屆亞太物理學會理事會	88.10.26~88.10.28	越南河內	姚永德	本所
第六屆日本暨法國磁性流體聯合研討會	88.10.28~88.10.30	日本秋田	楊謝樂	自理
第二屆韓國及日本之電子結構計算研討會	88.11.01~88.11.03	韓國漢城	魏金明	國科會
第二屆韓國及日本之電子結構計算研討會	88.11.01~88.11.03	韓國漢城	李定國	自理
歐洲生醫工程研討會-99	88.11.04~88.11.07	奧地利維也那	王唯工	本所
1) 動力系統中的新發展 2) 非平衡統計物理的最新趨勢	88.11.04~88.11.06 88.11.15~88.11.25	印度 印度	加德	自理
第三屆東和大學統計物理國際會議	88.11.08~88.11.12	日本福岡	海耳倫	主題計劃
第四十四屆磁學與磁性物質年會	88.11.15~88.11.18	美國加州	李尚凡	國科會+本所
第四十四屆磁性及磁性材料研討會	88.11.15~88.11.18	美國 San Jose	姚永德	本所+國科會
第三屆國際 Bio-PIXE 會議	88.11.16~88.11.19	日本京都大學	林爾康	國科會

會　　議　　名　　稱	會　　期	舉 辦 地 點	出席人員	經 費 來 源
第三屆國際粒子誘發 X-射線產生在生物應用研討會	88.11.16~88.11.19	日本京都	余岳仲	本所
第四十四屆磁學及磁性材料研討會	88.11.15~88.11.18	美國 San Jose	柯松仁	主題計畫

Institute Sponsored Meetings

1. 第一屆海峽兩岸物理材料科學研究推動研討會
2. 中華民國物理學會 1999 年年會暨研究成果發表會
3. **1999 Symposium on Superlattice Physics**(第三屆超晶格物理性質研討會)
4. **International Symposium on Advanced Magnetic Technologies**
5. **Nuclear Physics Spring School 1999**(第九屆核子物理春季講習會)
6. **StatPhys-Taiwan-1999: Equilibrium and Non-equilibrium Phase Transitions**
   (統計物理國際會議)
7. **Third International Conference on B Physics and CP Violation**

第一屆海峽兩岸物理與材料科學研究推動研討會

二月三日(星期三)

09:00 ~ 09:30 開幕典禮
主席致詞 國科會自然處處長 王 瑜 女士
來賓致詞 國科會副主委 蔡清彥 先生

表面物理及鑽石薄膜研究
主持人: 周炳琨,齊正中

09:30 ~ 09:45 鄭天佐 - " 原子尺度的表面物理研究 "
09:45 ~ 10:00 蔡秀芬 - " 矽(111)表面的二維鎵聚合體 "
10:00 ~ 10:30 許寧生 - " 金鋼石及其相關薄膜的場致電子發射研究進展和未來展望"
10:30 ~ 10:45 林諭男 - " 鑽石及類鑽石薄膜之電子場發射特性-發展現況"

晶體成長與薄膜研究
主持人: 吳錫侃,何鳴鴻

11:30 ~ 11:45 洪敏雄 - " 化學氣相沉積氮化鈦和鎢薄膜之方向性成長之研究"
11:45 ~ 12:00 陳力俊 - " 在Ti/Si系統中增益生成低電阻率C54-$TiSi_2$研究 "
12:00 ~ 12:15 王 牧 - " 非平衡條件下晶體聚集的形態和機制研究 "
12:15 ~12:30 黃 瑜 - " 鉍系超導體的選擇性區域生長 "

凝態材料研究
主持人: 洪敏雄,靳達申

13:30 ~ 13:45 吳錫侃 - " 國科會工程處(金屬及陶瓷材料工程學門)簡介 "
13:45 ~ 14:00 李克健 - " 大陸新材料研究發展現狀 "
14:15 ~ 14:30 李三保 - " 數學在材料科學的應用 "
14:30 ~ 14:45 魏柄波 - " 液態金屬深過冷與快速結晶研究 "
14:45 ~15:00 盧 柯 - " 凝聚態材料的熔化與過熱機理 "

奈米材料與物理研究
主持人: 古煥球,洪嘯吟

15:30 ~ 15:45 靳達申 - " 大陸鈉米材料研究發展現狀 "
15:45 ~ 16:00 林鴻明 - " 台灣超微結構材料之研究現況 "
16:00 ~ 16:15 朱 靜 - " 鈉米碳管及相關的鈉米量子線的制備及物理化學特性研究 "
16:15 ~ 16:30 牟中原 - " 中孔徑分子篩MCM-41"
16:30 ~16:45 謝思深 - " 超長定向碳鈉米管列陣的制備 "
16:45 ~ 17:00 範守善 - " 碳鈉米管及相關的-維鈉米材料 "
17:00 ~ 17:15 沈保根 - " $Sm_2(Fe,Ga,Si,Cu)_{17}C_y$化合物的磁晶各向昇性和矯頑力[1] "
17:15 ~ 17:30 姚永德 - " 磁性鈉米材料之物性研究 "

光電材料與物理研究
主持人: 鄭天佐,謝思深

19:00 ~ 19:15 洪嘯吟 - " 電子材料的光化學加工新方法 "
19:15 ~ 19:30 紀國鐘 - " 台灣藍光材料發展策略 "
19:30 ~ 19:45 汪 茫 - " 有機半導體復合光電導材料的研究 "
19:45 ~ 20:00 謝文峰 - " 凝體物理研究發展現況 "
20:00 ~ 20:15 范文祥 - " 發光高分子內與分子間激發態之研究 "

20:15 ~ 21:15 綜 合 座 談
主持人: 李克健,牟中原

二月四日(星期四)

09:00 ~ 14:00　Taipei City Tour

15:30 ~ 16:00　參加1999年中華民國物理年會暨研究發表會
超　　導 Section　李曉光 - " 大陸高溫超導研究發展 "
表　　面 Section　王恩哥 - " 共價鍵結合的輕元素化合物:非晶鈉米金薄膜 "
半 導 體 Section　鮑希茂 - " 哇基鈉米發光材料的研究 "
光電/光學 Section　高瑞平 - " 大陸晶體材料研究發展 "
統計/計算 Section　何鴻鳴 - " 大陸計算(機)材料科學進展 "

凝態物理研究　　主持人: 姚永德 , 朱　靜

16:00 ~16:15　莊東榮 - " 台灣大學凝態中心研究計畫簡介 "
16:15 ~ 16:30　鄒立堯 - " 凝聚態物理資助狀況與發展趨勢 "
16:30 ~ 16:45　陳建德 - " 台灣凝態物理同步輻射能譜學進展現況 "
16:45 ~ 17:00　陳啓東 - " 單電子電晶體的製作與測試 "
17:00 ~ 17:15　古煥球 - " Gd_2CuO_4-型銅氧化物中弱鐵磁性與晶體對稱之關聯 "

散　會

中華民國物理學會 1999 年年會暨研究成果發表會

大會演講

10:45~11:30 (2 月 4 日)　主持人: 齊正中　地點: 學術活動中心
汪治平　**Ultrafast lasers and high-field physics**
11:30~12:15 (2 月 4 日)　主持人: 張達文　地點: 學術活動中心
李湘楠　**重味物理的微擾理論**
8:30~9:30　(2 月 5 日)　主持人: 黃昭淵　地點: N1-A
Dr. Tinkham　Metallic Quantum Dots
9:30~10:30 (2 月 5 日)　主持人: 楊鴻昌　地點: N1-A
崔章琪　**Two energy gaps in cuprate superconductors**

論文宣讀分組目錄

**********2 月 4 日(星期四)**********

Section Aa: 超導　　主持人: 楊宗哲　　地點: N1-A

Aa1　13:42~13:54　郭義雄　Department of Electrophysics, National Chiao-Tung University, Hsinchu, Taiwan, Republic of China
Measurement of grain-size distribution using the Josephson effect in high Tc materials

Aa2　13:54~14:06　洪連輝　Department of Physics, National Changhua University of Education, Changhua 500, Taiwan
Optimal size of array pinning centers for magnetic flux in superconductors

Aa3　14:06~14:18　李中裕　Solid State Laboratory, Department of Electrophysics, National Chiao-Tung University, Hsinchu 300, Taiwan
Correlation Between Temperature Effect of Thin Film Growth Mechanism and Oscillation of RHEED Intensity by Laser MBE Deposition.

Aa4　14:18~14:30　鄭慧愷　Department of Electrophysics, National Chiao-Tung University, Hsinchu, Taiwan, Republic of China
Effects of grown-in disorder and oxygen on the surface resistance of YBCO films

Aa5　14:30~14:42　孫玉平　Department of Physics, National Tsing Hua University, Hsinchu, Taiwan 300, R.O.C.
Institute of Solid State Physics, Academia Sinica, Hefei, China
Enhanced flux pinning in $Bi_2Sr_2CaCU_20_{8+\delta}$ single crystal embedded with MgO nanometer particles*

Aa6　14:42~14:54　徐永源　Department of Physics, National Tsing Hua University, Hsinchu, Taiwan 300, R. 0. C.
Low field flux creep near dimensional crossover in Pr-doped Bi-2212 single crystals*

Aa7 14:54~15:06 陳俊霖 Department of physics, National Changhua University of Education, Changhua 500, Taiwan.

Magnetic Response of the Superconducting Thin Film

Section Ca: 表面 主持人: 鄭 靜 地點: N1-B

Ca1 13:30~13:54 王玉麟 Institute of Atomic and Molecular Sciences, Academia Sinica, P. 0. Box 23-166, Taipei, Taiwan

Gallium-Induced Magic Clusters and Incommensurate Structures on the Si(111) Surface

Ca2 13:54~14:06 伍昊慈 Institute of Physics, Academia Sinica, Taipei, Taiwan

Atomistic processes of Ni adatom on Ni surfaces

Ca3 14:06~14:18 傅祖怡 Institute of Physics, Academia Sinica, Taipei, Taiwan

Direct observation of atomic diffusion around cluster corner sites on Ir(111) surfaces

Ca4 14:18~14:30 張俊明 National Center for High-Performance Computing, Hsinchu, Taiwan 30043, R.O.C.

Diffusion mechanisms for Al adatom and small clusters on Al (111) surface

Ca5 14:30~14:42 黃永孟 Department of Physics, National Taiwan University

Spectroscopic Imaging of Defects on Si Surfaces

Ca6 14:42~14:54 溫源漢 Physics Department, National Taiwan University, Taipei 10617, Taiwan, R.O.C.

Potential Tensor Function of H-atcm on Flat Cu(100)

Ca7 14:54~15:06 吳璧如 Department of Physics, National Cheng Kung University, Tainan, Taiwan R.O.C.

Zone center modes of hexagonal and cubic diamond under pressures: A first-principle study

Section Da: 半導體 主持人: 羅奕凱 地點: N2-B

Da1 13:30~13:54 孫允武 Department of Physics, National Chung-Hsing University, Taichung, Taiwan, R.O.C.

Overview of Fractional Quantum Hall Effect

Da2 13:54~14:06 吳仲卿 Department of Physics, National Changhua University of Education, Changhua, Taiwan, R.O.C.

Submicron Resonant Tunneling Diode in GaAs/AlGaAs DoubleBarrier Structures

Da3 14:06~14:18 楊淳青 Department of Physics, National ChangHua university of education, ChanghuaTaiwan.

The Affection of Darwin term on the Fine Structure of Spherical Quantum Dot

Da4 14:18~14:30 梁輝正 Department of Electrophysics, National Chiao Tung University, Hsinchu 300, Taiwan, R.O.C.

Effects of incoherent processes on the quantum transport through a finiterange time-modulated potential

Da5 14:30~14:42 唐志雄 Department of Electrophysics, National ChiaoTung University, Hsinchu 30010, Taiwan ROC

Time-modulated effects in a narrow constriction: from photon-induced transport to ac response

Da6 14:42~14:54 柳銘哲 Department of clectrophysics, National Chiao Tung University, Hsinchu 30050, Taiwan, R.O.C.

Effects of incoherent processes on the dc current induced by a linearly time-dependent magnetic flux threading a mesoscopic ring

Da7 14:54~15:06 吳金生 Division of General Study, Yuan-Ze University, NeiLi, Taiwan, R.O.C.

Self-Consistent Calculation for the Semiconductor and Vacuum Interface

Section Ea: 光電/光學 主持人: 賴映杰 地點: N5-B

Ea1 13:30~13:42 林恭如 Institute of Electro-Optical Engineering, Tatung Institute of Technology, Taipei 104, Taiwan

Optoelectronic Generation of THz Electromagnetic Pulses from GaAs:H+

Ea2 13:42~13:54 黃鼎偉 Institute of Electro-Optical Engineering and Department of Electrical Engineering, National Taiwan University, Taipei, Taiwan, R.O.C.

Stable additive-pulse mode-locked fiber laser with chirped apodized fiber gratings

Ea3, Ea4 13:54~14:18 賴映杰 Institute of Electro-Optical Engineering, National Chiao Tung Univarsity, Hsinchu Taiwan, R.O.C,

Noise Characteristics of Modelocked Fiber Lasers

Ea5 14:18~14:30 張玉衡 Department of Physics, National Kaohsiung Normal University, Kaohsiung 802, Taiwan

Femtosecond Self- and Cross-Phase Modulation in GaAs Semiconductor Laser Amplifiers

Ea6 14:30~14:42 黃衍介 Department of Atomic Science, National Tsinghua University, Hsinchu, Taiwan 30043

The Proposed Interferometric-type Laser-driven Particle Accelerator

Ea7 14:42~14:54 林俊源 Department of Physics, University of Essex, Colchester C04 3SQ, UK.
Institute of Physics, Academic Sinica, Taipei Taiwan

Recent Results on Double Pulse Pumped Collisional Excitation X-ray Lasers

Ea8 14:54~15:06 林恆慶

Section Fa: 原子/分子　　主持人: 何耀錦　　地點: N1-C

Fa1 13:30~13:54 易台生 Department of Physics, National Central University, Chung-Li, 32054, Taiwan, R.O.C.

Photoabsorption cross section measurement on metal vapors*

Fa2 13:54~14:06 方德貴 Institute of Atomic and Molecular Sciences, Academia sinica, Taipei 106, Taiwan

Strong Electric-field Effects on the Structure Profiles of doubly Excited Resonnances in He Ground State Photionization*

Fa3 14:06~14:18 陳應誠 Department of Physics, National tsing Hua University, Hsinchu, 300, Taiwan, R.O.C.

Electromagnetically Induced Transparency in Laser-cooled Rubidium Atoms

Fa4 14:18~14:30 張稚卿 Department of Math. And science Education, Nation Hsinchu Teachers College, Hsinchu 300, Taiwan

Photoionization Cross Section of Lithium between 70 and 74 eV

Fa5 14:30~14:42 曾煥基 Department of Physic, National Sun Yat-Sen University, Kaohsiung 804, Taiwan

Fluorescence Excitation Spectra of Xenon Dimers with Synchrotron Radiation

Fa6 14:42~14:54 黃永生 Department of physics, National Chung-Hsing University, Taichung, Taiwan

Lifetimes of Lithium in spherical quantum dots

Fa7 14:54~15:06 吳國禎 北京清華大學物理高等研究中心

The classification of the highly excited vibrational eigenstates by the diabatic correlation technique

Section Ga: 同步輻射　　主持人: 胡宇光　　地點: N1-D

Ga1 13:30~13:54 彭維鋒 Department of Physics, Tamkang University, Tamsui 251, Taiwan,R.O.C.

Soft X-ray Absorption Spectroscopy Applied Materials Science

Ga2 13:54~14:06 張石麟 Department of Physics, National Tsing Hua University, Hsinchu, Taiwan, R.O.C. 300
Synchrotron Radiation Research Center, Hsinchu, Taiwan,

Quantitative Phase Determination for Macromolecular Crystals Using Stereoscopic Multi-beam Imaging

Ga3 14:06~14:18 張凌雲 Synchrotron Radiation Research Center, Hsinchu Taiwan

XAFS Study in Nanocrystalline Fe, Co, Ni and Cu Metallic Powders

Ga4 14:18~14:30 張玉貴 Department of Physics, Tamkang University, Tamsui 251, Taiwan,R.O.C

Quantum Confinement Effect in Nano-Diamonds

Ga5 14:30~14:42 謝輝煌 Department of Physics, Tamkang University, Tamsui, Taiwan, R.O.C.

Resonant photoemission study of Ni-Cu alloys

Ga6 14:42~14:54 黃迪靖 同步輻射研究中心

Electronic Structure of Manganese Perovskite Thin films

Section Ha: 中高能實驗　　主持人: 李世昌　　地點: N2-C

Ha1 13:30~13:54 張元翰 Institute of Physics, National Central University

Results from the first shuttle flight of the AMS detector

Ha2 13:54~14:06 葉　平 Institute of Physics, Academia Sinica, Taipei, Taiwan

Heavy Nuclei Detection with AMS detector

Ha3 14:06~14:18 黃明輝 Institute of Physics, Academia Sinica, Taipei, Taiwan

Detection of GeV Trapped Radiation by AMS Detector

Ha4 14:18~14:30 莊曜勵 Institute of Physics, Academia Sinica, Taipei, Taiwan

A Study of Geomagnetic Cut-off with AMS data

Ha5 14:30~14:42 黃宜誠 Department of Physics, National Taiwan University, Taipei, Taiwan, R.O.C.

Installation and Performance of Partial EFC for KEK-B Commissioning

Ha6 14:42~14:54 王正祥 National Lien-Ho College of Tech and Comm, Miao-Li, Taiwan, R.O.C.

Belle Physics Simulation study on B→ η' Xs and B-DDbar

Ha7 14:54~15:06 郭榮升 National Kaohsiung Normal University, Kaohsiung Taiwan, R.O.C.

The Study of Two-Body B decays to Kaons and Pions In BELLE

Section Ka: 統計/計算　　主持人: 胡進錕、梁鈞泰　　地點: N2-D

Ka1 13:42~13:54 黎璧賢 Dept. of Physics & Center for Complex Systems, National Central University, Chung-li, Taiwan 320

Topological effects on statics and dynamics of knotted polymers

Ka2 13:54~14:06 陳企寧 Institute of Physics, Academia Sinica, Taipei, Taiwan

Simulated Annealing and X-ray Crystallography

Ka3 14:06~14:18 施奇廷 National Center for High-Performance Computing.. Hsinchu, Taiwan, R.O.C.

Geometrical Analysis of the HP Model for Protein Structures

Ka4 14:18~14:30 S. Hyrian Institute of Physics, Academia Sinica, Taipei, Taiwan

Parallel Calculation of Protein Energy in a Pentiurn-II Cluster

Ka5 14:30~14:42 Zoltán Néda Institute of Physics, Academia Sinica, Taipei Taiwan

Stochastic Resonance in Ising Models

Ka6 14:42~14:54 N. Sh. Izmailian Institute of Physics, Academia Sinica, Taipei Taiwan, R.O.C.

Universal Amplitude Ratio for an Ising Model on a Bethe Lattice

Ka7 14:54~15:06 林財鈺 Institute of Physic, Academia Sinica, Nankang, Taipei, Taiwan, R.O.C.

Universal Finite-Size Scaling Functions for Percolation Problems

Section Ab: 超導 主持人: 郭義雄、周 雄 地點: N1-A

Ab1 16:12~16:24 楊鴻昌 Department of Physics, National Taiwan University, Taiwan, R.O.C.

Recent Development in High-T_c SSQUIDsMagntometers

Ab2 16:24~16:36 王德峻 Department of Electrophysics, National Chiao-Tung University, Hsinchu, Taiwan

Deterministic Quantum Dynamics in Driven Josephson-RCSJ Phase Flow

Ab3 16:36~16:48 姚斌誠 Department of Physics and Materials Science Center, National Tsing-Hua Universiy, HsinChu 300, Taiwan

Noise in New $Yba_2Cu_3O_y$ 45° bi-epitaxial Josephson Junctions and de SQUID

Ab4 16:48~17:00 尤孝雯 Department of Physics, National Taiwan University, Taipei, Taiwan, 106, R.O.C.

The Single layer $YBa_2CU_3O_y$ Magnetometers

Ab5 17:00~17:12 羅志偉 Department of Electrophysics, National Chiao Tung University, Hsinchu, Taiwan, R.O.C.

Study of the Ultrafast Dynamics of $Pr_xY_{1-x}Ba_2Cu_3O_{7-\delta}$ Superconductor Thin Films at Low Temperature by Femtosecond Spectroscopy

Ab6 17:12~17:24 洪夢聰 Department of Physics, National Sun Yat-Sen University, Kaohsiung, 804, Taiwan, R.O.C.
Department of Electrical Engineering, National Sun Yat-Sen University, Kaohsiung, 804, Taiwan, R.O.C.

Effects of thermal properties on IR detection and noise studies of HTSC bolometers

Ab7 17:24~17:36 黃如君 Materials Science Center, Tsing-Hua University, Hsin-Chu 300, Taiwan, R.O.C.

The Effect of Pr Substitution on the T_c Suppression of $RBa_2Cu_4O_8$ (R= Y, Ho, Dy, Gd, Eu)

Section Cb: 表面 主持人: 林登松 地點: N1-B

Cb1 16:00~16:24 黃英碩 Institute of Physics, Academia Sinica, Taipei, Taiwan,

Observation of a Novel Nucleation and Growth Behavior in Ge/Pb/Si(111)

Cb2 16:24~16:36 張添智 Institute of Physics, Academia Sinica, Taipei, Taiwan, R

Growth Mechanism and morphology of Ge on Ph covered Si(111) Surfaces

Cb3 16:36~16:48 黃榮俊 Physics Dept., National Cheng-Kung University, Tainan, Taiwan, R.O.C.

Self assembly of 1D like columnar structure in permalloy thin films

Cb4 16:48~17:00 吳月娥 Department of Physics, National Taiwan Normal University, Taipei, Taiwan 106, R. O. C.

The growth and the formation of surface alloy of Co/Ag/Pt(111)

Cb5 17:00~17:12 侯春樹 Department of Mechanical Engineering, National Taiwan, R.O.C.
University of Science and Technology, Taipei 106, Taiwan, R.O.C.

Effect of frequency and various electrodes on electrical properties of ferroelectric PbO.6Sro.4TiO3 thin films grown by pulsed laser deposition

Cb6 17:12~17:24 余彬源 Department of Physics, National Taiwan Normal University, Taipei 117, Taiwan, R. 0. C.

Study on electrical and optical properties of smart PZT ceramics and thin films

Cb7 17:24~17:36 洪谷融 Department of Physics, Tamkang University, Taiwan

STUDIES of INTERNAL SURFACES of ZEOLITES by 2D-ACAR

Section Db: 半導體 主持人: 孫允武 地點: N2-B

Db1 16:00~16:12 羅奕凱 Department of Physics and Institute of Material Science, National Sun Yat-Sen University, Kaohsiung, Taiwan

Effect of Threading Dislocations on Electron Transport in $In_{0.24}Ga_{0.76}N$/GaN Multiple Quantum Wells

Db2 16:12~16:24 林泰源 Department of Physics, National Taiwan University, Taipei, 106, Taiwan, R.O.C.

Optical quenching of the photoconductivity phenomena in n-type GaN

Db3 16:24~16:36 洪魏寬 Department of Physics, National Taiwan University, Taipei, Taiwan, R.O.C.

Pulsed laser deposition of GaAsN on GaAs

Db4 16:36~16:48 潘永中 Department of Electrophysics, National Chiao Tung University, Hsinchu,Taiwan, R.O.C.

Growth characterization and Photoluminescence Study of GaN:Mg Film Prepared by Metalorganic Vapor Phase Epitaxy

Db5 16:48~17:00 徐宸科 Department of Electrophysics, National Chiao Tung University, Hsinchu 300, Taiwan, R.O.C.

Metastable Photoluminescence Studies on Mg-doped GaN Grown by MOCVD

Db6 17:00~17:12 鍾浩銘 Department of Electrophysics, National Chiao-Tung University, Hsinchu, Taiwan, R. 0. C.

Long term photocapacitance decay behavior in undoped GaN

Section Eb: 光電/光學　　主持人: 高甫仁　　地點: N5-B

Eb1 16:00~16:12 高甫仁 Department of Physics, National Sun Yat-Sen University, Kaohsiung, Taiwan 80424

Ultrasensitive fluorescence imaging through near-field excitation and application of a liquid nitrogen cooled CCD

Eb2 16:12~16:24 蔡定平 Department of Physics. National Chung Cheng University, Chia Yi 6211. Taiwan, R. 0. C.

Study of the near-field optical intensity gradients

Eb3 16:24~16:36 高甫仁 Department of Physics, National Sun Yat-Sen University, Kaohsiung, Taiwan 80424

Development of a two-photon confocal microscope

Eb4 16:36~16:48 李君浩 Institute of Electro-Optical Engineering and Department of Electrical Engineering, National Taiwan University, Taipei, Taiwan, R.O.C.

Compact all-semiconductor-optical-amplifier nonlinear optical loop mirrors

Eb5 16:48~17:00 王浩偉 Institute of Electro-optical Engineering, National Chiao Tung University, Hsinchu, Taiwan, R.O.C.

A two-stage up-convertor made of $AgGaSe_2$ and β-BBO crystals

Eb6 17:00~17:12 許志雄 Institute of Electro-Optical Engineering and Department of Electrical Engineering, National Taiwan University, Taipei, Taiwan, R.O.C.

Wavelength conversion based on PPLN with grating structures

Section Fb: 原子/分子　　主持人: 廖思善　　地點: N1-C

Fb1 16:00~16:24 李凱弟 Synchrotron Radiation Research Center, Hsinchu 300, Taiwan R.O.C.

Auger Decay and Fragmentataion of Molecules Studied by the coincidence Techniques

Fb2 16:24~16:36 孔慶昌 Institute of Atomic and Molecular Sciences, Academia Sinica, Taipei Taiwan

Observation of the 3snd ^{1}D ti tge 3pbg 1F autoionization resonances in Mg

Fb3 16:36~16:48 屈一至 Institute of Atomic and Molecular Sciences, Academia Sinica, Taipei 106 , Taiwan

Core-Polarization Effects on Quantum-Defect Parameters from the Relativistic Multi-Channel K-Matrix Theory*

Fb4 16:48~17:00 郭啟東 Department of Physic, National Sun Yat-Sen University, Kaosiung 804, Taiwan

The Pressure Dependence of XeO Excimers Emission

Fb5 17:00~17:12 周祥順 Division of General Education, National Taiwan Ocean University, Keelung 202, Taiwan

Relativistic many-body calculations of transition amplitudes for beryllium-like ions

Fb6 17:12~17:24 趙聖德 Physics Department, National Taiwan University, Taipei, Taiwan ROC
Institute of Atomic and Molecular Sciences, Academia Sinica, Taipei Taiwan ROC

The Electric Field Effect on the Dynamics of High rydberg States of Hydrogen Atom and the High Resoulaution Principle of ZEKE Spectroscopy

Section Hb: 中高能實驗　　主持人: 鄧炳坤、王子敬　　地點: N1-D

Hb1 16:00~16:12 王明哲 Institute of Physics, Academia Sinica, Taipei 115, Taiwan, R.O.C.

Is it only top?

Hb2 16:12~16:24 劉以正 Institute of Physics, Academia Sinica, Taipei, Taiwan

Single Top Production and M(t-tbar) at Tevatron

Hb3 16:24~16:36 張寶棣 Institute of Physics, Academia Sinica, Taipei,Taiwan

W/Z + Jets at CDF

Hb4 16:36~16:48 黃達年 Institute of Physics, Academia Sinica, Taipei , Taiwan

The CDF Computer Farm for RUN II

Hb5 16:48~17:00 陳彥竹 Institute of Physics, Academia Sinica, Taipei, Taiwan

Search for Direct CP Violation in Decays of Hyperons

Hb6 17:00~17:12 賴文彬 Institute of Physics, Academia Sinica, Nan-Kan Taipei, The Pilot Experiment of Neutrino Physics in Taiwan

Prospects of Using Crystal Scintillators in Future Neutrino Experiments

Hb7 17:12~17:24 李浩斌 National Taiwan University, Taiwan

A Pilot Experiment with Reactor Neutrino in Taiwan

Hb8 17:24~17:36 王孫崇 Institute of Physics, Academia Sinica, Nankang, Taipei, Taiwan R.O.C.

Phi Meson Photo-Production at SPring-8

Section Kb: 統計/計算　　主持人: 姜一民　　地點: N2-C

Kb1 16:12~16:24 胡進錕 Institute of Physics, Academia Sinica, Nankang, Taipei, Taiwan, R.O.C.

The Number of Incipient Spanning Clusters in Percolation Models: A Brief Review

Kb2 16:24~16:36 陳企寧 Institute of Physics, Academia Sinica, Nankang, Taipei, Taiwan, R.O.C.

Partition function zeros of the Q-state Potts model for non-integer Q

Kb3 16:36~16:48 楊朝順 Department of Physics, National Sun Yat-sen University, Kaohsiung, TaiwanRandomness-Induced **the Evolution of first-Order to econd-Order Phase Transition in the Three-State Potts Antiferromagnetic Model on a Triangular Lattice**

Kb4 16:48~17:00 陳昭安 Institute of Physics, Academia Sinica, Nankang, Taipei, Taiwan, R.O.C.

Critical point of the Kagomé Potts model: a Monte Carlo renormalization grou and scaling datermination

Kb5 17:00~17:12 蕭又新 Institute of Physics, Academia Sinica, Nankang Taipei, Taiwan, R.O.C.

Stochastic resonance in n-GaAS

Kb6 17:12~17:24 Prashant M. Gade Institute of Physics, Academia Sinica, Nankang Taipei, Taiwan, R.O.C.

Synchronization and Its Instabilities in spatially Extended Systems.

Section Ac: 超導 主持人: 李文獻 地點: N1-A

Ac1 11:00~11:12 羅紅梅 Department of Physics, National Tsing Hua University, Hsinchu, Taiwan 300, R.O.C.

Weak ferromagnetism and structure symmetry of Bi-doped $Gd_{2-x}Bi_xCUO_4$ cuprates*

Ac2 11:12~11:24 林柄南 Department of Physics, National Tsing Hua University, Hsinchu, Taiwan 300, R.O.C.

Metal-insulator transition and strong electron correlation for the Bi-2212 $Bi_2Sr_2Ca_{1-x}Pr_xCu_2O_{8+\delta}$ single crystals*

Ac3 11:24~11:36 李宗仁 Department of Physics, National Tsing Hua University, Hsinchu, Taiwan 300, ROC

Structure Analysis of the 2212-type rare earth cuprates Bi_2Sr_2 $RCu_2O_{8+\delta}$ (R=Pr, Gd, Y)

Ac4 11:36~11:48 林俊源 Institute of physics, National Chiao Tung University, Hsinchu 300, Taiwan, ROC

The insulating state of oxygen deficient $YBa_2Cu_3O_x$

Ac5 11:48~12:00 劉旭禎 Department of Electrophysics, National Chiao Tung University, Hsinchu, Taiwan

Electronic structure and hole distribution of $Y_{1-x}Pr_xBa_2Cu_3O_{7-y}$ thin films

Ac6 12:00~12:12 李宗仁 Department of Physics, National Tsing Rua University, Hsinchu, Taiwan 300, R.O.C.

Structure refinement of $(La_{1-x}Nd_x)_{0.7}Sr_{0.3}MnO_3$ system by Reitveld method*

Ac7 12:12~12:24 陳淑女 Department of Physics, National Sun Yet-Sen University, Kaoshiung, Taiwan, R.O.C.

Magnetic Field Dependence of the Low Temperature specific Heat of $La_{2-x}Sr_xCuO_4$

Ac8 12:24~12:36 陳定遠 Department of Physics and Materials Science Center, National Tsing Hua University

Structure and Magnetic Studies of Double Perovskite $Sr_2Y(Ru_{1-x}Cu_x)O_6$ and $Sr2(Y_{1-x}Ax)RuO_6$(A=Ca,Tb)

Section Bc: 磁學 主持人: 張慶瑞、陳 恭 地點: N1-C

Bc1 11:00~11:24 林明發 Department of Physics, National Cheng Kung University, Tainan 701, Taiwan R. O. C.

Magnetooptical Properties of Carbon Toroids

Bc2 11:24~11:36 周 雄 Department of Physics, National Sun Yat-Sen University, Kaohsiung, 804, Taiwan, R.O.C.

Low-field magneto-resistance effect of $La_{0.7}Sr_{0.3}MnO_3$ by high-energy ion beam bombardment

Bc3 11:36~11:48 傅昭明 Physics department, National Kaoshiung Normal University, Kaoshiung, Taiwan

Non-Ohmic Behavior in sintered $La_{(1-X)}Sr_xMnO_3$ Magnetic Oxides

Bc4 11:48~12:00 呂正中 Department of Physics, National Cheng Kung University, Tainan, Taiwan, R.O.C.

The Frozen of Magnetization in Pr_2CuGe_6

Bc5 12:00~12:12 李文獻 Department of Physics, National Central University, Chung-Li, Taiwan

MAGNETIC ORDER AND SPIN REORIENTATION IN $Nd_{0.45}Ca_{0.55}MnO_3$

Bc6 12:12~12:24 吳勝允 Department of Physics, National Centeral University, Chung-Li, Taiwan

Magnetic order and fluctuations in bilayered $La_{2-2x}Sr_{1+2x}Mn_2O_7$

Bc7 12:24~12:36 黃勝榮 Department of Physics, National Central University, Chung-Li 320, Taiwan

Magnetic Structure Studies of the Polyaniline/FeOCI and Sodium/FeOCI Nanocomposites

Section Dc: 半導體 主持人: 楊遵榮 地點: N1-B

Dc1 11:00~11:12 孫建文 Department of electronic Engineering, Feng Chia University, Taichung 407, Taiwan

Ultrafast Carrier Dynamics in AIxGal-xAs/GaAs Quantum Wells Generated with Femtosecond Laser Pulses

Dc2 11:12~11:24 孫建文 Department of electronic Engineering, Feng Chia University, Taichung 407, Taiwan.

Hot electron relaxation in $Al_xGa_{1-x}As/GaAs$ Quantum Wells

Dc3 11:24~11:36 詹國禎 Department of Electrical Engineering, National Taiwan University, Taipei

Built-in electric field evaluation on GaAs i-n$^+$ip$^+$ structures by differential photoreflectance and FFT techniques

Dc4 11:36~11:48 范榮權 Department of Physics, National Taiwan University, Taipei, Taiwan, R.O.C.

Photoconductivity study of above-barrier states in GaAs-AlGaAs multiple quantum wells

Dc5 11:48~12:00 黃文啟 Department of Physics National Cheng Kung University Tainan, Taiwan, R. 0. C.

A photo reflectance study of the surface Fermi level and surface state distribution in lattice-matched InAlAs surface intrinsic-n$^+$ structure

Dc6 12:00~12:12 陳榮斌 Department of Physics, Yung-Ta Junior College of Technology & Commerce, Ping-Tung, Taiwan, R.O.C.

The effects of valence-band mixing on the FKO spectra

Dc7 12:12~12:24 Goutman Kuri Department of Physics, National Taiwan Normal University, Taipei 117, Taiwan R.O.C.

Formation and Characterization of $Ge_{1-x}Si_x$ Alloy using MeV ion Beam

Section Ec: 光電/光學 主持人: 謝文峰、施宙聰 地點: N2-B

Ec1 11:00~11:12 黃繼億 Institute of Optical Sciences, National Central University, Jungli, 32054, Taiwan

Wavelength Dependence of The Electron-hole Competition in Nonlinear Photorefractive BaTi03

Ec2 11:12~11:24 陳 駿 Department of Physics, National Chung Cheng University, Chia-yi 621, Taiwan.

The first hyperpolarizabilities of the photosensitive phthalocyanines studied with the hyperRayleigh scattering and a femtosecond laser

Ec3 11:24~11:36 徐力行 Department of Physics, National Cliang-Hua University of Education, Cliang-Hua 500, Taiwan

Photoemission study of the electronic structures of some transitionmetal compounds

Ec4 11:36~11:48 莊陽德 Department of Mathematics & Science Education, Tainan Teachers College, Tainan, Taiwan, R. 0. C.

Low temperature phase transition of $Li_{0.12}Na_{0.88}NbO_3$ studied by Raman Scattering

Ec5 11:48~12:00 李明威 Physics Department, National ChungHsing University, Taichung, 402 Taiwan

Optical Transmission of Rare-Earth Hydride-YH_{3-8}

Ec6 12:00~12:12 盧正杰 Department of Physics, National Taiwan Normal University, Taipei 116, Taiwan

Long-wavelength Optical Properties of $Zn_{1-x}Mn_xSe$

Ec7 12:12~12:24 陳家駿 Department of Physics Fu-Jen Catholic University, Taipei, Taiwan, 242 R.O.C

Optical and Physical Properties of two Commercial ZBLAN Glasses

Ec8 12:24~12:36 李世忠 Institute of Nuclear Energy Research PO Box 3-4, Lungtan, Taiwan 32500, R.O.C.

Signal Conditioning in Optogalvanic Spectroscopy

Section Hc: 中高能實驗 主持人: 張元翰、陳鎰鋒 地點: N1-D

Hc1 11:00~11:24 侯書雲 Institute of Physics, National Central University

Search for the Standard Model Higgs boson at LEP 11

Hc2 11:24~11:36 林勳志 National Central University Chung-Li, Taiwan

Study of the Photon Structure Function F_2^γ at LEP

Hc3 11:36~11:48 謝志生 Physics Department, National Central University, Chung-Li , Taiwan R.O.C.

Study of the Spin I Particle in Two Photon Collision

Hc4 11:48~12:00 S. Behari National Central University, Chung-Li, Taiwan

A simulation study of charmless hadronic decays of B mesons, B→ΦK, in the BELLE environment

Hc5 12:00~12:12 賴宏亮

Hc6 12:12~12:24 張維甫

Hc7 12:24~12:36 阮文滔 Department of Physics and Center for Complex Systems, National Central University, Chungli 320, Taiwan, R.O.C.

Dust Coulomb Clusters in a Plasma Trap

Section Ic : 粒子/場論 主持人: 鄭海揚 地點: N2-C

Ic1 11:00~11:24 林貴林 Institute of physics, National Chiao-Tung University, Hsinchu 300, Taiwan R.O.C.

Flavor changing b quark decays and their implications

Ic2 11:24~11:36 林志隆 Department of ElectroPhysics, National Chiao-Tung University, Hsinchu 300, Taiwan

On the resummations of the parton distribution function

Ic3 11:36~11:48 廖惠施 Department of Physics, National Tsing-Hua University, Tainan, Taiwan, R.O.C.

Global determination of heavy quark effective theory parameters

Ic4 11:48~12:00 施鴻賢 Institute of Physics, Academia Sinica, Taipei, Taiwan

The $\Lambda_b \to p l \nu$ decay in perturbative QCD

Ic5 12:00~12:12 楊桂周 Institute of Physics, Academia Sinica, Taipei, Taiwan
D meson lifetimes
Ic6 12:12~12:24 曾 龍 Institute of Physics, Academia Sinica, Taipei, Taiwan
CP violation in nonleptonic B meson decays
Ic7 12:24~12:36 周忠憲

Section Mc: 一般物理 主持人: 伊 林、闕志鴻 地點: N2-D

Mc1 11:00~11:24 陳義裕 Physics Department, National Taiwan University, Taipei, Taiwan, R.O.C.
Scaling relations for particles whose velocities are randomly reset
Mc2 11:24~11:36 張存續 Department of Physics, National Tsing Hua University, Hsinchu, Taiwan, ROC
Theory and experiment of ultra high gain gyrotron traveling wave amplifier
Mc3 11:36~11:48 陳仕宏 National Center for High-Performance Computing, Hsinchu 300, Taiwan, R.O.C.
Theoretical study of the gyrotron backward wave oscillator
Mc4 11:48~12:00 賈魯強 Department of Physics and Center for Complex Systems, National Central University, ChungLi, Taiwan 320 , R.O.C.
Empty Site Models of Granular Heap Formation
Mc5 12:00~12:12 許家榮 Department of Electrophysics, National Chiao Tung University, Hsinchu, Taiwan. R.O.C.
Dielectric Breakdown Patterns in Liquid Dielectric Films with Various Shapes of Electrodes
Mc6 12:12~12:24 聶斯特 Dept. of Physics and Center for Complex Systems, National Central University, Chung-Li, 320, Taiwan,
Is there really an electromagnetic radiation raction?
Mc7 12:24~12:36 李振良 Materials Science and Technology Center and Department of Mechanical Engineering, National Taiwan University of Science and Technology, Taipei 10672, Taiwan, Republic of China
FATIGUE BEHAVIOR AND MICOSTRUCTURE EVOLUTION IN LEAD ZIRCONATE TITANATE STANNATE CERAMICS
Mc8 12:36~12:48 陳寬任 Department of Physics, National Cheng Kung University, Tainan 701, Taiwan, ROC
Simulation with Dynamic Source for Explaining Experimental Measurement of Alphas' Energy Spectrum"

Section Bd: 磁學 主持人: 林明發、傅昭明 地點: N1-C

Bd1 14:00~14:24 賴志煌 National Tsing Hua University, Department of Materials Science and Engineering, HsinChu 300, Taiwan
Exchange Anisotropy of Epitaxial (100) NiMn/NiFe
Bd2 14:24~14:36 陳 恭 Department of Physics, Chung-Cheng University, Chia-Yi, Taiwan, R.O.C.
Structural and magnetic characterizations in transition metal oxide thin films and superlattices
Bd3 14:36~14:48 黃榮俊 Physics Department, National Cheng-Kung University, Tainan, Taiwan
Exchange biased effect and GMR in FeMn/Py/Cu/Py spin-valve films
Bd4 14:48~15:00 林敏聰 Department of Physics, National Taiwan University, 106 Taipei, Taiwan
Giant enhancement of magneto-optical response of Co/Pt(111) ultrathin films upon thermal annealing
Bd5 15:00~15:12 蔡志申 Institute of Physics, Academia Sinica, Taipei, Taiwan
Surface magneto-optic Kerr effect study of ultrathin Co Films on Si(111) and $CoSi_2$ Surfaces
Bd6 15:12~15:24 黃清鄉 Synchrotron Radiation Research Center, Hsinchu, Taiwan, R.O.C.
The features of magnetic field and calculation photon spectrum on the synchrotron radiation storage ring with an elliptically polarized undulator
Bd7 15:24~15:36 魏培坤 Institute of Atomic and Molecular Sciences, Academia Sinica, Taipei, Taiwan
PHASE SEPARATION PROCESS IN POLYMER BLEND FILMS STUDIED BY NEAR FIELD OPTICAL MICROSCOPE

Section Dd: 半導體 主持人: 徐子民 地點: N1-A

Dd1 14:00~14:12 楊遵榮 Department of Physics, National Taiwan Normal University, Taipei 117, Taiwan, Republic of China
Far Infrared Absorption and Raman Scattering Study MOCVD growth InSb Films onGaAs Substrates
Dd2 14:12~12:24 張幼青 Department of Physics, National Tsing-Hua Universily, Hsinchu 300, Taiwan
Calculation of the energy levels of a hydrogenic impurity center in GaAs/Ga1-xAIxAs quantum well structures using B splines basis
Dd3 14:24~14:36 林志明 National Hsinchu Teacher's College, Hsinchu, Taiwan
Phase transitions Of $Zn_{0.83}Mn_{0.17}Se$ thin film under high-pressure

Dd4 14:36~14:48 杭大任 Department of Physics, National Taiwan University, Taipei, Taiwan R.O.C.

Observation of positive and negative persistent pbotoconductivity in two-side doped $In_{0.53}Ga_{0.47}As/In_{0.52}Al_{0.48}As$ quantum well

Dd5 14:48~15:00 吳建霆 Dept. of Physics, Fu-Jen University, Taipei, Taiwan

Deposition of SiCN films by ion beam sputtering with an atomic nitrogen source

Dd6 15:00~15:12 溫子稷 Dept. of Electrophysics, National Chiao Tung University, HsinChu 300, Taiwan

EFFECT OF V/III RATIO ON DEEP LEVELS IN GAN BY TRANSIENT CAPACITANCE METHOD

Section Ed: 光電/光學 主持人: 潘犀靈 地點: N1-B

Ed1 14:00~12:24 王淑霞 Institute of Electro-Optical Engineering, National Chiao Tung University Hsinchu 300. Taiwan

Self-starting phase-conjugatc oscillation in a nematic liquid-crystal film modulated by a quasi-static electric field

Ed2 14:24~14:36 蔡振凱 Department of Physics, National Sun Yet-Sen University, Kaohsiung, Taiwan, R. 0. C.

Comparison between the experimental results and theoretical predictions of the HighSpeed Oscillation in a Semiconductor Laser generated by Orthogonal Polarization Optical Feedback

Ed3 14:36~14:48 程達隆 Department of Physics, National Sun Yat-Sen University, Kaohsiung, Taiwan, R.O.C.

Wavelength-Switching Properties in a Semiconductor Laser by Orthogonal Polarization Optical Feedback

Ed4 14:48~15:00 李正民 Department of Applied Physics, Chung Cheng Institute of Technology, Taoyuan, Taiwan

Study of Modulation Using Kretschmann Configuration of Surface Plasma-enhanced

Section Ld: 天文/重力/宇宙 主持人: 吳建宏 地點: N1-D

Ld1 14:12~12:24 聶斯特 Department of Physics and Center for Complex Systems, National Central University, Chung-Li, 320, Taiwan

Symmetric Teleparallel Gravity

Ld2 14:24~14:36 游輝樟 Department of Physics and Center for Complex Systems, National Central University, Chung-LI, Taiwan, R.O.C.

On spin one modes in the Poincaré Gauge Theory

Ld3 14:36~14:48 周 啟 Department of Physics., National Sun Yat-Sen University, Kaohsiung, 804. Taiwan Republic of China.

Observation of plasma bubbles by 6300Å 01 airglow

Ld4 14:48~15:00 曹慶堂 Department of Physics, Tamkang University, Tamsui, Taipei 251, Taiwan, Republic of China

Gauge independent trace anomaly for gravitons

Ld5 15:00~15:12 許祖斌 Dept. of Physics, National Chiao Tung University, Hsinchu, Taiwan, R.O.C.

Ashtekar variables, abelian instantons, and symmetry breaking.

Section Jd: 核中能物理 主持人: 張志義、顏迪佑 地點: N2-C

Jd1 14:00~12:24 余岳仲 Institute of Physics, Academia Sinica, Taipei, Taiwan

The Nuclear Microprobe Facility at IPAS

Jd2 14:24~14:36 魯定輝 Department of Physics,National Taiwan University, Taipei, Taiwan 10617, R.O.C.

ϕ Photoproduction from the deuteron

Jd3 14:36~14:48 魯定輝 Department of Physics, National Taiwan University, Taipei, Taiwan 10617, R.O.C.

The quark mass dependence of nucleon magnetic moments

Jd4 14:48~15:00 S. S. Kamalov Department of Physics, National Taiwan University, Taipei, Taiwan, R.O.C.

The generalized GDH integrals and the spin structure of the nucleon

Jd5 15:00~15:12 S.K. Patra Department of Physics, Chung Yuan Christian University, Chung-Li, Taiwan 32023, R.O.C.

The k-i Basis Shell Model- Recent Development of the Fermion Dynamical Symmetry Model

（壁報論文 138 篇，略）

第三屆超晶格物理性質研討會
1999 Symposium on Superlattice Physics

時間：88 年 4 月 23-24 日

地點：國立東華大學理工學院第一講堂

4 月 23 日(星期五)

13:30-14:00 Registration

14:00-14:20 Welcome and Opening Remarks 夏友平（東華大學理工學院院長）

Session I Chairman: 姚永德（中研院）

14:20-14:50 張慶瑞（台灣大學）
Exchange Bias in Spin Filter Junction

14:50-15:20 傅昭銘（高雄師範大學）
巨磁阻抗現象

15:20-15:50 陳恭（中正大學）
Magnetic Coupling in Ferrimagnetic/Ferrimagnetic Fe_3O_4/Mn_3O_4

15:50-16:05 Tea/Coffee Break

Session II Chairman: 傅昭銘（高雄師範大學）

16:05-16:35 陳啟東（中研院）
Electron Transport in Ferromagnetic Single Electron Transistors

16:35-17:05 翁明壽（東華大學）
Structure and Properties of Polycrystalline Multilayers

17:05-17:55 東華大學物理及材料系所諸位教授
東華大學研究簡報

18:00 Dinner

4 月 24 日(星期六)

Session III Chairman: 王吉祥（東華大學物理系主任）
邱爾德（東華大學電機系主任）

09:00-09:30 黃榮俊（成功大學）
Epitaxial Growth, Perpendicular Magnetic Anisotropy and Magnetic Domain Structure of Co/Pt Multilayers

09:30-10:00 **Ivo Klik** (中研院)
Planar Hall Effect in Magnetic Thin Films and Multilayers

10:00-10:30 彭隆瀚（台灣大學）
Structural Asymmetry Effects on the Optical Properties of InGaN Quantum Wells

10:30-10:45 Tea/Coffee Break

10:45-11:15 洪雪行（同步輻射）
X-ray Characterization on Aperiodic Superlattice Structures

11:15-11:45 李志浩（清華大學）
Study the Structure of Epitaxial Co/Pt Multilayer

11:45-12:15 管傑雄（台灣大學）
超晶格紅外線偵測器的物理特性

12:15-13:30 Lunch

4 月 24 日(星期六)

Session IV Chairman: 張慶瑞（台灣大學）

13:30-14:00 盧志權（工研院）
Epitaxy on Cu (100) / Si (100)

14:00-14:30 林敏聰（台灣大學）
Magnetic and Surface-Sensitive Approach in Magnetic Low-Dimensional Systems

14:30-15:00 李宗仁（清華大學）
The Modulated Structure in Bi2212 System

15:00-15:30 李尚凡（中研院）
鈮/鈷多層膜的磁性與超導性質

15:30-16:00 姚永德（中研院）
超晶格及超薄膜之物理特性研究

16:00:16:20 姚永德（中研院）
Discussion & Closing Remarks

17:00 Dinner

International Symposium on Advanced Magnetic Technologies (ISAMT'99)
Academia Sinica, Taipei, Taiwan
May 24~25,1999

Monday, May 24

Session A

A-1 Recent Developments in High Density Optical Recording Science and Technology
*Takao Suzuki
Information Storage Materials Lab., Toyota Technological Inst., Japan

A-2 The Physical Boundaries to High Density Magnetic Recording
*Robert L. White
Stanford Center for Research on Information Storage Materials, USA

A-3 New Perpendicular Recording Media
*Kazuhiro Ouchi
Akita Research Institute of Advanced Technology, Japan

Session B

B-1 Optical Storage Technology Development in Taiwan
* Eric G. Lean
Opto-Electronics & Systems Labs., ITRI,
Taiwan

B-2 Recent Vibration Issues of Computer Hard Disk Drives
*I. Y. Shen
Dept. of Mechanical Engineering, University of Washington, USA

B-3 Advances in Magnetic Storage Technology
*Yoshimasa Miura
Fujitsu Ltd., Japan

Session C

C-1 Magnetization Process of 2D Arrays of Small Magnetic Particles
*Martha Pardavi-Horvath
Dept. of Electrical Engineering & Computer Science, The George Washington University, Washington, D.C.

C-2 Magnetostatic Waves-Based Microwave and Magnetooptic Devices
*Chen S. Tsai
Inst. of Applied Sci. & Engineering Research, Academia Sinica, Taiwan, and
Dept. of Electrical & Computer Eng., Univ. of California, Irvine, USA

C-3 Advances in Ferrite Microwave Materials and Devices
*Ernst Schloeman
Raytheon Research, Waltham, MA, USA

C-4 Ferrite Plating and Applications of the Oxide Magnetic Films Prepared
*M. Abe
Dept. of Physical Electronics, Tokyo institute of Technology, Japan

Session DA

DA-1 Calculations of the Microstructure and Magnetic Properties of Particulate Recording Media
G. N. Coverdale and *R. W. Chantrell
Univ. of Wales Bangor, UK

DA-2 Stretched-Exponential Decay in Isolated Single Domain Particles
*I. Klik and Y. D. Yao
Inst. of Physics, Academia Sinica, Taiwan

DA-3 Magnetic Structure and Fe Moment Distribution in Rare-earth Iron Intermetallic Compunds by First-principles Calculations
*Wai-Yim Ching and Y.-N. Xu
Dept. of Physics, Univ. of Missouri-Kansas City, USA

DA-4 Orientation Dependence of the Magnetocrystalline Anisotropy in Fe, Co and Ni Multilayers
*G. Y. Guo
Dept. of Phys., Nat'l Taiwan Univ., Taiwan

DA-5 Thermal Relaxation in Interacting Magnetic Fine Particles
Jing Ju Lu, Hong Yuan Deng, and *Huei Li Hunag
Dept. of Phys., Nat'l Taiwan Univ., Taiwan

Session DB

DB-1 Optimal Design of Magnetic Devices
*Norio Takahashi
Dept. of Electrical and Electronic Engineering, Okayama Univ., Japan

DB-2 Effect of Thin Film Microstructure of Magnetic Rigid Disks on Corrosion & Its Implication on Tribology
J. J. K. Lee, *Ray W. J. Chia, and C. C. Wang
Western Digital Co., USA

DB-3 Further Development of Magnet Industry in China

*Yang Luo

Beijing 100081 , China

DB-4 An Innovative Design of A Slim Type DVD Spindle Motor

*D. R. Huang, T. F. Ying, S. J. Wang, L. T. Kuo, H. C. Huang, and C. Y. Huang

Opto-Electronics & Sys. Labs., ITRI, Taiwan

DB-5 Present Status and Problems on Magnetic Measurements

*Takayoshi Nakata

DB-6 Dept. of Electrical and Electronic Eng., Kanto Gakuin Univ., Japan

Studies on Antiferromagnetic/Ferromagnetic Interfaces

*Hua-Ching Tong, C. Qian, L. Miloslavsky, X. Shi, F. Liu, and S. Dey

Read-Rite Co., Fremont, USA

Session E

E-1 Spin Polarized Tunneling: The Physics and the Potential for MRAM and Sensors

*J. S. Moodera

Francis Bitter National Magnet Lab., MIT, Cambridge, USA

E-2 Magnetic Tunneling Junction Devices for Non-Volatile Random Access Memory

*S. S. P. Parkin

IBM Res. Division, Almaden Res. Center, USA

E-3 Magnetic Tunnel Junctions

A. Barthélémy, J. Briatico, J. P. Contour, J-M. de Teresa, R. Lyonnet, J-L. Maurice, J. Nassar, F. Nguyen Van Dau, F. Montaigne, *F. Petroff, P. Seneor, A. Schuhl, A. Vaurès, and A. Fert

UMR CNRS-THOMSON CSF, France

E-4 Enhancement of Tunneling Magnetoresistance Through a Magnetic Barrier

*Ching-Ray Chang and S. P. Chen

Dept. of Physics, Nat'l Taiwan Univ., Taiwan

Session F

F-1 Photoemission from Quantum Well States in Magnetic Heterostructures

*Z. Q. Qiu

Dept. of Physics, Univ. of California at Berkeley, USA

F-2 Extremely Clean Sputtering Process for GMR Elements — Exchange Anisotropy and Spin Dependent Transport

*Migaku Takahashi, Masakiyo Tsunoda, and Kazuhiro Uneyama

Dept. of Electronic Engineering, Tohoku Univ., Japan

F-3 Soft X-Ray Magnetic Circular Dichroism and Magnetic Research

*Chien-Te Chen

Synchrotron Radiation Research Center, Taiwan

F-4 Imaging of Magnetic Domains with a Photoemission Electron Microscope

Gerhard H. Fecher

Johannes Gutenberg - Universitat, Institut fur Physik, D-5099 Mainz, Germany

Tuesday, May25

Session G

G-1 A Review of HDD Ruggedization Process

*Sri M. Sri-Jayantha

Watson Res. Center, IBM, NY, USA
T. J. Watson Research Center

Yorktown Heights, NY 10598, USA

G-2 Magnetic Water Treatment

*J. M. D. Coey and S. Cass

Physics Dept., Trinity College, Ireland

G-3 Permanent Magnet Films for MEMS Applications

* Tsung-Shune Chin

Dept. of Materials Science and Engineering, Nat'l Tsing Hua Univ., Taiwan

G-4 Advanced Magnetic Force Microscopy Tips for Magnetic Characterization

*Sy-Hwang Liou

Dept. of Physics and Astronomy, and Center for Materials Research and Analysis, Univ. of Nebraska-Lincoln, USA

Session H

H-1 Nanocompsoite Nd-Fe-B Magnets – Technological Perspective

V. Panchanathan

Magnequench International, USA

H-2 Molecular Metalwires

*S. M. Peng

Dept. of Chemistry, Nat'l Taiwan Univ., Taiwan

H-3 High Coercivity Co Alloy Longitudinal Thin Film Media with CoCrTa Intermediate Layer

*Teck-Seng Low

Electrical Eng. Dept., Nat'l Univ. of Singapore

H-4 Magnetic Domain Reversal Dynamics in Co-Based Nanomultilayers

*Sung-Chul Shin

Dept. of Phys. And Center for Nanospinics of Spintronic Materials, Korea Advanced Inst. of Sc. and Tech., Korea

H-5 Perpendicular Magnetic Anisotropy and Domain Structure of Unpatterned and Patterned Co/Pt Multilayers

*J. C. A. Huang, L. C. Wu, M. M. Chen, J. C. Wu, and T. H. Wu

Dept. of Physics, Nat'l Cheng Kung Univ., Taiwan

(Poster Session including 74 articles, omitted)

八十八年核子物理春季講習會

Nuclear Physics Spring School 1999

會 程 表 (Program)

時間 / 日期	5/27 (四)	5/28 (五)	5/29 (六)	5/30 (日)
8:00 9:00		早餐 Breakfast	早餐 Breakfast	早餐 Breakfast
9:00 10:00		Lee (I)	Ji (II)	Ji (IV)
10:00 10:30		休息 Break	休息 Break	休息 Break
10:30 11:30		Ji (I)	Perry (III)	Lee (IV)
11:30 12:30		Perry (II)	Lee (III)	結帳 Check out
12:30 14:00		午餐 Lunch	午餐 Lunch	午餐 Lunch
14:00 18:00	報到 **Registration**	自由活動 Free	自由活動 Free	散
18:00 19:30	晚餐 Dinner	晚宴 Banquet	晚餐 Dinner	
19:30 20:30	Perry (I)	Lee (II)	Ji (III)	
20:30 21:30	討論 Discussion	討論 Discussion	Perry (IV)	會

Titles:

Ji : Deep Inelastic Scattering and the Quark-Gluon Structure of the Nucleon

Lee : Physics at JLAB and SPring-8

Perry : Light-Front Dynamics in QCD and QED

StatPhys-Taiwan-1999

Symposium on Equilibrium and Non-Equilibrium Phase Transitions

9-16 August, Institute of Physics, Academia Sinica, Taipei, and
Department of Physics, National Dong Hwa University, Hualien

Notes:1. For further information, please visit http://www.sinica.edu.tw/~statphys
2. On 9 August, Tour bus departs from Center of Academic Activities at 8:00.
3. **R:** review talk, **S**: seminar talk, **C**: contributed talk

Monday, 9 August 1999

08:00 - 17:00 Tour to National Palace Museum and Taipei City
16:00 - 20:00 Registration and Free Discussion at Institute of Physics

Tuesday, 10 August 1999

08:00 - 09:30 Registration and Continental Breakfast at Institute of Physics
09:30 - 10:00 Opening and Welcome Addresses
Chin-Kun Hu (Chairman, StatPhys-Taiwan-1999)
Kuo-Shu Yang (Vice President of Academia Sinica)
Yeung-Der Yao (Vice Director of Inst. of Phys.)
10:00 - 11:00 **RI** A Brief History of Phase Transitions and Critical Phenomena
P. *C. Hohenberg (Yale Univ., USA)*
11:00 - 11:20 < Coffee Break and Group Photo >
11:20 - 12:20 **R2** Monte Carlo Investigation of Phase Transitions: Status and Perspectives
K. Binder (Johannes-Gutenberg-Uiliversitat, Germany)
12:20 -14:00 < Lunch Break & Poster Section >
14:00 - 15:00 **R3** Can Statistical Physics Contribute to The Science of Economics?
H. Eugene Stanley (Boston Univ., USA)
15:00 - 15:30 **S1** Phase Transitions in Non-equilibrium Systems of Self-propelled Particles
Andras Czirok (Eotvos Univ., Hungary)
15:30 - 16:00 < Coffee Break >
16:00 - 16:30 **S2** Spin Models on Random Lattices
Wolfhard Janke (Universitat Leipzig, Germany)
16:30 - 17:00 **S3** Structure and Relaxation Dynamics of Polymer Knots
Pik-Yin Lai (Nat' 1 Central Univ., Taiwan)
17:00 - 17:30 **S4** Flat Histogram Method
Jian-Sheng *Wang (Nat'1 Univ. of Singapore, Singapore)*
17:30 - 18:00 **S5** Spanning Clusters at Criticality
Lev. N. Shchur (Landau Institute for Theoretical Physics, Russia)
18:30 - Welcome Buffet Dinner at Institute of Phys.

Wednesday, 11 August 1999

08:00 - 09:00 Registration and Continental Breakfast at Institute of Physics
09:00 - 10:00 **R4** What Has Molecular Dynamics Wrought?
Berni Alder (Lawrence Livermore Nat 1 Laboratory, USA)
10:00 - 10:30 **S6** Liquid-state Theory of Charged Colloids
Macia C. Barbosa (Universidade Federal, Brazil)
10:30 - 10:50 < Coffee Break >
10:50 - 11:50 **R5** Genesis, Selected Applications, and Future Prospects of the Mode Coupling Theory
Kyozi Kawasaki (Chubu University, Japan)
11:50 - 12:20 **S7** Flocks, Herds, and Schools: A Quantitative Theory of Flocking
Yuhai Tu (IBM T. J. Waston Research Center, USA)
12:20 - 14:00 < Lunch Break & Postdeadline Posters >

14:00 - 15:00 **R6** Ordering Phenomena on Growing Films
Mehran Kardar (MIT., USA)
15:00 - 15:30 **S8** Novel Nucleation and Growth Behavior Observed in Ge/Pb/Si(iii)
Ing-Shouh Hwang (Academia Sinica, Taiwan)
15:30 - 16:00 < Coffee Break >
16:00 - 16:30 **S9** Emergence of Scaling in Random Networks
Albert-LaszIo Barabasi (Univ. of Notre Dame, USA)
16:30 - 17:00 **S10** Witten's Integral and the Kontsevich Integral
Louis H. Kauffman (UIC, USA)
17:00 - 17:30 **S11** Stability of a Two-Component Bose-Einstein Condensate
M. Wadati (Univ. of Tokyo, Japan)
18:00 - <Dinner >

Thursday, 12 August 1999

08:00 - 09:00 Registration and Continental Breakfast at Institute of Physics
09:00 - 10:00 **R7** Quantum Mechanical Effects on Condensed Matter Phenomena
Seiji Miyashita (Univ. of Tokyo, Japan)
10:00 - 10:20 < Coffee Break >
10:20 - 11:20 **R8** The Behavior of Gases and Liquids During a Phase Transition
D. Beysens (CEA-Grenoble, France)
11:20 - 12:30 < Lunch & Check Out >
12:30 - 18:30 Tour to National Dong Hwa University (Hualien)
19:00 - Dinner at Hualien

Friday, 13 August 1999

9:00 - 10:00 **R9** Dimer Statistics and Exactly Solved Models in Statistical Mechanics
F. Y. Wu (Northeastern Univ., USA)
10:00 - 10:30 **S12** Real Arnold Complexity versus Real Topological Entropy for a One-parameter-dependent Two-dimensional Birational Transformation
J. M. Maillard (Universite de Paris 6, France)
10:30 - 10:50 < Coffee Break >
10:50 - 11:50 **R10** New and Exact Applications of Real Space Renormalization
Bernard Derrida (Ecole Normale Superieure, France)
11:50 - 13:00 < Lunch Break >
13:00 -18:00 Tour to Taroko National Park
19:00 - Welcome Buffet Dinner at Parkview Hotel

Saturday, 14 August 1999

09:00 - 10:00 **R11** The Protein Folding Problem
Chao Tang (NEC Research Inst., USA)
10:00 - 10:30 **S13** Traffic States of a Model Highway with On-ramp
Doochul Kim (Seoul National Univ., Korea)
10:30 - 10:50 < Coffee Break >
10:50 - 11:50 **R12** Geometrical Aspects of Phase Transitions in Frustrated and Unfrustrated Systems
Antonio Coniglio (Universita di Napoli "Federico II", Italy)
11:50 - 12:20 **S14** Computer Simulations of Traffic Flow
Macoto Kikuchi (Osaka Univ., Japan)
12:20 - 13:30 < Lunch Break >
13:30 - 14:00 **S15** Cluster Analysis of Ising Model and Universal Finite-size Scaling
Yutaka Okabe (Tokyo Metropolitan Univ., Japan)

14:00 -14:30 **S16** Some Recent Applications of Conformal Field Theory to Statistical Mechanics
Peter Kleban (Univ. of Maine, USA)

14:30 - 15:00 **S17** Exact Results for the Zeros of the Partition Function of the Potts Model on Finite Lattces
Richard J. Creswick (Univ, of South Carolina, USA)

15:00 - 15:30 < CofFee Break >

15:30-17:30 **C1-C8** Contributed Talks

Sunday, 15 August 1999

09:00 - 09:30 **S18** Ground State Entropy in Potts Antiferromagnets
R. Shrock (State Univ. of New York, USA)

09:30 - 10:00 **S19** Euclidean Random Hamiltonians
A. Zee (Univ. of California, Santa Barbara, USA)

10:00 - 10:30 **S20** Transition Operators for Bethe-Ansatz States
M. L. Ge. (Nankai Univ., China)

10:30 - 10:50 < Coffee Break >

10:50 - 11:50 **R13** One Hundred Years of Nonequilibrium Patterns
Pierre Hohenberg (Yale Univ., USA)

11:50 - 13:30 < Lunch Break >

13:30 - 15:30 **C9-C16** Contributed Talks

18:00 - Dinner at Hualien City

List of Contributed Talks

Saturday (14 August)

15:30-15:45 **C1** Enumerations of Plane Meanders
Iwan Jensen (University of Melbourne, Australia)

15:45-16:00 **C2** Partition Function Zeros of the Q-state Potts Model for Non-integer Q
Seung-Yeon Kim and Richard J. Creswick (University of South Carolina USA)
Chi-Ning Chen and Chin-Kun Hu (Academia Sinica, Taiwan)

16:00-16:15 **C3** Critical Behavior at Imperfect Surfaces
H. W. Diehl (Universitat-Gesamthochschule Essen, Germany)

16:15-16:30 **C4** Field-Theoretical Analysis of Criticaland Coexistence Singularities at Critica End Points
H. W. Diehl and M. Smock (Universitat-Gesamthochschule Essen Germany)

16:30-16:45 **C5** Bending Rigidity of Protein-coated Lipid Membranes
C.-M. Chen (National Taiwan Normal University, Taiwan)

16:45-17:00 **C6** Studies of Mesoscopic Lattices Forming with Magnetic Fluid
1. M. Jiang and M. S. Wang (National Sun Yat-sen University,Taiwan)
H. E. Horng (National Taiwan Normal University, Taiwan)
C. Y. Hong (Da-Yeh University, Taiwan)

17:00-17:15 **C7** Chain Formation and Polarization of Dipolar Chains
Juin-Yan Huang and Pik-Yin Lai (National Central University, Taiwan)

17:15-17:30 **C8** Buoyancy-driven Aggregation of Colloidal Particles in Liquid-vaporinterface
H.W. Yau, W.Y. Tarn, and *K.Y. Szeto (HKUST, Hong Kong)*

Sunday, (15 August)

15:30-15:45 **C9** Two Dimensional System of Several Millimeter Size SpheresUsing Triboelectrification
Yongki Choi, Kipom Kim, and Hyuk Kyu Pak (Pusan National University, Korea)

15:45-16:00 **C10** Dynamics of Spiral Patternsin Vertically Vibrated Thin Granular Layer System
Kipom Kim, Yonggun Jun, and Hyuk Kyu Pak (Pusan National University, Korea)

16:00-16:15 **C11** Synchronization as a Nonequilibrium Phase Transition
H.K. Leung (National CentralUniversity, Taiwan)

16:15-16:30 **C12** Kinetic Theory for Spatial Correlation in NonequilibriumReaction-diffusi on Systems
Junichi Wakou (Tokyo Institute of Technology, Japan)
Kazuo Kitahara (International Christian University, Japan)

16:30-16:45 **C13** Two Dimensional Diffusion in Free-standing Soap Film
Jeanman Sur and Hyuk Kyu Pak (Pusan National University, Korea)

16:45-17:00 **C14** Resistance of 2D Soap Froth
KM. Cheung, W.Y. Tarn and K.Y. Szeto (HKUST, Hong Kong)

17:00-17:15 **C15** DC Conductive Percolation of 2-D Fractal Random Network
Tai-Fa Young (National Sun Yat-sen University, Taiwan)
Huey-Jen Fang *(National Hu-Wei Polytechnic Institute, Taiwan)*

17:15-17:30 **C16** Dinucleotide and Multinucleotide Statistical Correlations and Molecular Evolution
Liaofu Luo (Inner Mongolia University, China)

(Poster section including 21 articles, omitted)

Scientific Program

The 3rd International Conference on B Physics and CP Violation

(Taipei, December 3 - 7, 1999)

Adobe PostScript format
Adobe Acrobat format

December 3 (Friday)

Session 1: B Factories I — *Chair: H. Sugawara*

09:00 - 09:20	Opening	NTU President Wei-Jao Chen
09:20 - 09:55	Status of e^+e^- B FactoryAccelerators	S. Kurokawa (KEK)
09:55 - 10:20	BABAR Detector Performance	D. Boutigny (LAPP, Annecy)
10:20 - 10:50	**Coffee Break**	

Session 2: B Factories II — *Chair: B.Y. Hsiung*

10:50 - 11:15	BELLE Detector Performance	K. Abe (KEK)
11:15 - 11:30	Performance of PID - Aerogel (BELLE)	T. Iijima (KEK)
11:30 - 11:45	- DIRC (BABAR)	M. Zito (Saclay)
11:45 - 12:00	- RICH (CLEO-III)	T. Skwarnicki (Syracuse)
12:00 - 12:20	Status and Results from HERA-B	O. Steinkamp (NIKHEF)
12:20 - 14:00	**LUNCH**	

Session 3: B Physics — *Chair: A.I. Sanda*

14:00 - 14:25	Physics Results from BABAR	D. Kirkby (Stanford)
14:25 - 14:50	Physics Results from BELLE	H. Aihara (Tokyo)
14:50 - 15:20	Ten Years of B Physics at LEP	S.L. Wu (Wisconsin)
15:20 - 15:50	**Coffee Break**	

Session 4: CKM Matrix Elements — *Chair: B.K. Chung*

15:50 - 16:15	B_s Mixing	S. Willocq (Massachusetts)
16:15 - 16:45	Theory of CKM Matrix Element Determination	C.S. Kim (Yonsei)
16:45 - 17:10	Global Fit of CKM Matrix	A. Stocchi (LAL-Orsay)
17:10 - 19:00	**RECEPTION**	

Contributed Evening Session I (15 min. each) — *Chairs: C. Kao & K. Terasaki*

	LEP Results on CKM Parameters	G. Eigen (Bergen)
	Model-independent Determination of $\|V_{ub}\|$	C.H. Jin (Melbourne)
	Study of CP Asymmetry of $B \to J/\psi K_S$ Decays in ALEPH	R. Forty (CERN)
	Can One Measure the Weak Phase of a Penguin Diagram?	R. Sinha (IMS, Madras)
	Constraints on SUSY Models from $b \to s\gamma$ and EW Precision Data	C. Kao (Wisconsin)
	$B \to X_s\gamma$ Decay and CP violation in Vector Quark Model	C .H. Chang (Taiwan Normal)
	New Physics Search at Asymmetric B Factories	Y.Y. Keum (Academia Sinica)
	Heavy Flavour Physics at HERA	C. Grab (ETH)
	Physics Program with a High p_T Trigger of HERA-B	R. Chistov (ITEP)
	Effective Field Theory in B Physics	W.M. Zhang (Cheng-Kung)
	Preasymptotic Enhancement Effects in b Decays	B. Melic (RBI, Zagreb)
	Non-factorizable Contributions in B decays	K. Terasaki (YITP)

December 4 (Saturday)

Session 1: Lifetime and Spectroscopy — *Chair: S. Suzuki*

09:00 - 09:35	Lifetime/Spectroscopy of Beauty/Charm Hadrons	F. Ukegawa (Tsukuba)
09:35 - 10:05	Lifetimes of Heavy Hadrons	I. Bigi (Notre Dame)
10:05 - 10:30	Theory of Heavy Baryon Decay	J. Körner (Mainz)
10:30 - 11:00	**Coffee Break**	

Session 2: B Decays — *Chair: G. Eilam*

11:00 - 11:20	Semileptonic B Decays	J. Thaler (Illinois)
11:20 - 11:40	Hadronic $b \to c$ Decays	A. Wolf (Syracuse)
11:40 - 12:05	Radiative B Decays	T. Skwarnicki (Syracuse)
12:05 - 12:30	Theory of Radiative B Decays	M. Misiak (CERN)
12:30 - 14:00	**LUNCH**	

Session 3: Charmless B Decays/Direct CP Violation — *Chair: T. Browder*

14:00 - 14:35	Charmless Hadronic B Decays	J. Smith (Colorado)
14:35 - 15:00	Theory of Charmless Hadronic B Decays	H.Y. Cheng (Academia Sinica)
15:00 - 15:20	Direct *CP* Violation in B Decays	J. Alexander (Cornell)
15:20 - 15:45	Theory of Direct *CP* Violation in B Decays	C.D. Lu (Hiroshima)
15:45 - 16:15	**Coffee Break**	

Session 4: Factorization and Final State Interactions *Chair: C.P. Yuan*

16:15 - 16:40	pQCD Treatment of Exclusive B Decays	H.N. Li (Cheng Kung)
16:40 - 17:05	Final State Interactions in Heavy Hadron Decays	M. Suzuki (Berkeley)

December 5 (Sunday)

Daytime	Excursion/Tour
18:30 - 20:30	**CONFERENCE BANQUET**
	-- Sky Lounge (12F) at Grand Hotel

December 6 (Monday)

Session 1: ε'/ε *Chair: R. Forty*

09:00 - 09:25	ε'/ε Measurement from KTeV	A. Roodman (SLAC)
09:25 - 09:50	ε'/ε Measurement from NA48	A. Nappi (Perugia)
09:50 - 10:10	Status and Results from KLOE/DA ΦNE	M. Incagli (Pisa)
10:10 - 10:40	Theory of ε'/ε	S. Bertolini (INFN)
10:40 - 11:10	**Coffee Break**	

Session 2: Determination of Unitarity Phases Chair: N. Lockyer

11:10 - 11:40	Experimental Study of $\sin 2\beta(\phi_1)$ and $\sin 2\alpha(\phi_2)$	W. Trischuk (Toronto)
11:40 - 12:10	Penguins and Mixing-dependent *CP* Violation	N. Deshpande (Oregon)
12:10 - 12:40	Determination of $\gamma(\phi_3)$	M. Gronau (Technion)
12:40 - 14:00	**LUNCH**	

Session 3: Lattice Results/Kaon Decay *Chair: D. Chang*

14:00 - 14:25	Lattice Hadronic Matrix Elements	A. Soni (BNL)
14:25 - 14:50	Rare K Decay Studies	S. Kettell (BNL)
14:50 - 15:15	Theory of Rare K Decays	G. D'Ambrosio (Naples)
15:15 - 15:45	**Coffee Break**	

Session 4: Rare B and D Decays *Chair: C.S. Huang*

15:45 - 16:10	Rare Semileptonic and Leptonic B Decays	F. W thwein (MIT)
16:10 - 16:35	Theory of Rare Semi/leptonic B Decays	T. Morozumi (Hiroshima)
16:35 - 17:05	D Mixing and Rare Decays	H. Park (Korea)
17:05 - 19:00	(Dinner on your own)	

Contributed Evening Session II (15 min. each) *Chairs: J. Trampetic & P.*

ε'/ε in SUSY	A. Masiero (SISSA)
Analysis of ε'/ε in the $1/N_c$ Expansion	A. P. Soldan (Dortmund)
Future Prospects on $K_L \to \pi^0\nu\bar{\nu}$ Experiment	Y.B. Hsiung (Fermilab)
D^0 Mixing Results from CLEO	D. Asner (Santa Barbara)
CP Violation Tests in the Charm Sector	B. O'Reilly (Colorado)
D Meson Lifetimes	K.C. Yang (Chung-Yuan)
Current Status of Radiative B Decays	J. Trampetic (RBI, Zagreb)
CMS/ATLAS Prospects on B Physics	P. Vikas (CMS/Minnesota)
$B \to X_s\tau^+\tau^-$ in a *CP* Spontaneously Broken 2HDM	C.-S. Huang (ITP, Beijing)
Effect of Flavor Conserving *CP* Violating Phases in SUSY Models	P. Ko (KAIST)
CP Asymmetries in $B^\pm \to \pi^\pm K$ in SUSY	G. Bhattacharyya (Saha)
CP Violation Induced by R-L Down Squark Mixings	C.K. Chua (Taiwan)

December 7 (Tuesday)

Session 1: Other *T* and *CP* Violation *Chair: S.C. Lee*

09:00 - 09:30	*T* Violation and other *CP/CPT* Studies	T. Yamanaka (Osaka)
09:30 - 09:55	Theory of *CP* Violation in Hyperon Decay	S. Pakvasa (Hawaii)
09:55 - 10:20	*CP* Violation in Hyperon Decay	K.B. Luk (Berkeley)
10:20 - 10:50	**Coffee Break**	

Session 2: Outlook for Hadronic Machines *Chair: G. Eigen*

10:50 - 11:15	CDF Upgrade for Run-II	R. Hughes (Ohio State)
11:15 - 11:40	D0 Upgrade for Run-II	R. Hughes [G. Gutierrez (Fermilab)]
11:40 - 12:05	Future B Physics from BTeV/LHCb Perspective	S. Stone (Syracuse)
12:05 - 14:00	**Lunch**	

Session 3: B and New Physics *Chair: A. Masiero*

14:00 - 14:25	Manifestation of SUSY in B Decays	Y. Okada (KEK)
14:25 - 14:45	Beyond SM CP Violation in B System	X.G. He (Taiwan)
14:45 - 15:15	B System as a Window on New Physics	J. Hewett (SLAC)
15:15 - 15:45	**Coffee Break**	

Session 4: Conference Summary *Chair: W.S. Hou*

15:45 - 16:15	Summary of Experiment	T. Nakada (CERN/Lausanne)
16:15 - 16:45	Summary of Theory	R. Peccei (UCLA)
17:00	**Conference Adjourns**	

Seminars

中央研究院物理所八十八年度演講一覽表

(1998 年 7 月~1999 年 12 月)

演 講 題 目	演講者姓名	所 屬 機 構	日 期
Trilepton Signal in the Minimal Supergravity Model at the Tevatron	Chung Kao	Wisconsin University	07/07/1998
Status of BES Experiment 北京譜儀：現況及展望	李金	北京高能物理研究所	07/10/1998
Softmatter and Statistical Physics Journal Club : A Phase Transition in Acoustic Wave Propagation	Emile Hoskinson	中央大學 & University of British Columbia	07/13/1998
Near-field Scanning Optical Microscopy : Electromagnetic Coupling between the Aperture Tip and the Sample	顧本源	中國科學院物理研究所	07/14/1998
Role of Edge States in Magneto-transport of Quantum Waveguide and Mesoscopic Rings	顧本源	中國科學院物理研究所	07/14/1998
The Experimental Physics Program at T.J. Lab	George Chang	University of Maryland	07/24/1998
1.Testing Hawking-Unruh Effect with Ultra-Intense Lasers 2.Foundations of Quantum Mechanics	陳丕燊	美國史丹佛加速器中心	08/06/1998
1.Nano-and Micro- Structure on the Two Dimension Electron Gas 2.From Basic to Applied Researches	金 勇	法國國家微電子實驗室	08/06/1998
電力系統相量量測單元及其在穩定度監測應用－（非線性現象）	劉志文	台灣大學電機學院	08/07/1998
Integrated Magnetoelectronics and Magnetooptics	Chen S. Tsai	UC, Irvine	08/11/1998

演　講　題　目	演講者姓名	所　屬　機　構	日　期
蔡教授與所內研究同仁座談	Chen S. Tsai	UC, Irvine	08/11/1998
Magnetic skyrmion lattices in heavy fermion superconductor Upt_3	A. Knigavko	Physics of Department, National Taiwan University	08/19/1998
Organic Electroluminescent Materials and Devices	陳金鑫	Display Technology Lab., Eastman Kodak Company	08/19/1998
Dynamical Scaling in Phase Ordering Kinetics	Iksoo Chang	Dept. of Phys., Pusan National Univ.	08/26/1998
Phase Separation of a Binary Fluid Containing Surfactants in a Hele-Shaw Cell	Jiunn-Ren Roan		08/26/1998
生理監視器之研製	尤景良	工業技術研究院量測技術發展中心儀器發展組	08/29/1998
磁阻式磁頭設計	游騰健	和喬科技股份有限公司	09/01/1998
磁阻式磁頭製程	李昭松	和喬科技股份有限公司	08/06/1998
Computational Electromagnetics	Ken Morgan	Fellow of Royal Academic of Eng., Univ. of Wase	09/16/1998
Introduction to D-Branes in String Theory	賀培銘	台大物理系	09/18/1998
鈮酸鋰的光電特性及應用	王維新	台大電機系及光電所	09/24/1998
The Earth's Main Field	莊曜勵	中央研究院物理所	09/24/1998
宇宙的一生	孫維新	中央大學天文所	09/25/1998
太陽系之起源與演化	陳文屏	中央大學天文所	09/25/1998
生物的演化	周延鑫	國立自然科學博物館	09/25/1998
人類的演化	王道還	中央研究院史語所	09/25/1998

演　講　題　目	演講者姓名	所　屬　機　構	日　期
Some Examples of Weak Matrix Elements on the lattice	Chi-Jen Lin	UKQCD Collaboration Univ. of Edinburgh	09/25/1998
Fun With DNA-Some Aspects of Complete Bacterial Genomes	李弘謙	中央大學物理	09/30/1998
Molecular Beam Epitaxy of InGaAs Quantum Dots	蔡振瀛	中央大學電機系	10/08/1998
$\Delta I=3/2$ Amplitude and CP Violation in Hyperon Decays	何小剛	台灣大學物理系	10/09/1998
On the Rooted Tutte Polynomial	伍法岳	美國東北大學	10/14/1998
Recent Progress in Plasma and Fusion Research	劉全生	Univ. of Maryland 及國家理論科學研究中心	10/14/1998
Angle-Resolved Photoemission Study of the Electronic Structures of $AuAl_2$ and $PtGa_2$	徐力行	彰化師範大學物理系	10/17/1998
Integer Quantum Hall Transition : An Example of Quantum Phase Transition	Chang-Ming Ho	Theoretical Physics, Oxford and Dept. of Applied Physics, Univ. of Tokyo	10/20/1998
Framentation of Percolation Clusters in General Dimensions	Iksoo Chang	Dept. of Physics, Pusan University	10/21/1998
Toward ACFA Joint Linear Collider : Physics at the e+e- Linear Collider	Takayuki Matsui	KEK-JLC Group	10/23/1998
地球的組成及起源	劉玲根	中央研究院地球科學研究所	10/28/1998
Fun with SO(10)	李文隆	師範大學物理系	10/30/1998
Heavy Hadron Lifetimes in PQCD	李湘楠	成功大學物理系	10/30/1998
Prospects of Magnetic/Superconducting Single-Electron Transistors	陳啓東	中央研究院物理所	10/30/87

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Neutrino Nucleus Neutral Current Interactions	高崇倫	台灣大學物理系	11/02/1998
Quasi-SUSY Parametrization : THDM Versus Massm Via Radiative Correction to $e^+e^-\to H^+H^-$	Abdesslam Arhrib	Faculty of Sciences and Techniques, Univ. of Tanger Morocco	11/03/1998
Prospects of Scanning Probe Microscope Based Nanolithography	果尙志	清華大學物理系	11/04/1998
$B\to\eta'Xs$ Inclusive Decays and NLO Effective Hamiltonian	林貴林	交通大學物理系	11/06/1998
活耀星系與黑洞	孫維新	中央大學天文所	11/11/1998
The $\Lambda_b\to p\lambda\nu$ Decay in Perturbative QCD	施賢鴻	中央研究院物理所	11/13/1998
From Chaos in Hamiltonian Dynamical System to Relaxation in Complex Materials	K.L. Ngai	Naval Research Lab., Wash. D.C., USA	11/16/1998
Cold Dark Matter and Its Detection	吳建宏	中央研究院物理所	11/16/1998
Application of Ion Beam on Solid State Research	朱唯幹	美國德州休士頓大學物理系	11/19/1998
Cosmic Microwave Background Anisotropies	Dick Bond	Canadian Institute for Theoretical Astrophysics	11/19/1998
Do puzzles in "Top" samples point to new physics?	J. Antos	中央研究院物理所	11/20/1998
Dirac Theory for Electron and Space-time Structure	林駿	交通大學電子物理系	11/23/1998
差動共焦顯微術及其應用	汪治平	中央研究院原分所	11/25/1998
Resonant X-ray Scattering near the Iron K Edge Terfenol-D Single Crystals	洪雪行	同步輻射研究中心	11/25/1998
B-meson Bound States	張爲民	成功大學物理系	11/27/1998

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Disorder, Quantum Chaos, and Localization	張爲民	成功大學物理系	11/27/1998
Physics Research in Lithuania & Spectroscopy and its Application	Zenonas Rudzikas	State Inst. of Theoretical Phys. & Astronomy Vilnius, Lithuania	12/01/1998
Alternative Interpretation of the Tevatron Top Events	張維甫	清華大學物理系	12/04/1998
The Physics of Hollow Lithium	鍾光組	North Carolina State Univ. 及國家理論研究中心	12/09/1998
Temperature Analysis of Magnetization Process in Soft Magnetic Materials	Ivan Tomas	Dept. of Magnetism Czecholovak Academy of Sciences	12/10/1998
W_R effects on CP Asymmetries in B Meson Decays	姚　珩	師範大學物理系	12/11/1998
Graphite Encapsulated Metal Nanocrystals	鄧茂華	台灣大學地質系	12/15/1998
Particles Physics from LEP to LHC	Ben Shen	U.C. Riverside	12/17/1998
Status of Recent Parton Distribution Analyses	賴宏亮	清華大學物理系	12/18/1998
Two-Phonon Octupole Vibrations in ^{208}Pb- The Past , Present, and Future Study	Minfang Yeh	WSU	12/21/1998
Application of Field Theory to Condense Matter Physics and Other Areas(I)	Tony Zee	Univ. of California Santa Barbara, Inst. for Theoretical Physics	12/21/1998
Scalar top quark as the next-to-lightest supersymmetric particle	周志隆	Stanford, SLAC	12/23/1998
Nanotube Materials and Novel Properties	盧建平	University of North Carolina	12/24/1998
Application Physical Techniques to Biological Systems	Shyue Chu Ke	Emory University, USA	12/28/1998

演　講　題　目	演講者姓名	所　屬　機　構	日　期
Superconductivity , Bose Condensation and Pairing Correlations in Low Dimensional Systems	Armen N. Kocharian	Dept. of Physics ans Astronomy, California State Univ.	12/29/1998
Monopoles and Instantons	Kimyeong Lee	Seoul National University	12/31/1998
The LHC-ALTAS Experiment (with focus on the muon system)	Uwe Bratzler	Max Planck Inst., Munich, Germany	01/04/1999
New Effects on Ferromagnetic Nanostructures	N. Giordano	Purdue University	01/13/1999
Protein Folding: A Physicist's Approach	Ho Lee	Rockfeller University	01/13/1999
Obtainment of very low temperatures in the Mk range: different principles and systems	Philippe Hernandez	Cryo-Generation Dept., Air Liquide	01/22/1999
Shape Equation of Single-and Multi-Bilayer Vesicles of Membranes and Extension to Coil Formation in Carbon Nanotubes (I)	Zhong-Can ou-Yang	Inst. Theo. Phys. Acad. Sinica, Beijing	01/25/1999
Number of Periodic Orbits in 1D Continuous Maps of the Interval-Complete Solution of the Counting Problem	Bai-Lin Hao	Inst. of Theo. Phys., Acad. Sinica, Beijing	01/29/1999
Some New Scaling Relations for Particles, whose Velocities are Randomly Reset	Yih-Yuh Chen	Dept. of Phys., National Taiwan Univ.	01/29/1999
Synchronize in Coupled Map Lattices	Prashant M. Gade	Inst. of Phys., Academia Sinica, Taipei	01/29/1999
Multistability and High Dimensional Chaos in a Microwave Device with Time-Delay Feedback	You-Hsien Shiau	Inst. of Phys., Academia Sinica, Taipei	01/29/1999
Effects of Quenched Disorder on Chaotic Diffusion of Simple Maps	Hsen-Che Tseng	Dept. of Phys.,National Chung-Hsing Univ.	01/29/1999

演　講　題　目	演講者姓名	所　屬　機　構	日　期
The Novel Nucleation and Growth in Ge/Pb/Si(111)	Ing-Shouh Hwang	Inst. of Phys., Academia Sinica	02/01/1999
A connection between inclusive decay rates of bound and free heavy quarks	Ilya Narodetskii	ITEP, Moscow	02/02/1999
Effects of supersymmetric CP phases on the $B\rightarrow X_s\gamma$ and $B_s\rightarrow X_s\lambda^+\lambda^-$ decays in the minimal supergravity model	Y. -Y. Keum	KEK and APTCP	02/03/1999
Obtainment of very low temperatures in the Mk range: different principles and systems	Philippe Hernandez	Cryo-Generation Dept., Air Liquide	02/03/1999
Monolayer Phase Transition in Liquid Crystal Model	Zhong-Can ou-Yang	Inst. Theo. Phys. Acad. Sinica, Beijing	02/03/1999
Berry Phase in Condensed Matters	牛　謙	Univ. of Texas, at Austin, Natl. Center for Theoretical Sci., Taiwan	02/23/1999
Topics in Biophysics	陳長謙	中央研究院化學所	03/03/1999
Inclusive and exclusive B decays	楊桂周	中央研究院物理所	03/12/1999
Searching for new physics in $b\rightarrow s\,s\,d$ decay	呂才典	北京大學	03/17/1999
The AMS RICH Detector on the International Space Station	任忠良	中央研究院物理所	03/19/1999
Evidence for Coulomb Charging in an open quantum dot at zero magnetic field	Chi-Te Liang	Cavendish Lab., Univ. of Cambridge	03/19/1999
Progress of the LEPS project at Spring-8	T. Mibe	RCNP, Osaka University	03/23/1999
Recent important result of nonzero ε'/ε for direct CP violation in Kaon system and its implications	何小剛	台灣大學	03/26/1999

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The scattering of photons and neutrinos in Astrophysics	高　鍾	University of Wisconsin	03/30/1999
Coercivity and Magnetic Study of Quenched SmFeSiC Ribbons	張宏偉	清華大學材料所	03/30/1999
Compositionally-induced surface phase transitions in alloys	鄭偉鈞	台灣科技大學	04/06/1999
Quantum Monte Carlo Simulation Methods(1)	Naoki Kawashima	Dept. of Phys., Tokyo Metro. Univ.	04/06/1999
Pairing Correlation of t-J model Studied by Power-Lanczos	Y. C. Chen	Dept. of Phys., Tung Hai Univ.	04/06/1999
Quantum Monte Carlo Simulation Methods(2)	Naoki Kawashima	Dept. of Phys., Tokyo Metro. Univ.	04/06/1999
Neel Temperature and Magnetic Phase Boundary of the Spin-1/2 Heisenberg Antiferromagnet in Three Dimensions	Kok Kwei Pan	Dept. of General Studies, Chung Gung Univ.	04/06/1999
Quantum Monte Carlo Simulation Methods(3)	Naoki Kawashima	Dept. of Phys., Tokyo Metro. Univ.	04/06/1999
Quantum Monte Carlo Simulation Methods(4)	Naoki Kawashima	Dept. of Phys., Tokyo Metro. Univ.	04/07/1999
Charge and Spin Dynamics of Hubbard Chains	Youngho Park	Inst. of Phys., Academia Sinica	04/07/1999
A Brief Journey Through Space Physics	李羅權	成功大學理學院	04/07/1999
Some Properties of Decagonal Quasicrystals	張殿林	中國科學院北京物理所	04/08/1999
Quarks in Nuclear Physics	Dinghui Lu	台灣大學物理所	04/09/1999
Phase diagram and transport property of manganites with colossal magneto-resistance	丁秦生	國家科學理論研究中心	04/14/1999
CP violating b→s γ decay ans Bs-Bs mixing in Supersymmetric Model	蔡俊謙	台灣大學物理所	04/16/1999

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Direct CP Violation in Charmless Hadromic Two-body Decays of Bd ans Bu Mesons	陳耀煌	成功大學物理所	04/23/1999
Novel Thermoelectric Materials	Ctirad Uher	University of Michigan	04/27/1999
磁性流體研究	洪姮娥	台灣師範大學物理系	04/28/1999
Massive Torsion Modes and the ABJ Anomaly	許祖斌	理論物理中心	04/30/1999
The Origin of Hairpin Vortices in a Turbulent Boundary-Layer	鮑咸平	成功大學水利及海洋工程系	05/03/1999
Non-equilibrium relaxation study of the critical phenomena	Nobuyasu Ito	Dept. of Applied Phys., Univ. of Tokyo	05/03/1999
Control parameter in granular convection	Keiko M. Aoki	Inst. of Comp. Fluid Dynamics, Tokyo	05/03/1999
Solid-fluid transition of polydisperse particle systems	Nobuyasu Ito	Dept. of Applied Phys., Univ. of Tokyo	05/03/1999
Helix-coil transition in DNA	Sh. A. Hayrian	Inst. of Phys., Academia Sinica	05/03/1999
Efficient simulation algorithms of Ising and particle system	Nobuyasu Ito	Dept. of Applied Phys., Univ. of Tokyo	05/04/1999
Monte Carlo dymaics in optimization	T. K. Lee	Inst. of Phys., Academia Sinica	05/04/1999
Sign cos(γ) from Rare Hadromic B decays	侯維恕	台灣大學	05/06/1999
Leptonic Phenomenology of a complete Theory of Supersymmetry without R-parity	江祖永	國家理論研究中心	05/12/1999
超微顆粒之合成技術	戴遐明	北京市精細陶瓷實驗室兼超細粉研究室	05/12/1999
分數量子霍爾效應－新發現的量子流體	孫允武	中興大學	05/12/1999

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On the Amplitude between J/ and Vector Glueball 0	詹傳宗	台灣大學物理所	05/21/1999
The ΔI=1/2 rule in Kaon system: a new look	鄭海揚	中央研究院物理所	06/04/1999
Renormalization in the internal space	Janos Polonyi	Louis Pasteur University, Strasbourg, France	06/07/1999
Perturbative 1/M correction in heavy hadron decays	李湘楠	成功大學物理所	06/08/1999
The Neutrion-Photon Interaction in the Presence of a Background magnetic Field .	黃建文	交通大學物理所	06/11/1999
Extended Boltzmann Equation Approach to Giant Mangetoresistance in Magnetic Multilayers	邢定鈺	南京大學	06/17/1999
Introduction to Genetic Algorithm	Tai-WeiYau	台灣大學光電工程研究所	06/17/1999
Quantum Manipulations of Single Charge Devices	陳啓東	中央研究院物理所	06/23/1999
Nonlinear Optics of Random Media: Fractal Composites and Percolation Films	Vladimir M. Shalaev	Dept. of Phys., New Mexico State Univ., U.S.A.	07/01/1999
Kont Theory and Functional Ingegrals	L. H. Kauffman	Univ. of Illious at Chicago Circle	07/26/1999
生物科技及智慧財產權之維護及移轉	梁啓銘	中研院公共事務組主任	08/04/1999
Exotic Kondo Effects in Metals	蔡炎熾	中正大學物理系	08/13/1999
Multi-Self-Overlap Ensemble Monte Carlo Method for Lattice Protein Models	Prof. Macoto Kikuchi	Osaka Univ., Japan	08/23/1999
Universal Quamplitutes in Finite-Size Scaling O(N) Spin Models	Prof. Martin Weigel	Univsität Leipzig, Gemany	08/24/1999

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Colossal Magnetoresistance and Phase Transitions in Manganese Oxides	邢定鈺	南京大學微結構物理國家重點實驗室	08/24/1999
磁性單電子電晶體之特性研究	陳啓東	中央研究院物理研究所	08/24/1999
超導、鐵磁多層膜之物性	李尚凡	中央研究院物理研究所	08/24/1999
超微粒物質之熱特性研究	陳洋元	中央研究院物理研究所	08/24/1999
超微粒物質之磁特性研究	姚永德	中央研究院物理研究所	08/24/1999
Statistical Properties of in utro cell cultures	Prof. Andras Czkrok	Eotvos University	08/30/1999
Universal Finite-Size-Scaling Function of Pure and Ising Models	Prof. Yusuke Tomita	Dept. of Phys., Tokyo Metropolitan Univ., Japan	08/31/1999
Universal radio of critical amplitueles for 2D site-diluted Ising model	Prof. Lev. N. Shchur	Landau Institute for Theoretical Physics	09/06/1999
Introduction to Landau Institute for Theoretical Physics	Prof. Lev. N. Shchur	Landau Institute for Theoretical Physics	09/08/1999
血液循環系統分析	林玉英	師範大學物理系	09/08/1999
New mechanism of X-ray radiation from a relativistic charged particle in dielectric random medium	Prof. Zh. S. Gevokian	中央研究院物理研究所	09/09/1999
Recent Development in the CP Violation of Supersymmetric Theories	張達文	國立清華大學	10/01/1999
Soft-Condensed Matter Journal Club: Statistical Properties of Fracture Precursors	梁鈞泰	中央研究院物理研究所	10/04/1999

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Acoustic Imaging in Helioseismology : A New Method to Probe the Solar Interior	周定一	清華大學物理系	10/06/1999
Determination of CKM Phase γ from Charmless Hadronic B Decay Rates	侯維恕	台灣大學物理系	10/08/1999
Topological phase Electromagnetic Dualities and Atomic Beam Experiments	何小剛	台灣大學	10/15/1999
Soft-Condensed Matter Journal Club: Light Scattering near the Localization Transition	杜其永	中央研究院物理研究所	10/18/1999
Investigation of the critical behaviour of the classical 3D n-vector magnetic model in the framework of the renormalization group approach and application of the collective variables method	Zoryana Usatenko	Institute for Condensed Matter Physics of the National Academy of Science, Ukraine	10/18/1999
音樂與心靈	黃奕明	國家交響樂團	10/20/1999
High Refractive Index Nano-materials	林唯芳	台灣大學材料所	10/21/1999
Surface Analysis of Silicon on Insulator Materials and Metal Films	林更青	University of Maryland, College Park	10/22/1999
Investigation of the critical behaviour diluted Ising Model in the framework of the massive field theory	Zoryana Usatenko	Institute for Condensed Matter Physics of the National Academy of Science, Ukraine	10/25/1999
One-dimensional spin-orbital model : A bosonization approcah	Yu-Li Lee	清華大學物理系	10/29/1999
A Comparison of Metropolis and Swendsen-Wang Algorithm	Tzuu-Shuh Chiang	Institute of Math., Academia Sinica	11/01/1999
Soft-Condensed Matter Journal Club: Super-rough Interfaces	龐寧寧	國立台灣大學	11/01/1999

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Polarized Λb in PQCD	施賢鴻	中央研究院物理研究所	11/05/1999
Raman study of single-walled carbon nanotubes prepared by the electric arc method	Serge Lefrant	I' Institut des Materiaux Jean Ronxel, Nantes	11/05/1999
Physics Beyond the Standard Model	袁簡鵬	國家科學理論研究中心	11/10/1999
Effect of threshold resummation	賴宏亮	成功大學物理系	11/19/1999
Dimers and spanning trees : New results for lattices in d dimensions	伍法岳	Northeastern Univ. USA	11/19/1999
Soft-Condensed Matter Journal Club: Floppy modes in disordered configurations	馬文忠	中央研究院數學所	11/22/1999
Renormalization Group and Gauge Symmetry	廖先彬	中正大學物理系	11/26/1999
Bounds on heavy-to-heavy weak decay form factors	蔣正偉	Physics Department, Carnegie Mellon University	11/30/1999
Atomic Structures by Direct Inversion of Diffraction Patterns	魏金明	中央研究院物理所	12/01/1999
Soft-Condensed Matter Journal Club: Recent Studies on a Simple Coupled System	葉真	國立中央大學	12/06/1999
精微熱流控制	王安邦	台灣大學應力所	12/08/1999
Advanced Vapor Phase Manufacturing Processes for High Temperature Superconductor Tapes	Shing-Jen Peng	Ginzton Laboratory, Stanford University,CA	12/08/1999
Charged Higgs Boson Phenomenology at a Muon Collider	A. G. Akeroyd	KEK	12/09/1999
音樂賞析：貝多芬 D 小調第九交響曲（歡樂頌）	黃奕明	國家交響樂團	12/10/1999

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Systematic Low Temperature Expansion in Ginzburg-Landau Model	高賢忠	淡江大學物理系	12/10/1999
Soft-Condensed Matter Journal Club: Percolation Rigidity	Zicong Zhou	中央大學物理系	12/13/1999
Magnetic Excitons in Heavy Fermion Semiconductors	Peter S. Riseborough	Polytechnic University New York	12/15/1999
微機電系統技術發展現況與未來趨勢	吳清沂	工研院微系統實驗室	12/15/1999
γ Determination from B→Kπ Decays in PQCD·	李湘楠	成功大學物理系	12/17/1999
Electrical and Mechanical Nanomeasurements of Carbon Nanotubes in Transmission Electron Microscope	Zhong Lin Wang	School of Materials Science and Engineering Georgia Institute of Technology, Atlanta	12/22/1999
以肥皂模進行流體力學實驗	溫志湧	大葉大學機械系	12/22/1999
Portal Computing	吳國維	蕃薯藤	12/22/1999
CP violation induced by the R-L down squark mixing	Chun-Khiang Chua	Physics Dept. NTU	12/24/1999
Electroweak Symmerty Breaking from Extra Dimensions	Hsin-Chia Cheng	Physics Dept. of Chicago	12/31/1999

Visiting Scholars

中央研究院物理所八十八年度訪問學人表

(1998 年 7 月~1999 年 12 月)

訪 問 人 姓 名	所　屬　機　構	訪　問　期　間
蔡定平	中正大學	07/01/1998--06/30/1999
李金	中國科學院高能物理所	07/01/1998--07/15/1998
陳紹平	Los Alamos National Lab.	07/01/1998--07/31/1998
李正雄	阿岡國家實驗室	07/02/1998--07/06/1998
唐叔賢	香港大學	07/02/1998--07/06/1998
伍法岳	美國東北大學	07/02/1998--07/06/1998
高鍾	威斯康辛大學	07/06/1998--07/15/1998
李匡邦	美國麻省羅爾維大學	07/20/1998--08/30/1998
梅維寧	美國尼布拉斯加大學	07/20/1998--08/20/1998
Douglas Osheroff*	美國	07/21/1998--07/30/1998
陳丕燊	史丹福加速器中心	07/28/1998--08/07/1998
盛華義	中國科學院	08/01/1998--08/31/1999
金勇	法國國家科學研究中心	08/05/1998--08/11/1998
蔡振水	UC, Irvine	08/09/1998--08/16/1998
Shirley C.Tsai	Calif State Univ, Long Beach	08/09/1998--08/16/1998
張益壽	韓國釜山大學	08/10/1998--08/30/1998
張爲民	成功大學	08/26/1998--06/30/1999
David Lin	英國愛丁堡大學	09/25/1998--09/25/1998
Jaroslav Antos	斯洛伐克科學院	10/01/1998--11/30/1999
伍法岳	美國東北大學	10/13/1998--10/19/1998
張益壽	韓國釜山大學	10/17/1998--10/25/1998
莊保安	中國科學院高能物理所	11/01/1998--12/31/1998
王佩良	中國科學院高能物理所	11/01/1998--12/31/1998

＊國際重要科技人士

訪問人姓名	所屬機構	訪問期間
趙平平	中國科學院高能物理所	11/01/1998--12/31/1998
Evgeni V. Ivashkevich	Bogoliubov Laboratory of Theoretical Physics	11/15/1998--12/14/1998
K. L. Ngai	Naval Research Lab.	11/15/1998--11/17/1998
E. W. Fischer	Max Planck Polymer	11/15/1998--11/17/1998
趙棣新	中國科學院高能物理所	12/01/1998--01/31/1999
袁堅	北京中國科學院	12/11/1998--04/10/1999
Nick M. Miskovsky	美國賓州大學物理系	12/19/1998--01/11/1999
Peter Kleban	美國緬因大學	12/21/1998--01/02/1999
李匡邦	美麻省羅爾維大學	12/23/1998--01/25/1999
李淇明	韓國漢城大學	12/24/1998--01/04/1999
蔡振水	UC, Irvin	12/31/1998--01/14/1999
李浩	美國洛克菲勒大學	01/09/1999--01/15/1999
李浩	美國洛克菲勒大學	01/22/1999--01/23/1999
蘇宗濼	北京中國原子能科學院	01/22/1999--01/27/1999
Y. Y. Keum	Theory Division KEK Japan	01/26/1999--02/09/1999
I. Narodestskii	Russian Research Center	01/26/1999--02/10/1999
崔章琪	本院院士	02/03/1999--02/06/1999
崔瑩鎮	韓國仁荷大學	02/21/1999--03/05/1999
趙平平	中國科學院高能物理所	03/11/1999--07/10/1999
王佩良	中國科學院高能物理所	03/11/1999--07/10/1999
呂才典	日本廣島大學	03/15/1999--03/28/1999
伍法岳	美國東北大學	03/19/1999--03/28/1999
顏東茂	美國康乃爾大學	03/26/1999--03/26/1999
高鍾	美國威斯康辛大學	03/28/1999--03/31/1999
Naoki Kawashima	Tokyo Metropolitan Univ.	04/03/1999--04/10/1999
Viatcheslav B. Priezzhev	Lab of Theoretical Phys. Dubna Russia	04/15/1999--05/08/1999
James C. Ho	Wichita State Univ.	04/27/1999--06/25/1999

訪問人姓名	所屬機構	訪問期間
G. G. Fecher	Johame Gutenberg U. of Mainz	05/01/1999--06/30/1999
趙棣新	中國科學院高能物理所	07/01/1999--10/31/1999
林玉英	台灣師範大學	07/01/1999--09/20/1999
陳啓明	台灣師範大學	07/01/1999--08/31/1999
朱經武	美國休士頓大學	07/05/1999--07/07/1999
李匡邦	美國麻省羅爾維大學	07/08/1999--09/08/1999
彭仲康	Harvard Medical School, USA	07/13/1999--08/11/1999
儒森斯坦	交通大學	07/15/1999--09/15/1999
梁培德	美國波特蘭大學	08/01/1999--03/31/2000
崔瑩鎮	韓國仁荷大學	08/04/1999--08/19/1999
Jeanman Sur	韓國釜山大學	08/08/1999--08/11/1999
Kipom Kim	韓國釜山大學	08/08/1999--08/11/1999
Lev. N. Shchur	Landau Institute for Theoretical Phys. Russian Academy of Sciences	08/16/1999--09/16/1999
Vladimir Morozov	Yerevan State Univ.	08/16/1999--09/16/1999
歐陽鐘燦	中國科學院	09/11/1999--09/20/1999
董錦明	南京大學	09/15/1999--12/14/1999
李金	中國科學院	10/01/1999--01/31/2000
郭子斯	美國紐約州立大學	10/22/1999--10/31/1999
Y. Y. Keum	Theory Division KEK Japan	11/01/1999--12/31/1999
辛哈	印度馬德拉斯數生科學研究中心	11/22/1999--12/03/1999
柯奈爾	Mainz University	11/29/1999--12/02/1999
白勝元	日本國家實驗室	12/08/1999--12/17/1999
K. L. Ngai	Naval Research Lab	12/12/1999--12/19/1999
劉延	中國科學院高能物理所	12/15/1999--04/14/2000
徐碩昌	中國科學院	12/16/1999--03/15/1999

訪問人姓名	所屬機構	訪問期間
李匡邦	麻省羅爾維大學	12/22/1999--01/25/2000
熊詩杰	南京大學	03/01/2000--06/30/2000
唐澤眉	中國科學院	04/20/2000--05/05/2000
陶祖萊	中國科學院	06/01/2000--09/30/2000

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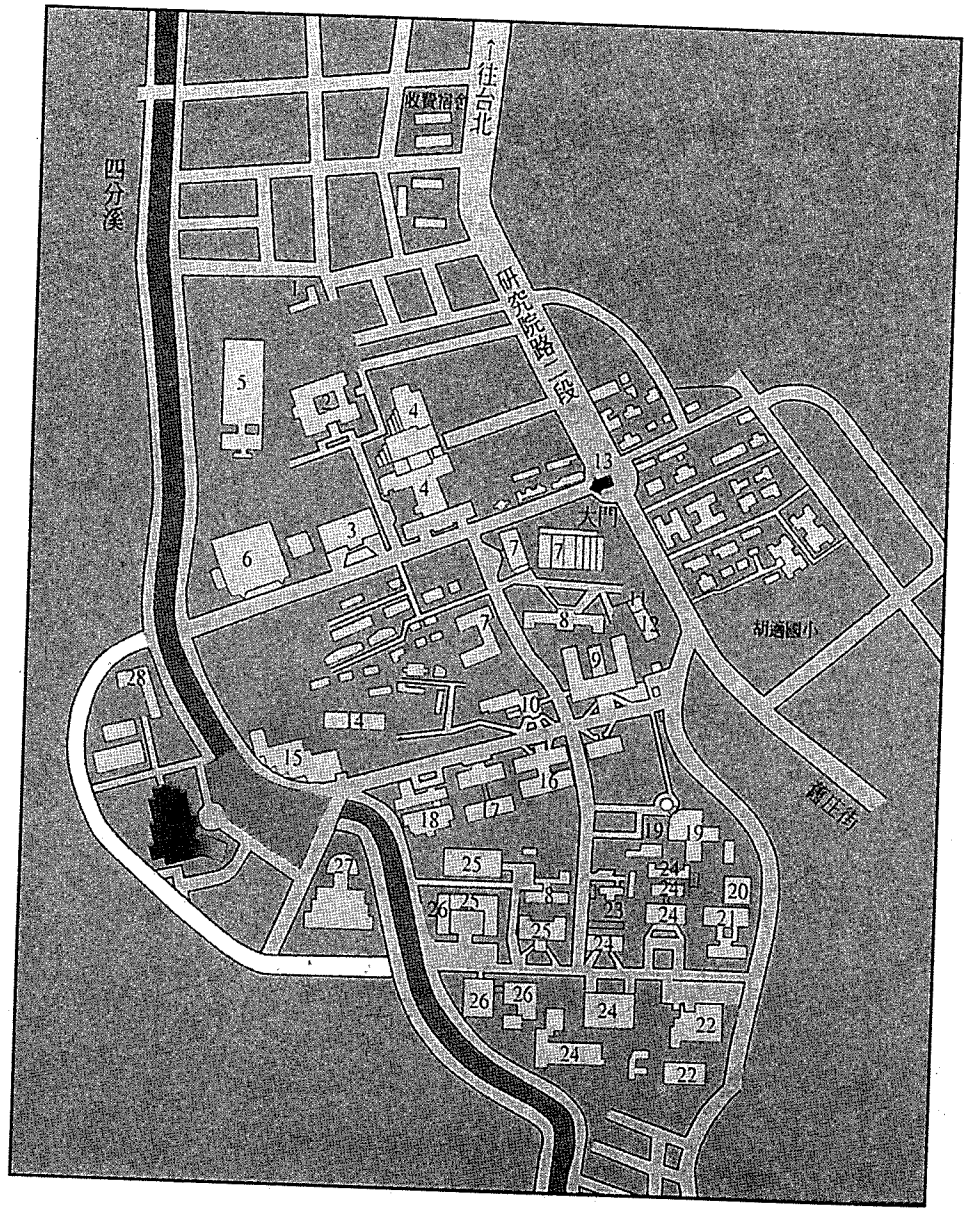

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中央研究院物理研究所年報

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物理研究所年報

第二十七卷

發行人：姚永德
編輯者：中央研究院物理研究所(出版小組)
出版者：中央研究院物理研究所
通訊地址：台北市南港區研究院路二段 128 號
電　話：(02) 2789-9612, 2788-0058
傳　真：(02) 2783-4187
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