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I

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II

Review of Research Projects

HYDRODYNAMICS AND ATMOSPHERIC PHYSICS

1. Review of Research Activities

(1) Basic Research in Hydrodynamics

a. Visualization of air bubble stream in stratified water
b. Shear and wall effects on vortex shedding behind an obstacle
c. Turbulence intensity and mean flow behind two cylinders
d. Diffusion and mixing of buoyant jets

(2) Numerical Methods

a. Numerical investigations of turbulent vortex shedding flows
b. Numerical simulations of three-dimensional low-Reynolds number flows
c. Numerical experiments of monotone semi-Lagrangian method
d. Simulation on liquid bridge
e. Numerical simulation of air bubble plume under seawater

(3) Atmospheric Physics

(4) Physics of Complex Fluids

a. Polymer conformation in binary mixture
b. Electrorheological fluid
c. Surfactant Driven Instability in a Hele-Shaw Cell
d. Flow in Granular Systems
e. Phase change in zone melting crystal growth under gravity

2. Facilities

(1) Water Channel Laboratory

(2) Optical Hydrodynamic Laboratory

3. Future Outlook

(1) Basic and applied research of turbulence

(2) Two-dimensional turbulence in soap film

(3) Physics of complex fluids

(4) Fluids under microgravity

1. Review of Research Activities

The members of our group are very active in conducting both basic and applied researches related to the physics of fluids. The basic research projects span the area of turbulence, two-dimensional flow, instability driven by surfactants, flow in granular systems, phase transitions of complex fluid and nonlinear oscillations problem. In applied researches, we are studying environmental fluid mechanics, mixing and diffusion of bouyant jets, numerical scheme for dilute gas-particle nozzle flow and modeling of atmospheric radiation related to remote sensing problems. Brief descriptions of these ongoing projects are given below.

(1) Basic Research in Hydrodynamics

a. Visualization of air bubble stream in stratified water:

We are studying the behavior of gas well blowout under sea water. The spreading characteristics of the air bubble stream in density stratified water setup in a water tank is investigated experimentally. A CCD camera is used to observe the flow pattern and the imaged data were analyzed by digital image processing technique. We found that the air bubble stream characteristics were strongly affected by the flow rate air discharge and the ambient stratification. In the future, we shall carried out detail measurement of the flow field of the air bubble stream.

b. Shear and wall effects on vortex shedding behind an obstacle:

The motion of flow over a bluff body arises in various engineering problems. It results in the wake frequently associated with unsteady and periodic vortex shedding. When the obstacle is near a wall, the effect of shear due to the wall cannot be ignored. Using numerical method, we investigate the effect of the shear rate of the ambient stream on the Stroke number and the dynamical force over the obstacle. We found that the presence of the wall affects the behavior of vortex shedding such that the frequency and the flow development in the wake are modified. In the future, we are going to extend our study to the turbulent regime by increasing the Reynold number and to compare the flow development when the ambient conditions are changed.

c. Turbulence intensity and the mean flow behind two cylinders:

Turbulence has been on of the unsolved problems in physics. Understanding the basic behavior of turbulence is necessary for both academic and practical reasons. Since cylinders in side by side arrangement are commonly encountered in practice, we are studying the turbulence intensity effect on the mean flow behind two cylinders in such arrangement. Using hot wire anemometer and A/D converter, we are able to

measure the turbulence signal. The statistical properties of the flow field are extracted from the digital turbulence signals by standard statistical methods. By separating the turbulence intensity from the conventional mixing of the mean velocity from our measured data, we found that stronger turbulence intensity is favorable to the development of wake mean velocity profile behind the cylinders. Also the vortex shedding frequency varies with turbulence intensity. We will investigate the Reynold Stress variation under different turbulence intensity case in the future.

d. Diffusion and mixing of buoyant jets:

Turbulence mixing of buoyant jets is significant and important in practical engineering applications such as dispersion of the plume of smoke from industrial chimney into atmosphere and the use of ocean-outfall to release sewage water into ocean. In order to design waste disposal system we need to understand the mixing and dilution process for buoyant development and to establish the capability of estimating the rise and width of buoyant jet. Using both experimental and numerical approaches, we found that i) ambient density stratification limit the vertical rise and restrict the mixing; and ii) the formation of the secondary and the third pairs of vortices causes the jet flow to oscillate from its maximum height-of-rise. We are planning to improve our numerical scheme of turbulence modeling that can account for the effect of density-stratification. The results of the numerical scheme will be compared to our experimental data.

(2) Numerical Methods

a. Numerical investigations of turbulent vortex shedding flows:

Turbulent vortex shedding flows past a square cylinder are numerically investigated. The calculations were carried out both by the second-order turbulence model and the large eddy simulations. The performance of the computations was evaluated by comparing the numerical results with data from available experiments. Results indicate that although the simulations with the second-order closure turbulence model give good agreement in the shedding frequency and mean dray as well as in some phase profiles of the mean velocity, the turbulence model underpredicts the turbulence energy level on the central-line considerably. The agreement of the large eddy simulations of flow structures and turbulence statistics with experimental data is good.

b. Numerical simulations of three-dimensional low-Reynolds number flows:

Low Reynolds number flows over a fence in a channel with a large aspect ratio

W/H=18, are numerically solved both by the two-dimensional approximated and three-dimensional realistic simulations. The result show that the two-dimensional simulations obviously deviate from the experimental data at the symmetrical plane while the three-dimensional simulations fit the experiments well. Flow distributions along the span-wise direction reveal that the main stream motion are nearly two-dimensional, while the flow motions in reversed zone are quit three-dimensional.

c. Numerical experiments of monotone semi-Lagrangian method:

In this project, we plan to use a class of monotone interpolation schemes for solving problems arising in semi-Lagrangian method which has the attractive advantage of long time-step. This numerical scheme follows the wind field characteristics backward in time, and then finds the departure point of the last time-step. Since such point is not usually on regular mesh, and some sort of interpolation is needed. However, the conventional procedures applied for interpolation of the departure point often lead to numerical oscillations. Over- and undershoot occur near strong gradients or discontinuities. This numerical oscillations phenomenon can result in nonphysical negative or super-saturation in a cloud model. In this project, we introduce a special monotone interpolation scheme which is capable of preserving the shape of the solution and of suppressing the numerical oscillations. The monotonicity is maintained by limiting the derivative values or using ideas from the FCT (flux corrected transport) schemes. In this work, we tested the algorithms with non-divergent wind field. We found that our algorithms can indeed suppress the wiggles and preserve the shape of the solution for advective process and in the same time possesses the advantage of semi-Lagrangian scheme.

d. Simulation on liquid bridge:

Liquid Bridge configuration consists of a liquid mass held by surface tension between two parallel, coaxial, solid disks in which the handling of non-confined liquid is required. The well-known crystal growth technique has received much attention. The history of transient behavior in the liquid bridge of half floating zone during drop shaft is simulated. The experiments of the convection in the half floating zone using drop shaft facilities of Japan Microgravity center is going to applied to check the accuracy of the investigation. The gravitational acceleration reduces from 9.8 m/sec^2 to 9.8×10^{-4} m/sec^2 during 0.15 second. The temperature, flow pattern, edge of the free boundary and free surface were measured coordinately in both earth's gravity and micro-gravity conditions. The simulation incorporates multi-phase numerical method based on the volume-of-fluid (VOF) transport equation. The

melt/solid interface mass, momentum and energy conservation are modeled by continuum surface mechanism. The new solution method is developed such that the present VOF model can be applied for the liquid bridge problem. The investigation verifies the fractional volume of fluid VOF cell partitioning approach into a predictor-corrector algorithm to deal with multi-phase (gas-liquid, melt-solid) free surface problems. The computational result compares with the experiment data of Japan Microgravity Center

e. Numerical Simulation of air bubble plume under water:

An integral bubble plume is applied to simulate the behaviors of offshore gas well blowout under seawater. The numerical simulation results are good in comparison with the field data. The bubble plume radius, upward velocity, and buoyancy for different ambient fluid stratification and gas flow rate cases are calculated and investigated. Analysis of the calculated results reveals that: (1) the bubble plume radius increases but terminate rise height decreases when the gas flow rate decreases. (2) Ambient seawater with strong stratification will inhibit the bubble plume rise and reduce its terminal rise height. (3) Seawater stratification effect on the bubble plume terminal rise of height is more significant than that of gas flow rate in several orders of magnitude.

(3) Atmospheric Physics

The two meteorological satellite systems that monitor the weather and storms in the East Asia area are the polar-orbiting NOAA satellites and geostationary satellite called GMS. The GMS has the advantage of giving images more frequently, as often as every half-hour and its coverage is large enough for synoptic weather analysis in the East Asia area. Since the atmosphere always masks the satellite images, modeling of radiative transfer to account for the atmospheric effects is needed to obtain cloud parameters. Therefore cloud analysis chart as derived from the satellite image data is valuable in weather analysis and forecasting. First the satellite data and the radiosonde data were used to make viewing angle correction and the water vapor correction. Then the cloud height and cloud top temperature was derived from the corrected infrared data, and the cloud amount, from the corrected visible data. The sea surface temperature retrieved over the cloudless region was compared with the buoy data collected by NODC. Finally a simple analysis was performed to get the high, middle and low cloud amount, which were in good agreement with the parameterized cloud amount.

(4) Physics of Complex Fluids

a. Polymer Conformation in binary mixture:

Conformation of a linear polymer (Polyacrylic Acid, PAA) in the binary mixture (water + 2,6-lutidine, LW) near the critical point of the LW is studied using dynamic light scattering by which the diffusion of the polymer molecules and the critical composition fluctuation of the LW are observed. When the correlation length ξ of the LW is comparable to the inter-monomer distance within the PAA molecule, the PAA molecule shrinks. The shrinking of the PAA molecule is confirmed by viscosity measurement. At temperature T close to the critical temperature T_c when ξ is comparable to the intermolecular distance of PAA, we find that $\xi \propto (1-T/T_c)^{\nu}$ with $\nu = 0.44\pm0.03$.

b. Electrorheological fluid:

The fluids whose rheological properties can be changed by an imposed electric field, are called electrorheological fluids. They are usually suspension of micron size particles in a non-conducting fluid. We have studied the dielectric response of a rheological fluid made of semi-conductive polymer in silicone oil. By comparing the dielectric spectra of two polymers (polyaniline and sulfonated copolyaniline) with similar chemical structure, we hope to clarify the basic mechanism of the observed the electrorheological behavior of these suspensions. Semiconducting poly(aniline-co-*o*-ethoxyaniline) was synthesized by chemical oxidation polymerization of aniline and *o*-ethoxyaniline with two different molar ratios in an acidic media. Their chemical structure and other physical properties such as conductivity, thermal stability, size and size distribution of the copolyaniline particles were examined by various techniques. Electrorheological (ER) fluids were then prepared by dispersing the copolyaniline particles in silicone oil for various solid volume fractions and their rheological properties under electric field were investigated. It was found that the flow curves (i.e. graph of shear stress vs shear rate) of the ER fluids using the copolyanilines exhibit a minimum around 5 s^{-1} shear rate at finite electric field. To understand such a strange flow curve, we are trying to develop a model based on the electrical conductivity different between the homopolyaniline and copolyanilines.

c. 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. The instability occurs only when the interfacial velocity exceeds a critical value which is determined by the physical parameters of the system. Once the instability occurs, a fingering pattern similar to those produced by directional solidification will be formed. The characteristic wavelength of this fingering patterns decreases with the increase in velocity. 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. Furthermore, not all surfactants can produce this observed instability. Up till now, the basic mechanism of this instability is still unclear.

d. Flow in Granular Systems:

A two dimensional rotating drum experiment and simulation were setup to study the flow and segregation effect produced by the flow in a binary mixture of granular materials. We found by a novel Monte Carlo simulation technique similar to the rules of self-organized criticality that the segregation can be induced by the differences in the frictional properties of the two types of grains. However, our simulation model can only produce segregation in the radial direction. No axial segregation can be observed. New simulation model is now being constructed to produce the axial segregation. In the experiment, imaging technique similar to the PIV in fluid systems is being developed to study the velocity distribution of the granular flow in the drum with a fast video camera. With this camera, we are able to obtain 200 frames of image per second with a spatial resolution of 256×256. Velocity field can be reconstructed from these images. Preliminary results have shown that the motion of the sheared layer of granular flow in the rotating drum can be clearly mapped out by our technique. Future applications of this technique will include the testing of scaling hypothesis of flow with system size.

e. Phase change in zone melting crystal growth under gravity:

The simulation incorporates multi-phase numerical method based on the level-set volume-of-fluid transport equation. The liquid phase, solid phase and the melt/solid interface are handled by a unique governing equation. This can be solved like a single phase problem dealt with enthalpy model by applying the porosity concept to identify the phase change region by applying a Darcy term in the momentum equation. After the enthalpy field is solved at each time step, the temperature and interface position can be obtained from temperature diagram.

Momentum and energy conservation are modeled by continuum surface mechanism. The new solution method is developed such that the present VOF model can be applied for the liquid bridge problem. The objective of the investigation is to develop and versify the fractional volume of fluid VOF cell partitioning approach into a predictor-corrector algorithm to deal with multi-phase (gas-liquid, melt-solid) free surface problems.

2. Facilities

(1) Water Channel Laboratory

We have a water channel in the Water Channel Laboratory to study the hydrodynamic phenomena of under water flow when controlled air current is imposed above the water surface. The channel has a cross section of 60cm × 60cm and 8m long. Flow can be realized by a towing track mounted on the channel or by a closed loop type pumping system that circulate the fluid inside the channel. A wave generator is installed for making wave of various amplitude and frequency. The flow can be measured using hot wire, hot film and salinity gauge. Recently a particle imaging velocimetry system with high resolution camera and digital imaging capability has been developed for quantitative measurement of the flow field in the water channel.

(2) Optical Hydrodynamic Laboratory

We have an optical hydrodynamic laboratory for studying the basic phenomena in complex fluids and non-linear phenomena in hydrodynamics systems. The research instruments include a high resolution (2048×2048 pixels) high dynamic range (16 bit) air cooled CCD camera, a two dimension laser Doppler velocimeter, a commercial goniometer for static and dynamic light scattering measurement, two digital correlators, an optical microscope with a temperature controlled stage that can be cooled down to 196°C, a fluorescent microscope, several image acquisition and analysis systems, a fast line scan camera, ..., etc. There are also many home made instruments for particular experiments. We have several computer controlled programmable temperature air and water bath for studying phase transitions of complex fluids, a laser scanning reflectometer for measuring the shape of liquid interfaces, an automatic film pulling setup with synchronized electric spark and video capture system to observe the rupturing of soap film. A mechanical rotating stage

with wireless communication and remote control for studying granular flow.

3. Future Outlook

Most of our ongoing researches are important topics of the non-linear physics such as the basic and applied researches on turbulence as well as the dynamics of complex fluids. This conform to the future direction in the area of non-linear physics and nano-scale physics of our institute. Some of our planned researches are given below.

(1) Basic and applied research of turbulence

Turbulence is a fascinating phenomenon that one can observed in daily life. It also gets in the way of many engineering problems. Complexity and randomness are the two properties of turbulence. Nevertheless, it follows some general laws which are comprehensible. Theoretically, turbulence can be described by the Navier-Stokes equation, which is non-linear and difficult to solve. Thus, it is very important to develop an accurate, effective and practical numerical scheme for predicting turbulence. On the other hand, precise turbulence experiments and measurement of the turbulence flow field are essential for the development of the theoretical and numerical approaches to the problem of turbulence. With the completion of our new wind tunnel laboratory, better wind tunnels and water tunnels suitable for high Reynold number investigation will be built for the experimental studies of turbulence.

(2) Two-dimensional turbulence in soap film

A soap film, which is created by surfactants, is a novel quasi two-dimensional system suitable for studying basic hydrodynamics phenomena in two-dimension. In the soap film experiments described in the previous sections, we have already mastered the technique of generating stable soap films. We are planning to construct a two-dimensional eccentric Couette cell and a two-dimensional soap film water tunnel. The soap film water tunnel, which will be installed in the new wind tunnel laboratory, will be 10 meter high in order to reach the turbulence regime. The flow field in the soap film water tunnel will be measured using our LDV and PIV systems.

(3) Physics of complex fluids

Complex fluids include polymer, surfactant, liquid crystal, binary mixtures, granular systems, ..., etc. These materials are very common in industrial processes

and studies of these complex fluids originate from the industrial needs and the emphasis of these investigations is put on the engineering aspect. Basic research on complex fluids is difficult because of the internal degree of freedom of the complex fluid and one cannot deduce their dynamical behavior from their static structure. Nevertheless, due to the advance of non-linear science, basic research on the complex fluids is getting more attention. Therefore, we shall continue our works on binary mixture phase separation, polymer solution, soap film, electrorheological fluids and granular systems.

(4) Fluids under microgravity

Research into fluid physics under reduced gravity conditions has been stimulated by basic research and numerous applications. For basic research, investigation includes the shape and stability of liquid surfaces; the bifurcation of convective flow; the stability of Marangoni flows.With respect to applications, studies on surface tension tanks, spacecraft dynamics, crystal growth, the product of composite materials and life sciences are supported by foundation institutes. Fluid physics plays an important role in microgravity research. Each experiment or procedure on basic research, material sciences or life sciences under microgravity environment, involves at least one fluid. In addition,fluid physics dominates many questions of fluid handling and of space stability. We shall corporate with the microgravity research institute to develop microgravity material processes, especially in floating zone technique. The physical phenomena of the floating zone solidification is going to be studied in detail. The free surface and contact line of liquids, nonlinear convection in mushy layer, gravity effects on thermocapillary flow and float zone will be investigated by simulation method.

NUCLEAR PHYSICS AND ACCELERATOR-BASED PHYSICS

1. Experimental Nuclear Physics and Accelerator-Based Physics

(1) Neutrino Oscillation, pilot experiment

(2) Measurement of the Spectra of the $^{11}B(p,2\alpha)^{4}He$ Sequential Decay

(3) L X-Ray Production in Lanthanide Elements by 1-5 MeV Helium Ions

(4) Charge State Dependence of L Shell X-Ray Production Cross Sections of ^{28}Ni, ^{29}Cu, ^{30}Zn, ^{31}Ga and ^{32}Ge by 12 MeV ^{16}O Ions

(5) Particle Induced X-Ray Emission in Multielemental Analysis

(6) Effect of Thermal Annealing on the Ni/Au Contact of p-Type GaN

(7) Resonant Rutherford Backscattering Studies of CeO Thin Film Deposited by RF Sputtering

(8) Analog Transitions in sd- and f- shell nuclei and the isovector part of optical potentials Studied by the (p,n) reaction

(9) The $^{54,56}Fe(d,n)^{55,57}Co$ Reaction and Single-Particle Energies of Nuclei from A=48 to 60

2. Theoretical Nuclear Physics

(1) Studies of Hypernuclei System

(2) Covariant light-front model of heavy mesons within heavy quark effective theory

(3) Field-Theoretic Realization of Heavy Mesons as Composite Particles

(4) Effective Field Theory of Heavy Mesons

(5) Hadron Gas Model in Heavy Ion Collisions

(6) Maximum Entropy-Minimum Norm Solution of the Generalized Inverse Problem

1. Experimental Nuclear Physics and Accelerator-Based Physics

(1) Neutrino Oscillation, pilot experiment

Searching for neutrino oscillation is the most sensitive and effective measurement on neutrino mass and flavour mixing. We continue to carry out a pilot experiment to study the feasibility of a full scale neutrino oscillation experiment with the $\bar{\nu}_e$'s provided by Power Plant-II of the Taiwan Power Company.

Several kinds of scintillation material have been developed and tested with boron loaded. The bulk light yield and attenuation length of these materials seems to be satisfactory for small detector cell. Background investigation, DAQ design, and neutron transport simulation are almost completed. A table top detector module has been constructed for large scale scintillation material manipulation training. Installation of the detector in the experimental site is underway. The phase I data taking will start late 1998.

(2) Measurement of the Spectra of the $^{11}B(p,2\alpha)^4He$ Sequential Decay

The p-^{11}B reaction induced by MeV protons is known to have three identical α particles in the final reaction channels. The complexity in the measurement of the reaction was evidenced by the continuous energy distribution. There appear also interference due to the elastic scattering of protons and arising from impurity of the target as well. We propose a new experimental method with the use of PIPS and ΔE detector system to measure successfully the spectra of $^{11}B(p,2\alpha)^4He$ sequential decay via the first excited state of ^{8}Be. Thin target of highly enriched ^{11}B was prepared by electron gun bombardment. Good energy resolution (13.9 keV) of the detection system was achieved.

(3) L x-ray production in lanthanide elements by 1-5 MeV helium ions

L x-ray production in $_{57}$La, $_{60}$Nd, $_{64}$Gd, $_{68}$Er and $_{71}$Lu was measured for He^+ bombardment in the energy range 1-5 MeV. Very thin target foils were used, and x-ray yields were measured simultaneously with elastically scattered ions. The L-shell and individual L_α, L_β, L_γ and L_l production cross sections and their ratios were extracted. These cross sections are compared to the results of the ECPSSR theory (energy-loss and Coulomb deflection effect, perturbed stationary state approximation with the relativistic correction), its united-atom (UA) extension UA-ECPSSR and the UA-ECPSSR-MI, which also accounts for multiple ionization (MI). With a few exceptions, the standard ECPSSR appears to be better than its modifications when L_β

$/L_\alpha$ and L_γ/L_α ratios are analysed. L_α, L_β, L_γ and L_ℓ and total L x-ray production cross sections, however, are in the best overall agreement with the UA-ECPSSR-MI theory.

(4) Charge State Dependence of L Shell X-Ray Production Cross Sections of $_{28}$Ni, $_{29}$Cu, $_{30}$Zn, $_{31}$Ga and $_{32}$Ge by 12 MeV $^{16}O^{q+}$ Ions

L-shell x-ray production cross sections of elements from Z_2=28 to 32 were measured. A 12 MeV incident oxygen beam, with and without K-shell vacancies, was used to make a charge state dependence analysis. Ultra-thin solid targets were used to approximate single collision events. Simultaneous measurements were made of both scattered particles and x-ray from the ultra-clean foils. Target L-shell to projectile K-shell electron capture for hydrogen-like ($q=Z_1-1$) and fully stripped($q=Z_1$) oxygen ions were then deduced. The measurements are compared with the prediction of the ECPSSR theory using a single-hole fluorescence yield. In general, this theory gives reasonable agreement with the data for oxygen ions without K vacancies while it overpredicts the data for oxygen ions with K vacancies.

(5) Particle Induced X-Ray Emission(PIXE) in Multielemental Analysis

In this paper, we report some recent results of PIXE elemental analysis. Using PIXE technique, measurements for a collection of precious ancient Chinese artifacts have been performed with 3 MeV protons from 9SDH-2 tandem accelerator. From the elemental determination with external-beam PIXE and vacuum-beam PIXE, the major and minor elemental contents of ancient bronzes weapons of Yin-Shang and Chou dynasties(~1600 BC), and Penghu potsherds recently recovered from deep seabed in the Penghu coast near Taiwan. Details of experimental results are given and discussed.

(6) Effect of Thermal Annealing on the Ni/Au Contact of p-Type GaN

In this study, the Ni/Au layers prepared by electron beam evaporation and thermal alloying were used to form Ohmic contacts on p-type GaN films. Before thermal alloying, the current-voltage(I-V) characteristic of Ni/Au contact on p-type GaN film shows non-Ohmic behavior. As the alloying temperature increase to 700 ℃, the I-V curve shows a characteristic of Ohmic contact. The Schottky barrier height reduction may be attributed to the presence of Ga-Ni and Ga-Au compounds, such as Ga_4Ni_3, Ga_3Ni_2, GaAu, and $GaAu_2$, at the metal-semiconductor interface. The diffusing

behavior of both Ni and Au have been studied by using Auger electron spectroscopy and Rutherford backscattering spectrometry. In addition, x-ray diffraction measurements indicate that the Ni_3N and Ga_4Ni_3 compounds were formed at the metal-semiconductor interface.

(7) Resonant Rutherford Backscattering Studies of CeO Thin Film Deposited by RF Sputtering

We have studied the stoichiometry of cerium oxide films deposited by RF sputtering on sapphire and MgO as a function of deposition conditions using the resonant Rutherford backscattering method. We found that some films have the off-stoichiometry of CeO_y with y greater than 2.0. Such an off-stoichiometry cannot be due to a mixture of the known phase of bulk cerium oxide samples. This may be due to either cerium vacancies or interstitial oxygen atomic impurities. The cerium ion x-ray photoemission spectra of those films cannot determine the vacancy of the cerium ions. The c-axis YBaCuO thin films deposited by sputtering on the $CeO_{3.3}$ buffer layer on sapphire was found to be epitaxial. The T_c was 86 K with ΔT_c less than 1 K.

(8) Analog Transitions in sd- and f- shell nuclei and the isovector part of optical potentials Studied by the (p,n) reaction

Quesielastic (p,n) reaction has been studied for sd- and f-shell nuclei at an incident proton energy of 35 MeV. Differential cross sections for isobaric analog $\Delta J^{\pi}=0^{+}$(Fermi;F) transitions and their angular distributions have been measured in a variety of N>Z target nuclei ranging $17 \leqq A \leqq 48$; namely $^{17,18}O$, ^{22}Ne, $^{25,26}Mg$, ^{27}Al, ^{30}Si, ^{34}S, $^{38,40}Ar$, and $^{42,44,48}Ca$. Results have been analyzed by the distorted wave Born approximation (DWBA) theory with macroscopic Lane-model optical potential. The isovector part of the optical-potential has been derived systematically by fitting experimental cross sections for these nuclei. As for the (p,n) reactions on the odd-A nuclei ^{17}O, ^{25}Mg and ^{27}Al, which include $\Delta J^{\pi}=1^{+}$ (Gamow-Teller;GT) and other $\Delta J^{\pi}=2^{+}\sim5^{+}$ contributions together with presently interested $\Delta J \pi =0+$ (Fermi;F) one, microscopic calculations have also been carried out to extract the pure Fermi contribution by subtraction. Also subtracted by microscopic calculations are contributions from the transitions leading to states close to an IAS excited by the (p,n) reaction on some even-even nuclei. The best fit parameters for each reaction are presented. A-dependent global parameters are obtained by least-square fitting.

(9) The $^{54,56}Fe(d,n)^{55,57}Co$ Reaction and Single-Particle Energies of Nuclei from A=48 to 60

In nuclear shell-model, Z or N=20-28 nuclei are expected to have simpler configurations in the ground state wave function, because of large energy gaps between orbits above and below $1f_{7/2}$ and itself. From this point of view, the spectroscopic studies for Sc and Cu isotopes have been done through (d,n) reactions with the Ca(Z=20) and Ni(Z=28) isotope targets in CYRIC.

The (d,n) reaction at higher incident energy is likely to make a one-proton state as target nucleus + one proton. From spectroscopic factors derived as a ratio of experimental differential cross section to one calculated with distorted wave Born approximation (DWBA), we can get information for a target nucleus, such as proton occupation probability and single-particle energies of shell-model orbits. Therefore, the (d,n) reaction plays an important role in the nuclear spectroscopic study.

The experiment was accomplished at CYRIC using AVF cyclotron and 44m time of flight facility. The $^{54,56}Fe$ targets consisted of self-supporting foils with 2.6 and 3.4 mg/cm2 thickness and 97.6 and 99.9% isotopical enrichments, respectively. Angular distributions of the differential cross section were measured between 0° and 70° at laboratory angles. Energy resolutions for the ground states were 200-230 keV. The angular distributions were measured for the states in excitation energy range up to 10 MeV.

In conclusion, we have observed many proton-single-particle states for the $^{55,57}Co$ nuclei by the (d,n) reaction at Ed= 25 MeV in the excitation energy region up to 10 MeV and assigned the transfer momentum ℓ for each state. The obtained spectroscopic factors are considered to be reliable, because they are almost similar to those derived from previous stripping experiments in ^{55}Co and satisfy the sum-rule predicted from the simple shell-model. The proton-single-particle energies calculated from the results of the stripping and pick-up reactions show a clear A-dependence, except ^{54}Fe.

2.Theoretical Nuclear Physics

(1) Studies of hypernucleus Systems

The $^{16}_{\Lambda}O$ hypernucleus is investigated by way of a folded-diagram method. The input G-matrix elements are calculated accurately from the Julich and the Nijmegen realistic hyperon-nucleon potentials with the Pauli exclusion operator properly treated

in the finite hypernuclear system. The effect of hyperon-nucleon-nucleon there-body forces is included through the consideration of the core polarization diagrams. Although our predicted energy spectrum of the hypernucleus is in good agreement with experiment in general, there are significant differences between the J^+ energy levels obtained form these two realistic potentials. The $p_{1/2}$-$p_{3/2}$ spin-orbit splitting given by these two potentials is also rather different. Our method can easily be extended to other hypernuclear systems.

(2) Covariant light-front model of heavy mesons within heavy quark effective theory

In this paper we construct a covariant light-front model of heavy mesons within the framework of heavy quark effective theory (HQET).The covariant model consists of the light-front heavy meson bound states constructed in the heavy quark limit with heavy quark symmetry and heavy quark effective theory as its basis. Within this model, the Isgur-Wise function and decay constants in the infinite quark mass limit can be evaluated in a very simple and most general way. The results are ensured to be consistent with heavy quark symmetry. From the heavy-quark-limit bound states, we can further develop a systematic approach to calculate $1/m_Q$ corrections from the $1/m_Q$ expansion of QCD. This covariant model can serve as a quasi-first-principles description of heavy meson dynamics, namely, a phenomenological covariant bound state in the heavy quark limit which is consistent with heavy quark symmetry, plus a reliable first-principles computation of the $1/m_Q$ corrections in HQET in terms of the 1/mQ expansion of the fundamental QCD theory.

(3) Field-Theoretic Realization of Heavy Mesons as Composite Particles

We construct a covariant field-theoretic model for the structure of a heavy meson in the heavy quark limit. This model overcomes the limitations caused by non-covariance in the light-front quark model, so that it is very useful for studying hadronic matrix elements at arbitrary momentum transfers. Furthermore, the model satisfies heavy quark symmetry and provides a suitable framework for the systematic evaluation of heavy quark symmetry breaking effects caused by $1/m_Q$ correctionsin the heavy quark effective theory of QCD. The Isgur-Wise function, the decay constant, and the axial-vector coupling constant are calculated, and physically realistic results are obtained.

(4) Effective Field Theory of Heavy Mesons

In this paper 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 with heavy quark symmetry (HQS) and the heavy quark effective theory (HQET). Hevay 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 evaluated from this effective theory. All the basic parameters of the HQET, namely, the heavy quark mass m_Q, the heavy meson residual mass $\overline{\Lambda}$, and the HQS breaking mass parameters λ_1 and λ_2, are consistently determined. λ_1 is found to be small due to a large cancellation between the heavy quark kinetic energy and the chromo-electric interaction between the heavy quark and light degrees of freedom. 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 will be used, as the first step in this study on heavy-ion collision, 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.

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.

(6) Maximum entropy-minimum norm solution of the generalized inverse problem

We study the role of different information measures vis-à-vis the maximum entropy-minimum norm method of Baker Jarvis et al. (BJ) for dealing with

undetermined inverse linear transforms. It is shown that the structure of the approximate solutions provided by the BJ approach does not depend on the functional form of the information measure.

PARTICLE PHYSICS

1. Experimental High Energy Physics

2. Particle Phenomenology

(1) Effective Field Theory of Heavy Mesons

(2) Nonfactorizable Effects in Hadronic Charmless B Decays

(3) Nonspectator Effects and B Meson Lifetimes

(4) Twist-3 and Quark Mass Contributions to the Polarized Nucleon Structure Function $g_2(\chi, Q^2)$

3. Gravitation and Cosmology

(1) CMB Anisotropy and Polarization

(2) Scale Invariance and Gravity

1. Experimental High Energy Physics

1997, as usual, is a busy year for our group. The Fermilab fixed target experiment E871 (Hyper CP) started engineering run in the beginning of the year and ended data taking in September. We collected about a billion Cascade and anti-Cascade decay events on tape and are ready to probe matter-antimatter asymmetry at a level of 10^{-4}. Yen-Chu Chen (陳彥竹) played a major role in providing the DAQ software for the experiment. A steady data taking rate of 13 megabytes per second and a maximum rate of 17 Mb/s were achieved, a record in Fermilab experiments. Chili Ho (何其力) was crucial in making the muon chamber work. With the early help of C.S. Yu (于傳松), who visited Fermilab for two months, Chili became the sole expert on the FEM (Front End Module) readout system of the muon chamber. Antonio Wong Chan (黃達年) took over the responsibility of maintaing the Monte Carlo code originally developed at Berkeley. He added the simulation code for muon chamber and clean up the code by going through each subroutine carefully. P.K. Teng (鄧炳坤) was responsible for coordinating the efforts. The experimental run and the initial results were so impressive that the Physics Advisory Committee (PAC) of Fermilab recommends approval of a second run for Hyper CP in 1999, on the condition that we can demonstrate our ability to carry out successful data analysis in May 1998. It is very likely that Hyper CP will be one of the two fixed target experiment approved by Fermilab to run in 1999, just before the collider run II starts. This will keep our group members in Hyper CP experiment busy through end of this century.

Physicswise, Yen-Chu has started to investigate the possibility of looking for CP violation in Omega and anti-Omega decay. How to search for CP violation effects in the decay of a spin 3/2 baryon system is an interesting topic that might not have been thoroughly studied before for lack of quality experimental data. We plan to carry out a theoretical investigation of this issue. Tony is looking into precision measurements of the mass and lifetime of Cascade and anti-Cascade, that will provide a good test of CPT invariance. However, before high quality data analysis can be successfully carried out, a lot of hard work need to be done on the software front. The full simulation has yet to match the data with high precision, the reconstruction code needs to be examined carefully to make sure that it will not introduce unwanted bias into the processed data, *etc*. With the second run coming up, we can only hope for the best.

The design, construction and test of the tracker, the data acquisition (DAQ) and the monitoring computer electronics for the Alpha Magnetic Spectrometer (AMS) started January of this year. 22 different kinds of boards were designed, built, and fully tested to the standard for space operation, from scratch. Two visiting scientists S.X. Wu (吳守庠) and Xudong Cai (蔡旭東) from M.I.T. stationed at the Lung Yuan Science Park (龍園科學園區) of Chung Shan Institute of Science and Technology (CSIST, 中山科學研究院) for eight months, working with H.Y. Wang (王煥玉), visiting scientist of our group from IHEP (北京高能所) and a team of CSIST technician, staff and engineers led by Dr. Cheng-Che Feng (馮澄澈). A.C. Wang (汪安群) and James Oyang (歐陽彥堂) were responsible in getting some 200 kinds of electronics and mechanical components in time. Every component was screened at CSIST. Every board has to go through a series of environmental stress screening (ESS), including vibration test and temperature cycling. Every crate needs to go through similar ESS test as well as electromagnetic compatibility test. These component-level, board-level and crate-level screening and test were conducted at CSIST by a team led by Bruno Yen (閻慧安). An AMS electronics meeting was held in Taiwan in the week of April 21 to iron out any ambiguities in interface of different electronics subsystems. A weekly phone meeting with AMS headquarter was conducted through out the year. We shipped 3 tracker crates and 2 DAQ crates to ETH, Zurich in October. This was "mission impossible" in the eyes of many experienced engineers including those of NASA. However, we have not quite finished yet in shipping the crates. The difficult task of on-board programming, *i.e.*, to program the various EPROM's, DSP's and Xilinx's on boards, is lying ahead and we have less than six months to accomplish it. Professor S.C.C. Ting (丁肇中) asked CSIST to send five software engineers to help. CSIST identified only three: Cheng Chang (張誠), M.L. Huang (黃敏亮) and J.Y. Weng (翁仁一). We enlisted our expert in computing, Ping Yeh (葉平), to lead this team for the impossible mission. AMS detector was integrated at ETH and shipped to Kennedy Space Center in January 1998. Cosmic ray data were taken continuously at ETH since November. They are displayed in the AMS homepage based on a program provided by Ping. AMS is expected to be launched by the shuttle Discovery for a 10-day space flight on June 2 1998.

On the other front, Oyang and our visiting scientist Andrea Gougas, were heavily involved in the design and construction of aerogel threshold counter (ATC) to distinguish electrons and positrons from heavier particles. We provided 150 photo

multiplier tubes and shared the cost of electronics for ATC. The decision to construct ATC for AMS was made only in late 1996. The design was not frozen until Spring of 1997. The detector was built and shipped to ETH in November. Final electronics arrived at ETH in December. The ATC is expected to play a crucial role in rejecting electron background for anti-proton and will allow us to identify anti-protons with energies higher than 2 GeV. It may also help us identify high energy positrons against the tremendous proton background.

The shuttle flight is only a test run for AMS. The real mission will be in 2002, after the International Space Station Alpha is built. AMS is expected to be upgraded after the shuttle flight. Electronics and particle-identification systems are the major items on the agenda. More "impossible" missions are lying ahead for us.

As planned, Henry Tsz-King Wong (王子敬) joined our group in January as a faculty member to lead the efforts of building up a national and international collaboration to conduct a first class reactor neutrino experiment based in Taiwan. The nuclear physics group of the Institute is a full partner of this project. Despite initial encouraging results, the R&D project that we started earlier to search for a boron-loaded liquid scintillator with good light yield, low light attenuation, good α-γ separation capability and low γ detection threshold did not lead to a practical solution. With all efforts, it appears difficult to increase attenuation length much beyond 1 meter while keeping the merit of α-γ separation with the required amount of boron added. The R&D efforts are summarized into a forthcoming publication. Meanwhile, new directions for detecting reactor neutrinos were investigated. During the one-month visit of Jin Li (李金), the Spokesperson of BES (北京譜儀), in July to our Institute, the possibility of building a CsI based electromagnetic calorimeter to observe the characteristic γ-lines as well as electrons, positrons and α-particles resulting from neutrino-nucleus interaction came up. It offers the chance to observe both the charged current and neutral current mediated neutrino-nucleus interactions at the same time. α-N-γ separation in such a detector can be well-achieved by pulse-shape discrimination. Since the idea of detecting neutrino this way has not been tried before, and since CsI based EM-calorimeter is now a matured technology, we decided that it deserves further study by initiating a pilot project of building a 500kg CsI EM-calorimeter, first as an active target to observe neutrino-electron scattering as well as neutrino-Cs and neutrino-I interactions. Later on we can use passive targets such as deuterium or boron compounds. The idea was

presented by Henry in several international conferences and was well-received. The collaboration in Taiwan is growing. Besides our colleagues K.W. Wang (王建萬), C.C. Kiang (江紀成) and K.C. Jon (仲國慶) of the nuclear physics group, we have two postdoctors Sun-Chong Wang (王孫崇) and Wen-Ping Lai (賴文彬), one Ph. D. Student from Taida, Haubin Li (李浩斌), full time research assistant, Y.C. Shih (施逸君), W.S. Leung (梁穎珊), Y.R. Wang (王右仁) and two master students C.L. Kao (高崇倫), C.C. Hsu (許晴程), from our group working on the project. Sun-Chong is responsible for hardware and shieding studies and Wen-Ping is coordinating the efforts in simulation and analysis. They were helped by Professors Chung Yun Chang (張仲澐) and C.C. Chang (張嘉哲), our collaborators from University of Maryland. Haubin is responsible for DAQ, with the supervision of Ping-Kun Teng. The visiting scientist form IHEP Prof. D.X. Zhao (趙棣新) is responsible for designing the trigger system. Several special purpose boards were designed by her for use in the neutrino project. Institute of Nuclear Research (核能研究所) as well as the School of Atomic Science Research of National Tsing Hua University are active partners of the project. They helped on shieding design, neutron transportation simulation, low background material characterization *etc.* Tai-Power (台電) is an indispensable partner. Dr. R.F. Su (蘇瑞鋒) of Nuclear Power Station-II plays a major role in helping us identify a suitable site inside the nuclear power plant, carry out site surveys and on general logistics support, *etc.* Many institutions from mainland China expressed their interests to join the project. Their efforts will be coordinated by Jin Li of IHEP. IHEP will play a major role in CsI calorimeter design, both in mechanical support and in electronics. The first version of technical design report for the CsI based reactor neutrino detector is ready in early 1998 and the contents are being updated. A lot of progress has been made and we hope to carry out the experiment in early 1999.

We had been collaborating with Academician Luke Yuan (袁家騮), Professor C.Y. Huang (黃昭淵) of the Center for Condensed Matter Science of Taida, Professor M.K. Wu (吳茂昆) of the Center for Material Science of Tsing Hua as well as a European group led by Professor Georges Waysand of the University of Paris to build a position-sensitive transition radiation (TR) detector based on superheated superconducting granules (SSG). The grant to build the detector was provided by the Ministry of Education and Taida jointly. Academia Sinica is responsible for carrying out the beam test with electron beams of energy up to 100 GeV. In an old experiment done by Luke Yuan and Georges Waysand using electron beam at DESY

of energy up to 5 GeV, they observed a linear rise of TR signal as electron energy increases and apparently turning into quadratic rise at the highest energy. Some theorists predicted a quadratic rise in TR intensity if multiple scattering effects are taken into consideration. We intend to carry out a beam test extending the electron energy will above 10 GeV. If indeed there is γ-dependence for γ in the range of 10^4 to 10^5, we will have a compact detector capable of measuring the energy of a very high energy charge particle such as proton. Cryogenic detector technology could play an important role in high sensitivity search of new particles or new physics phenomena. By joining this project, we shall acquire the necessary technology and first experience of this important field. In this year, we recruited Dr. Chinping Chen (陳晉平) to work on the project. He has since been stationed at University of Paris, participating in the construction and test of the 16-channel SSG-TRD. The construction was completed by end of the year. Extensive tests are undergoing. The application to CERN for two weeks of electron beam was approved, with electron energy up to 15 GeV. The beam time allocated is the first two weeks of September 1998. Tony is now working on the simulation and Ping-Kun is working on data acquisition. National Central University (NCU) will provide their silicon telescope for precision positioning of the beam. NCU is also interested in carrying out a beam test parasitically.

With Run II of Tevatron approaching, the upgrade project of CDF becomes the focus of the whole collaboration. The most important part of the detector upgrade project is the construction of the new silicon microstrip detector SVXII and ISL (Intermediate Silicon Layers). We are responsible for the optical readout system of the silicon detector. In particular, all the needed 700 pairs of the Dense Optical Interface Module (DOIM), which is the key component for parallel optical transmission employed for the optical readout system, will be produced in Taiwan by the end of 1998. We convinced the Chief Executive Officer Lu (呂學錦) of the Chunghwa Telecom Co. (中華電信公司) the importance of this project early this year. As a result, the priority of this project at Telecommunication Laboratory (TL) moved up and became one of the top-priority projects. By end of the year, TL produced all the photo-diode arrays we need. The production of laser-diode arrays encounter various difficulties. The yield rate is still around 15%. One major milestone was achieved: the bipolar driver and receiver chips designed by Ming Lee Chu (朱明禮) passed the functional test and radiation hardness test. The rad-hard test was done at Fermilab, organized by Yi-Cheng Liu (劉以正). Bit-error-rate tests

of several prototype DOIM's were carried out at Fermilab by Yi-Cheng and Maotung Cheng (鄭茂桐) and also at the Institute by Ming-Lee and Ping-Kun. They performed better than the specs of 10^{-12}. The progress of DOIM was well recognized in the CDF upgrade review. The final version of bipolar chips was submitted for production by end of the year. We shall be ready for production of DOIM in the Spring of 1998.

Both CMS Spokesperson Michel Della Negra and ATLAS Spokesperson Peter Jenni visited us twice this year. They are interested in collaborating with us on developing the parallel optical link technology. Ming Lee had participated in ATLAS and CMS meetings on optical links. Both collaborations will use VCSEL instead of the kind of laser diode arrays that we used. It turned out that Prof. K. F. Huang (黃凱風), now at National Chiao Tung University, was one of the first person to produce VCSEL at Bell Lab. He and Prof. K.C. Dai (戴國仇) are interested in collaborating with us in producing VCSEL array based DOIM for use in CMS and ATLAS experiments. Under our support, Prof. Dai presented their case at CMS meeting and provided some samples of VCSEL for radiation-harness test. The CMS test indicates that the rad-hard performance of the VCSEL's produced by Prof. Huang and Prof. Dai are as good as the Honeywell ones if not better.

A high-tech company in the Hsin Chu Science based Industrial Park, the Radiantech Inc. (捷耀科技) expressed its interest in packaging and testing the DOIM's for us. Radiantech will set up an assembly line for production and test of the DOIM's. The collaboration with Radiantech not only places the DOIM project on a firmer ground but also helps our further R&D on parallel optical communication and its application.

Besides the DOIM project, our group members including Ping, Paoti Chang (張寶棣) and Yi-Cheng also played an important role in the PC farm project of Fermilab in investigating the feasibility of using PC farms not only for data production but for on-line triggers. These results were reported in Supercomputing '97.

During 1997, CDF submitted 29 physics papers out of which 19 were published in Physical Review Letters and 7 were published in Physical Review D. Our group members had major contributions to several of these publications. In particular, Ping is one of the main authors of the paper on the measurement of top quark mass and cross section from dilepton events and Paoti is the chief author of the paper on

properties of six jet events while Ming Jer was the godparent for the papers on double parton scattering. Paoti also represented CDF and D0 to give an invited talk in the Monriod QCD conference. Besides QCD physics, Paoti also worked with our Ph. D. student P.S. Chang (張博舜) in trying to improve statistics on the measurement of Λ_b lefetime by incorporating more decay modes of the Λ_c's resulting form Λ_b decay. They expect to publish the result in 1998. In addition to Λ_b, Paoti is also searching for Ξ_b which has not been found at CLEO or LEP. It is very likely that positive results can be submitted in 1998.

Our old friend and collaborator Jaroslav Antos visited us for three months during the Spring of 1997 under an exchange program between Slovakia and Taiwan. He invented an improved method of determining the top quark mass from di-lepton events. One may have to wait for data from RunII to prove the superiority of this new method.

Ming Jer has been investigating the apparent excess of b-tagged W+2 jet and W+3 jet events of the CDF runI data. He was also trying to understand some apparent peaks in the invariant mass distribution of a lepton and a b-tagged jet. We hope he will have concrete publishable result soon.

On August 10, we organized a half-day symposium in memory of Madame C.S. Wu (吳建雄). Prof. S.C.C. Ting chaired the opening session when H. Schopper delivered the keynote speech on "40 Years of Experimental Works since Parity Violation". Prof. Xide Xie (謝希德) from mainland chaired the second session when four prominent female physicists, Prof. C. Jarlskog, Prof. Y.H. Chu (朱有花), Prof. F. Pauss and Prof. L.L. Chau (喬玲麗) gave invited talks.

It is a pity that Chili and Oyang decided to leave us and quit physics as a career. We wish them the best.

Finally, we would like to express our gratitude to our secretary Ms. T.S. Liu (劉翠霞) and our assistant on computing Mr. H.Y. Cheng (鄭弘彥) for their hard work which are indispensable in keeping our group moving.

2. Particle Phenomenology

(1) Effective Field Theory of Heavy Mesons

We have developed in detail in this work an effective field theoretical description for heavy mesons proposed recently. The effective theory incorporates with heavy quark symmetry and the heavy quark effective theory, from which a natural realization of heavy mesons in the heavy quark limit as a composite particle of the reduced heavy quark coupled with a brown muck of light degrees of freedom is provided. With the composite particle picture, the widely used quark models appear in this theory as a special case and yet it resolves the problems with relativity and covariance encountered in quark models. Moreover, the effective theory not only preserves the simplicity of quark models but also incorporates with the advantage of the Feynman diagrammatic approach in field theory. This may provide a link of the fundamental QCD theory to the phenomenologically successful quark model to solve the most difficult bound state problem of hadronic physics.

Meanwhile, as we have shown since the effective theory incorporates with the 1/M expansion of QCD Lagrangian in HQET, we can now systematically and explicitly evaluate the 1/M corrections to various heavy meson properties which is lacking within HQET itself. It also largely improves the covariant light-front quark model we constructed recently and provides a quasi-first-principles description of the heavy meson dynamics. Namely, although the description of heavy mesons structure is still phenomenological in nature at present because of the use of the phenomenological structure function, it offers a systematic approach to evaluate the 1/M corrections based on the first-principles 1/M expansion of QCD. This resembles very much the situation of the QCD analysis of deep inelastic scatterings for light quark systems, in which the low energy dynamics (described by parton distribution functions) is determined phenomenologically and perturbative corrections are given in a fully first-principles way. Here the situation may even be better since the phenomenological part is constrained by HQS and HQET, whereas the nonperturbative QCD dynamics should be much simpler in the heavy quark limit.

(2) Nonfactorizable Effects in Hadronic Charmless B Decays

For a given effective weak Hamiltonian, there are two important issues in the study of the hadronic matrix elements for nonleptonic decays of heavy mesons: one is the renormalization scale and scheme dependence of the matrix element, and the other is the nonfactorizable effect. For the former, we have emphasized that it is

important to first evaluate the vertex and penguin corrections to the matrix element of 4-quark operators at the scale and μ then apply factorization or any model calculation to the tree operator. To describe the hadronic charmless B decays dominated by penguin diagrams, it is necessary and inevitable to take into account the penguin corrections to the 4-quark operators. Nonfactorizable effects in hadronic matrix elements of $B\to$PP,VP decays can be parameterized in terms of the effective number of colors in the so-called generalized factorization scheme. effect. We show that, contrary to the common assumption, $N_c(V\text{-}A)(V+A)$ induced by the $(V\text{-}A)(V+A)$ operators are theoretically and experimentally different from $N_c(V\text{-}A)$ generated by the $(V\text{-}A)(V\text{-}A)$ operators. Based on the available CLEO data on hadronic charmless two-body decays of the B meson, we have shown that the nonfactorizable effect induced by the $(V\text{-}A)(V+A)$ operators is different from that generated by the $(V\text{-}A)(V\text{-}A)$ operators. This is the key element for explaining the CLEO measurement of $B\to \eta' K$.

(3) Nonspectator Effects and *B* Meson Lifetimes

The prediction of B meson lifetime ratios depends on the nonspectator effects of order $1/m_b^3$ in the heavy quark expansion. In the present QCD sum rule study, after subtracting the contributions from excited states approximated by the spectral density on the theoretical side of the sum rule starting from certain thresholds, we find that contributions to the matrix elements of octet-octet operators due to the quark-gluon condensate and gluon condensate are strongly suppressed. It is evident that the theoretical predictions are too small by about 15% to account for the central values of the observed total decay rates. Unlike the semileptonic decays, the heavy quark expansion in inclusive nonleptonic decay is it *a priori* not justified due to the absence of ananalytic continuation into the complex plane and hence local duality has to be invoked in order to apply the OPE directly in the physical region. If the shorter lifetime of the Λ_b relative to that of the B_d meson is confirmed in the future and/or if the lifetime ratio $\tau(B_s)/\tau(B_d)$ is observed to be less than unity, then it is very likely that local quark-hadron duality is violated in nonleptonic decays. It should be stressed that local duality is it *exact* in the heavy quark limit, but its systematic 1/M expansion is still lacking.

(4) Twist-3 and Quark Mass Contributions to the Polarized Nucleon Structure Function $g_2(x,Q^2)$

Quark transverse spin is famous for its conceptual difficulties and confusions in the literature. Quark transverse spin is a fundamental degree of and the transversity parton distribution which measures the quark helicity-flip in the helicity basis is well-defined even for massless partons.

We introduce a generalized special propagator for massive quarks. The advantage of the special propagator method is to completely separate the hard part between different orders in 1/Q (twist) in a manifestly electromagnetic gauge invariant way.

We have clarified the role of the quark mass in defining the chiral odd transversity contribution $h_1(\chi)$ in g_T in the improved parton model in DIS. We have also shown that the special propagator can be readily generalized to include the quark mass. This technique is employed to extract the hidden short distant contribution buried inside the soft part. The importance of the special propagator approach is to enable one to truly factorize the hard and soft part and obtain an explicit gauge invariant result twist by twist. This fact is important to ensure a parton model interpretation for the matrix elements thus obtained. This is because only a fixed number of partons are involved in the matrix elements for a definite twist. Therefore $h_1(\chi)$ in the parton model language is a measurement of the transversely polarized quark and anti-quark distributions inside the nucleon in the transverse basis, or, a measurement of chiral symmetry breaking effects inside the nucleon in the helicity basis. However, it is important to note that transversity is of higher twist in nature in DIS but can become a leading twist effect in other high energy process, say, Drell-Yan in particular. It mixes with other twist three contributions and cannot be separately measured in DIS.

3. Gravitation and Cosmology

(1) CMB Anisotropy and Polarization

We compute numerically the scalar- and tensor-mode induced Stokes parameters of the cosmic microwave background, by taking into account the basis rotation effects. It is found that the tensor contribution to the polarization power spectrum get enhanced and dominates over the scalar contribution for low multipoles in a universe with or without recombination. Furthermore, we show that all full-sky averaged two-point cross-correlation functions of the Stokes parameters vanish, and calculate the expected signal to noise ratio for the polarization experiment currently underway.

(2) Scale Invariance and Gravity

We attempt to include the scale-invariance as an additional fundamental symmetry of the space-time. This gives birth to a new scalar-tensor theory of gravity, in which the scalar is an auxiliary field. For a pure gravity theory without matter field, the symmetric phase represents an equivalent class of gravity theories, which the Einstein gravity plus a cosmological constant belongs to under a special gauge choice. The one-loop quantum correction of the theory is calculated by using the Vilkovisky-DeWitt's method. We find that the scale symmetry is broken dynamically, and that the Einstein gravity is the ground state of the broken phase. We also discuss the consequent cosmological implications. It is found that the model admits an inflation via the Hawking-Moss bubbling, but the inflation rate remains undetermined due to the strong gravity limit. In light of this, scale-invariant metric perturbations having a dominant tensor component can be generated without slow-rollover. Also, the time-delay experiment restricts the present universe to be very close to the ground state.

SOLID STATE PHYSICS AND BIOPHYSICS

1. Surface Science and Thin Films

(1) Self-diffusion and dynamic behavior of atoms at step-edges of iridium surfaces

(2) Strain-direction-dependent growth morphology of vicinal Si(001) surface

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

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

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

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

(7) Novel mechanism for cluster diffusion on fcc metal(111) surfaces

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(1) Phase separation state in the 2D t-J model

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6. Biophysics

1. Surface Science and Thin Films

(1) Self-diffusion and dynamic behavior of atoms at step-edges of iridium surfaces

Steps are an integral part of a surface. Many surface phenomena are to a very large extend affected or even determined by the existence of lattice steps. We have done a study of the dynamic behavior of atoms at step-edges and on stepped surfaces of iridium. The subjects investigated include diffusion of ledge atoms along steps of different atomic structures, detachment or dissociation of step edge atoms, descending and ascending motion of atoms at step edges, upward movement of in-layer atoms, and stable structure of nanometer size islands, etc. Quantitative data derived include the activation barrier height of various atomic processes occurring at lattice steps. We also present parameters of adatom diffusion on the terrace of the Ir(113) and (331)surfaces to compare with ledge atom diffusion along step edges of the Ir(111). Possible implications of the behavior of atoms at lattice steps, particularly to ultra thin film epitaxy, are discussed. These interesting results have been publicated in Phys. Rev. B and Surf. Sci. Lett.

(2) Strain-direction-dependent growth morphology of vicinal Si(001) surface

The shape dependence of vicinal Si(001) surfaces on the applied uniaxial strain direction is studied. This dependence is intimately related to the anisotropic nature of the intrinsic strain field which originates from the surface dimerization. The strain relief mechanism is shown to be different in two orthogonal directions. Normal to the steps, step-pair bunching and waving lead to formation of hillocks and pits. Along the step direction, bending of step pairs forms a cusp which later develops into a deep groove. This result is published in Phys. Rev. Lett.

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

Scanning tunneling microscope with low frequency modulation in Z piezo is used to study the conductance quantization of a gold (Au) point contact at ambient pressure and at room temperature. An apparent down-shift trend is found in the conductance peak positions with increasing contact curvature. By changing the modulation frequency, difference local boundary roughness is expected for a metallic neck forming in a dynamic process. The broadness of the first conductance peak is analyzed to study this effect and is seen to increase with the driving speed from 400

Å/s to 1000 Å/s. This result will be published soon.

(4) 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 are published in Phys. Rev. Lett. and Surf. Sci.

(5) 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 will be published in Phys. Rev. Lett. and other journals.

(6) 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 at room temperature. 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 standard 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 and at island edges is the rate-determining step in the nucleation and growth process. We believe nucleation as well as growth is initially hindered by the high energy

barriers for Ge clusters to exchange with Pb atoms until Ge clusters reach a critical size. Our results may shed much needed light on the fundamental mechanism in surfactant-mediated epitaxy. Some of them are 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 will be published in Surf. Sci. Lett.

(7) Novel mechanism for cluster diffusion on fcc metal (111) surfaces

Using ab-initio pseudopotential and embedded-atom method calculations (on Al, Ni, Pt, and Ir surfaces), we establish a general picture for self-diffusion of small clusters on (111) surfaces of fcc metals. In this picture, a novel mechanism, i.e., zigzag motion, plays an important role in the diffusions of dimer and tetramer. Dimer diffusion is accomplished by zigzag motion together with a concerted motion of dimer atoms. Trimer, forming a compact structure, diffuses through a concerted motion where three trimer atoms move together. Tetramer diffuses through a zigzag motion where only two of the tetramer atoms move simultaneously in each step. Thus, tetramer diffusion by zigzag motion has a lower energy barrier than that for trimer diffusion. This phenomenon agrees with the experimental results of Ir_n/Ir(111) found by field ion microscopy. We conclude that, the self-diffusion barrier drop from trimer to tetramer on (111) surfaces of fcc metals is a universal phenomenon. The results have submitted to Phys. Rev. Letters.

(8) Holography with low-energy Kikuchi electrons

The direct inversion of diffraction patterns of low-energy (< 1000 eV) inelastic scattered electrons (Kikuchi electrons) emitted from the surface is found to yield the three-dimensional Patterson function of the near-surface structure. The multiple scattering effects are eliminated by the integral-energy phase-summing method. Special attention is needed to remove the anisotropic effect of atomic scattering

factors. The technique has been applied to the systems such as Ag(100), Ag(111), Si(111)(2x1), Si(111)(7x7),$\sqrt{3}$x$\sqrt{3}$ Au/Si(111), and$\sqrt{3}$x$\sqrt{3}$ Sb/Si(111) surfaces. High-fidelity, artifact-free three-dimensional images of the nearby atoms measured from the emitting atoms are obtained with a high-resolution of 1 A in all directions. This short-range-order KEH tool, which provides the building blocks (such as adatom, dimer, trimmer) on the surface, can be viewed as a twin of grazing-incidence X-ray diffraction. The combination of quick data-acquisition by the LEED optics (recoreded with a CCD camera) and data-inversion using 2D FFT has led KEH to become a real-time tool. All the results have been published in Phys. Rev. **B** and Surface Review Letters.

(9) Synchrotron radiation application

Sychrontron radiation from the Synchrotron Radiation Research Center (SRRC) storage ring is used to perform 1) Photoemission spectroscopy, 2) X-ray absorption spectroscopy and 3) Photoelectron imaging spectromicroscopy. The combination of these techniques provided detailed information in two research areas 1) detection and characterization of surface chemical inhomogeneities related to segregation and diffusion and 2) advanced and non-destructive characterization of novel materials, such as low dimensional and nanostructured materials. Considerable effort on the development of the technique of synchrotron spectromicroscopy has also reulted in a unique high energy resolution version of the spectromicroscopy.

(10) Diamond thin films

Boron and nitrogen doped diamond films for field emission study have been grown by microwave and hot-wired plasma enhanced chemical vapor deposition techniques. Boron doped diamond films exhibit semiconducting characteristic behavior, but nitrogen doped diamond films behaved like intrinsic diamond films with high threshold voltages. The effect of amorphous carbon incorporated in the diamond film is still unclear. Crystalline silicon carbides grown together with diamond crystals have been observed due to the melting of silicon substrate in hot-wired system.

(11) Metal thin films and superlattices

Metal thin films and superlattices have been grown by molecular beam epitaxy and sputtering methods. Co,Ni,Fe,NiFe,Cu,Cr,V..... etc. have been used. X-ray

diffraction, reflection high energy electron diffraction, atomic force microscopy are used to characterize the film structure. Magneto-optical Kerr effect, four-probe and superconducting quantum interference device are used to characterize the magnetic and transport properties. Giant magnetoresistance effect and magnetic anisotropy are studied. Influence of the Fe buffer layer on the magnetoresistance of NiFe/Cu superlattices has been observed. The magnetic coupling in the NiFe/Cu superlattices is enhanced by the Fe buffer layer.

2. 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.

(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 an 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.

3. Magnetism

(1) The angular dependence of the plannar hall effect in Co-Ni films

$Co_{100-x}Ni_x$ (x=70,75,80,90 at.% Ni) alloy films were made by the vapor depositon method. Easy axis could be defined by a depositon field parallel to either lengh (L-film) or width (T-FILMS) of the sample. The anisotropic magnetoresistance (AMR) and the planar Hall effect (PHE) hysteresis loops were simultaneously measured with a slowly sweeping field H. The angle θ between the hard axis and $\vec{H}$ could be varied. Domain patterns were also recorded at each stage of the mangetization or demagnetization process. Besides the usual AMR and PHE behaviors, we have observed the forms of a voltage " mountain', like ΔV_{mr} and ΔV_{ph}, supermposed on the normal curves at the switching field Hsw. ΔV_{mr} is an even function of θ and ΔV_{ph} is an odd function. The well known magneto-transport theory based on the single-domain model is modified to adopt the real situation of the multidomain structure. We have been successful to explain all the ΔV_{ph} data observed experimentally. In addition, from the angular dependence of ΔV_{ph}, not only we check the direction of mean easy axis consistently, but also tell the degree of easy-axis dispersion in the film. It is found that the $Co_{30}Ni_{70}$ T-film has the least dispersion and sizable AMR ratio $\Delta \rho / \rho_{\perp} = 3.6\%$ at room temperature.

(2) Effect of cold work on anisotropic magnetoresistance of $Co_{25}Ni_{75}$

Various states of the polycrystalline $Co_{25}Ni_{75}$ sample have been achieved by cold rolling and heat treatments after cold rolling. At each metallurgical stage, electrical resistivity $\rho^s_{\parallel}$, measured in the saturated condition with a longitudinal field, and resistivity $\rho^s_{\perp}$, obtained in the similar condution with a transverse field, were taken

at 77K. We used a quantity $\Delta \rho_{\parallel} / \Delta \rho_{\perp}$, defined as $(\rho^s_{\parallel} - \rho_0) / (\rho^s_{\perp} - \rho_0)$. Where ρ_0 is the resistivity in zero field (or a demagnetized state), to check the magnetic anisotropy in the sample. It is found that cold work can induce an easy axis parallel to the roll direction. This phenomenon is associated with the short-range order and the directional Co-Co pair order formed during a cold-rollimg process. Recovery and recrystallization were observed, if the rolled sample have been annealed at various temperatures T_Q. Both stress relief and change of texturing lead to an enhancement of magnetic anisotropy of the longitudinal type. Anisortropic magnetoresistance $\Delta \rho / \Delta \rho_0$ of cold-rolled sample (CR-0) is the lowest. When T_Q is increased, $\Delta \rho / \rho_0$ gets recovered. However, $\Delta \rho / \Delta \rho_0$ of a plainly salt water quenched sample is always large than that of a cold-rolled one.

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

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.. Several systems about the spin valve effect have been investigated, and more systems will be prepared and studied.

(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.

(5) Magnetic coupling effect and its applications

Research of the magnetic coupling between magnetic gears with different magnetic poles has been very active because of the potential applications in transmitting power and overload protection. Each application demands careful analysis of the system and optimum condition of the parameters. Recently we have reported some interaction behaviors of magnetic coupling effect. We have applied

these interaction behaviors to study the improvement of the efficiency of a spindle motor. Recently a high efficiency and low cogging torque spindle motor has been designed by varying the magnetization profiles of the rotor and the geometry shape of the teeth of the stator in motor. In the near future, under this research topic more systematic magnetic coupling effect will be nivestigated and their applications will be cinsidered.

(6) Magneto-Kerr effect

A Magneto-Kerr effect apparatus has been built. With this instrument we have observed the magnetised state in the Co/Cr, NiFe/Cu and Co/Mo etc. system at room temperature. For example, the inplane anisotropy of these bylayers were determined by the longitudinal MOKE as a function of the azimuthal angle which is the angle between the in-plane applied field and Co[0001]. The uniaxial anisotropy is consistent with the crystalline anisotropy of the hcp-Co. The magnetic hysteresis major and minor loops taken with the field along the easy axis were rather square suggesting that the bilayers consist of an ensemble of very well aligned uniaxial in-plane hcp-Co columns which comprise the Co layer. Generally speaking, the magnetic behavior depends on the structure of the Co films.

(7) Magnetic fluid study

The diverse structures of ferrofluid etc magnetic fluids subject to magnetic fields have attracted considerable interest. We will prepare a series of magnetic fluids, e.g. Fe_3O_4 ferrofluid emulsions with varying droplet size etc. and will study their pattern formation etc. by the mutually interacting ferrofluid droplets in the emulsion as a function of applied magnetic field of given strength and orientation. Besides, the quantun size effect and the dimensional problem etc. will be studied under this research plan.

(8) Magnetic alloy films with perpendicular anisotropy

We have made a series of Co-Po alloy films. Film thickness ranges from 80 to 2500 angstrom. This topic is interesting, beause the Pd-rich Co-Pd films exihibit both the perpendicular anisotropy K_u and large polar Kerr effects. Following measurements have been carried out in order to obtain the structural, transport, and magnetic properties of the film samples: AES depth, XRD, AFM, Moke, SQUID, AMR, saturation magnetostriction, and Hall effect. We have found that K_u is closely

related to the degree of (111) texture. AMR can be used to detect the magnetic anisotropy readily. Some of the samples were post-annealed. Hence, the growth of grain sizes, the change of texture, and the variation of macro-stresses in each film at each stage can be assessed systematically. From a purely transport perspective, we were able to make a full analysis on the subjects of surface, grain-boundary, and impurity scatterings respectively.

(9) Electronic properties of metallic thin films

A SQUID (Superconducting QUantum Interference Device) based small resistance bridge will be built. The goal is to 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 measure Giant Magnetoresistance effect in magnetic multilayers. Separation between bulk and interface effects using this technique is straightforward. We will measure CPP resistance in Ferromagnet/ Superconductor multilayers and study the interplay between cooper pair and ferromagnetic exchange field.

4. Quantum Size Effects and Nanostructures

(1) Quantum size effects and heavy-fermion behavior in $CeAl_2$ nanoparticles

About two decades ago nanoparticles were widely studied by scientists and mechanic engineers mostly by reason of their general physical properties and engineering applications. Lately due to more interesting basic physical properties found in nanoparticles, such as the quantum size effects, the research on nanoparticles again becomes an important field. There is no doubt that the physical properties of nanoparticles can be affected directly by the confinement of limited geometric sizes. In addition to this, there are also some other size-generated effects, for instance the phonon quantum size effect and the electronic quantum size effect. The former is associated to the addition of new low-frequency surface modes and the truncation of large wave-vector limit in lattice vibrational spectrum; and the latter is related to the increase of the energy level spacing and the decrease of density of states of conduction electrons at Fermi level $D(\varepsilon_F)$.

By virtue of their simplicity and ease of preparation for single element most of these studies have being made on pure elements such as Ag and Pd, whereas not much work was done on more complicated alloys or compounds. In order to examine these quantum size effects on alloys and compounds especially for heavy-

fermion, we have performed thermodynamic measurements on bulk $CeAl_2$ and 80Å-$CeAl_2$ nanoparticles for the comparison of their physical properties, i.e., crystal field effect, RKKY interaction and heavy-fermion (Kondo) behavior.

A value of γ as high as 3600mJ/ mole K^2 with T_K=0.65K is observed in 80Å-$CeAl_2$ nanoparticles in measurements of the low-temperature specific heat. This magnitude is about twenty-four times of its bulk value (≈150mJ/ mole K^2). Instead of the magnetic ground state (T_N=3.8K) seen in bulk $CeAl_2$ a non-magnetic Kondo anomaly (heavy-fermion behavior) is observed in $CeAl_2$ nanoparticles. The size dependence of ground state is believed to be originated from the quantum size effects. It is conjectured that the existing heavy-fermion behavior that is hindered by the magnetic order in bulk $CeAl_2$ is entirely revealed after the long-range RKKY interaction is suppressed by the change of particle size. The smaller Kondo temperature $T_K \approx JD(\varepsilon_F) \exp(-1/JD(\varepsilon_F))$ of nanoparticles in comparison to 5K of the bulk is conceptually acceptable owing to a smaller value of $D(\varepsilon_F)$ in nanoparticles.

(2) Single electronics

We are presently establishing a laboratory for fabrication and characterization of nano-scale solid state devices. The objectives are to study electron transport properties of mesoscopic samples and to investigate potential applications of these devices. Single electronics made of normal metals, conventional superconductors and magnetic materials is our main research subject, III-V semiconductor mesocopic structures are also of interest. We have now an SEM-based electron-beam writer for fine pattern lithography and, by the end of this year, we should have an e-gun evaporator for device fabrication and a dilution refrigerator for low temperature electric measurement.

5. Strongly Correlated Electronic Systems

(1) Phase separation state in the 2D *t-J* model.

This paper is published in the January issue of Physical Review B. My Ph.D. student Dr. Shih has used our "power-Lanczos" method to determine the phase boundary of the phase separation state in the 2D *t-J* model. This result shows that for the physical regime corresponding to the high temperature superconductors, the *t-J* model does not exhibit phase separation as claimed by some recent works. This work really demonstrates the better numerical accuracy of our method than other's (T. K. Lee).

(2) d-Wave pairing correlation in the two-dimensional *t-J* model.

This paper is now under review by Phys. Rev. Lett. 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 $J/t \leqq 0.5$ 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. It will have serious influences on how we think of the mechanism of superconductivity. (T.K. Lee)

(3) Phase diagram of the two-chain Hubbard model

This paper has been submitted to Phys. Rev. B. 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 and developed a 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)

(4) Work in progress

Recently we have begun to look at the stripe phase. This is motivated by recent neutron scattering data. Our goal is to calculate the dynamical susceptibility of the stripe phase and compare with experiments. We are also looking at the SO(5) connection with the *t-J* model. Exact diagonalization has found low energy spectra of the *t-J* model is closely related to SO(5) operators. We are looking at the Casimire operator and trying to understand the connection better.
(Jian-Xin Li, Youngho Park and 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).

STATISTICAL AND COMPUTATIONAL PHYSICS

1. Equilibrium Statistical Physics

(1) Universality of critical existence probability for 3d percolation

(2) Universal Scaling Functions for 3d Percolation

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

(4) Critical point of the Kagome Potts model

(5) Exact spin - spin correlation functions of Bethe lattice

(6) Exact phase diagrams for an ultrathin magnetic film

2. Nonequilibrium Statistical Physics

(1) Self-organized criticality in stick-slip models

(2) Stochastic resonance in Ising systems

(3) Driven lattice gas model

3. Nonlinear Dynamics

(1) Stochastic postponement of domain transitions and destabilization of current in the Gunn diode

(2) Pattern transition and chaos in nonlinear semiconductors

4. Computational Biological Physics

(1) X-ray crystallography and general optimization problems

(2) Host heterogeneity in susceptibility

(3) Limiting similarity and species packing in competition-colonization models

(4) Local frequency dependence and global coexistence

(5) Protein folding problems

5. PC Farm and Parallel Computing

During 1 July 1997 - 30 July 1998, in the Institute of Physics of Academia Sinica there were two research fellows (Chin-Kun Hu and Ting-Kuo Lee), two associate research fellows (Simon C . Lin and Kwan-tai Leung), five postdoctorals (Chi-Ning Chen, Jau-Ann Chen, J. Dushoff, P. M. Gade, Sh. A. Hairyan, Nikolay Izmailian, W.-Y. Liang, Z. N{\'e}da, Jia Kang,YuoHsienShiau, and Yan-Chi Tsai) and one Ph.D. student (Chai-Yu Lin) in the research group of statistical and computational physics. Some of the postdoctorals stay here only a few monthes during the fiscal year. The main research results and research programs are listed as follows.

1. Equilibrium Statistical Physics

(1) Universality of critical existence probability for 3d percolation

Using a histogram Monte Carlo simulation method, we calculate the existence probability E_p for bond percolation on simple cubic (sc) and body-centered cubic (bcc) lattices and site percolation on sc lattices with free boundary conditions. The R_1 spanning rule considered by Reynolds, Stanley, and Klein is used to define percolating clusters. We find that E_p for such systems has very good finite-size scaling behavior and the value of E_p at the critical point is universal and is about 0.265 ± 0.005 (C.-Y. Lin, C.-K. Hu, and J.-A. Chen).

(2) Universal Scaling Functions for 3d Percolation

Using a histogram Monte Carlo simulatio method (HMCSM), Hu, Lin and Chen had found that bond and site percolation models on planar lattices have universal finite-size scaling functions for the existence probability E_p, the percolation probability P, and the probability W_n for the appearance of n percolating clusters in these models. In this paper we extend above study to percolation on three-dimensional lattices with various linear dimensions L. Using the HMCSM, we calculate the existence probability E_p and the percolation probability P for site and bond percolation on simple cubic (sc), and site percolation on body-centered cubic (bcc) and face-centered cubic (fcc) lattices; each lattice has the same linear dimension in three dimensions. Using the data of E_p and P in a percolation renormalization group method, we find that the critical exponents obtained are quite consistent with universality of critical exponents. Using a small number of nonuniversal metric factors, we find that E_p and P have universal finite-size scaling functions. This implies that the critical E_p is a universal quantity, which is 0.265 ± 0.005 for free boundary

conditions and is 0.924 ± 0.005 for periodic boundary conditions. We also find that W_n for site and bond percolation on sc lattices have universal finite-size scaling functions (C.-Y. Lin and C.-K. Hu).

(3) 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 $a/(c^2 a^2+1)$ is an invariant (Y. Okabe, K. Kaneda, M. Kikuchi, and C.-K. Hu).

(4) Critical point of the Kagome Potts model

The determination of the critical point of the q-state Potts model on the Kagome lattices has been an outstanding unsolved problem. Here we determine the Kagome critical point by regarding the Potts model as generating correlated bond percolations. By applying a combination of Monte Carlo renormalization group and finite-size scaling analysis to the percolation problem, numerical results with a confidence interval of 5 digits are obtained for the Kagome critical point for q=1,2,3,4. Results for q=1 are consistent with a recent highly accurate numerical estimate by Ziff and Suding, and results for q=2 agree with the known exact result, both within 0.01%. For q=3,4 our results show that a conjecture due to Wu on the Kagome Potts critical is extremely accurate, and our numbers do not rule out the possibility that the Wu conjecture may actually be exact (J.-A. Chen, C.-K. Hu, and F.-Y. Wu).

(5) Exact spin - spin correlation functions of Bethe lattice spin models in external fields

We develop a transfer matrix method to compute exactly the spin-spin correlation functions for Bethe lattice Ising model and Blume-Emery-Griffiths (BEG) model in the external magnetic field h and for any temperature T. The correlation length ξ (T,h) obtained from the spin-spin correlation function shows interesting scaling and divergent behavior as $h \to 0$ and T approaches the critical temperature T_c (N. Sh. Izmailian and C.-K. Hu).

(6) 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 $|J_3|\rightarrow 0, \Delta T_c \equiv |T_c(J_3)-T_c(0)|/T_c(0) \sim |J_3/J_1|^{1/\phi}$, 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 and N.Sh. Izmailian).

2. Nonequilibrium Statistical Physics

(1) Self-organized criticality in stick-slip models

Self-organized criticality (SOC) often occurs in non-equilibrium steady states. We consider the possibility of observing SOC in spatially extended systems approaching equilibrium. We study a spring-block model governed by threshold dynamics and driven isotropically by an increase of the spring constants in time. It models the approach of an elastically strained system to its strainless state, punctuated by friction from a substrate. Due to its multiplicative driving, criticality occurs even with periodic boundary conditions via a novel mechanism dictated by a coarsening process.The results show a high degree of universality, and should be relevant to a class of similar systems approaching equilibrium via a punctuated threshold dynamics (K.-t. Leung, J.V. Andersen and D. Sornette).

(2) Stochastic resonance in Ising systems

We study the phenomena of stochastic resonance in Ising model, regarding it as a spatially extended two-state system driven by stochastic noise that arises from finite temperature, and an oscillating magnetic field. The response in the magnetization to the external field is calculated by means of both a mean-field theory with linear-response approximation, and the time-dependent Ginzburg-Landau equation. Analytic results for the temperature and frequency dependent response, including the resonance temperature,compare favorably with simulation data (K.-t. Leung and Z. N{\'e}da).

(3) Driven lattice gas model

We study the critical behavior of a three-dimensional driven diffusive system which is the most studied model for non-equilibrium phase transitions, and the simplest extension of Ising systems to non-equilibrium steady states.Based on anisotropic finite-size scaling theories, the system is analyzed with system shapes, sizes and statistics far exceeding previous studies, using a fast multi-spin coding technique. Our analysis settles a long-standing controversy regarding the nature of the critical properties, confirming the field-theoretic results of critical exponents and the important role of spatial anisotropies (K.-t. Leung and J.-S. Wang).

3. Nonlinear Dynamics

(1) Stochastic postponement of domain transitions and destabilization of current in the Gunn diode

We use numerical simulation method to study the nonlinear behavior of spatio-temporal oscillations in the Gunn diode at room temperature, in which the applied bias includes a dc term and a stochastic noise term. We find noise-induced stabilization in the traveling state, stochastic postponement of the stationary- to traveling-domain state, and destabilization of current. Our results show that the temporal noise plays an equivalent role as the spatial (noise) characteristic (i.e., Schottky barrier) in the dynamical system (Y.-H. Shiau, Y.-C. Cheng and Chin-Kun Hu).

(2) Pattern transition and chaos in nonlinear semiconductors

We study the dyamical behavior of the stationary electric-field domains in the Gunn diode under periodically driving at a fixed driving frequency. We find interesting pattern transitions: type-I rocking domain→type-I hybrid domain →type-II rocking domain →type-II hybrid domain as the amplitude of the ac bias varies. The type-II rocking and the type-II hybrid domains exhibit period-doubling route to chaos and fully chaotic behavior, respectively. The multi-domain formation can also be found in the type-II domains. The evolution of the electric-field domains and the bifurcation processes will be given in detail (Y.-H. Shiau, Y.-C. Cheng and Chin-Kun Hu).

4. Computational Biological Physics

(1) X-ray Crystallography and General Optimization Problems

Starting October 1996, we are beginning the new project of using the simulated annealing 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 method we may speed up this process. We have verified that the method indeed can resolve the structures of molecules with about 100 atoms with ease. In trying to understand why the method works, we have discovered that there is a special distribution function describing the optimization process. At present, we have discovered that this distribution function is in fact also present in other optimization problems like traveling salesman problem and quadratic assignment problem etc.. A paper is now in preparation to discuss this universal behavior among different optimization problems, different parameters and algorithms. (Chi-Ning Chen, Jian Kang, S.C. Lin, S.P. Li and T.K. Lee).

(2) Host heterogeneity in susceptibility: lessons from an insect virus

We present a model of an insect disease that allows for heterogeneity in susceptibility of hosts, and apply it to a system involving a nuclear polyhedrosis virus and a lepidopteran host. We focus on three main points. First, efforts to quantify how the evolution of virulence will affect pathogn fitness will inevitably be complicated by host heterogeneity in resistance. Second, mathematical models can be a useful practical tool in using pathogens as microbial pesticides, especially in the use of genetically-engineered pathogen strains.Finally, theimportance of host heterogeneity and the usefulness of models in managing these pathogens together strongly motivate further development of epidemic models that incorporate host heterogeneity in susceptibility (Greg Dwyer, J. Dushoff, J.S. Elkinton, and S.A. Levin).

(3) Limiting similarity and species packing in competition-colonization models

Understanding what restricts or allows coexistence of species in ecosystems, what determines species similarities or competitive differences, and what determines maximum diversity represent some of the fundamental questions in ecology. Here we use a hierarchical model of competition-colonization tradeoffs, first proposed by

Levins and Culver (1971) to explore coexistence at the high-diversity limit. We derive a power law for the densities of a system ordered by this tradeoffs, and also derive results for the relationship between achieved species packing and system stability (A. P. Kinzig, S. A. Levin, J. Dushoff and S. Pacala).

(4) Local frequency dependence and global coexistence

In sessile organisms such as plants, interations occur locally so that important ecological aspects like frequency dependence are manifest within local neighborhoods. Using interacting particle system models, we investigated how local frequency-dependent competition influenced whether two species could coexist. Individuals of the two species were rrandomly placed on a grid and allowed to interact according to local rules. For four different frequency-dependent scenarios, the results indicated that over a broad parameter range the two species could coexist. Local measures of the correlation structure during invasion transients can serve as predictors of ultimate invasibility and coexistence (J. Molofsky, R. Durrett, S. Levin, J. Dushoff and D. Griffeath).

(5) Protein folding problem

The purpose of this work is to predict the three-dimensional structure of a protein from its one-dimensional sequence. Since the spring of 1998, we have been working on this problem from following directions: 1. multicanonical MC (Monte Carlo) simulations of peptides or proteins based on all-atom models, 2. multicanonical MD (molecular dynamics) simulations of peptides or proteins based on all-atom models, 3. multicanonical MC simulations of peptides or proteins based on simple models for amino acids, 4. development of new simulation method, 5. development of models for water-protein interactions, and 6. development of algorithms for parallel computing (Sh. A. Hairyan, C.-K. Hu, W.-Y. Liang, and W. C. Ma).

5. PC Farm and Parallel Computing

Since 1995, we can see there is a great hardware and software progress in personal computer technology which makes PC usable in scientific computing due to its commodity nature. For example, high performance CPU, PCI bus, fast memory component, large scale storage peripherals, 2D/3D graphics devices, fast network devices and many free, mature and well tested UNIX like operating systems and Internet public domain software on Internet are available. These off-the-shelf

resources have brought us to a new era.Currently, we are building a Linux clustered production system with batch, parallel, distributed resources capability. The purpose is to provide a single transparent interactive, batch, distributed and parallel computing environment to scientific users. Now we have in in Academia Sinica Computing Center (ASCC) two batch clusters, 33 hosts. We are going to build one parallel cluster (32 hosts) around Sep. 1998 and a distributed resources cluster (16 hosts) around Jan. 1999. With the PC Farm Project, we provide a PC based scientific computing environment, get the core technology of parallel and distributed computing, and learn more about hardware/software we are using for the optimization purpose (Simom C. Lin).

III

List of Ongoing Research Projects

List of Ongoing Research Projects

中研院物理所八十七年度計畫清單一覽表

(1997年7月~1998年6月)

主持人	計畫名稱	執行期間	計畫編號
王明哲	重夸克及強作用物理之實驗探討(Ⅱ)子計畫三CDF實驗之電腦模擬與數據分析(Ⅰ)	08/01/97-07/31/98	NSC87-2112-M-001-043
王建萬	微中子振盪之先行性實驗(Ⅱ)	08/01/97-07/31/98	NSC87-2112-M-001-034
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	08/01/96-07/31/99	NSC87-2314-B-001-011-M01
王唯工	以脈診研究中醫藥之歸經原理	07/01/97-06/30/98	CCMP87-RD-006
王唯工	模擬性之氣功外氣研究:動物模型之建立與實驗	07/01/97-06/30/98	NRICM-87103
王唯工	八味地黃丸的歸經研究(一)	03/20/98-06/30/98	
王唯工	八味地黃丸的歸經研究(二)	03/20/98-03/19/99	
任盛源	鈷鎳磁膜的磁阻與平面霍爾效應研究	08/01/97-07/31/98	NSC87-2112-M-001-021
江紀成	由7LI經放射性捕獲反應研究8BE核之D態	08/01/97-07/31/98	NSC87-2112-M-001-031
何侗民	矽中鎂氧複合雜質紅外線吸收光譜之研究(1/2)	08/01/97-07/31/98	NSC87-2112-M-001-024
余岳仲	鋰離子束誘發稀土元素之M-層游離研究	08/01/97-07/31/98	NSC87-2112-M-001-032

主持人	計畫名稱	執行期間	計畫編號
余海禮	微擾QCD與小X物理	08/01/97-07/31/98	NSC87-2112-M-001-00
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(1/3)	08/01/97-07/31/98	NSC87-2112-M-001-03
李世昌	重夸克及強作用物理之實驗探討(Ⅱ)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(Ⅰ)	08/01/97-07/31/98	NSC87-2112-M-001-04
李世昌	以精密質譜儀探測宇宙中反物質及暗物質(子計畫一):探測反物質及暗物質(Ⅱ)	08/01/97-07/31/98	NSC87-2112-M-001-04
李世昌	重夸克及強作用物理之實驗探討(總計畫)(Ⅱ)	08/01/97-07/31/98	NSC87-2112-M-001-04
李定國	t-J模型與高溫超導體研究(1/3)	08/01/97-07/31/98	NSC87-2112-M-001-0
李定國	t-J模型與高溫超導體(中型儀器)	08/01/97-07/31/98	NSC87-2732-M-001-0
杜其永	可溶性高份子聚合物對二元混合液的臨界特性之影響	08/01/97-07/31/98	NSC87-2112-M-001-0
林爾康	MeV質子激發11^B(ρ,α)8^Be(2α)三體核反應之研究	08/01/97-07/31/98	NSC87-2112-M-001-0
姚永德	夸米尺寸金屬之物理特性研究	08/01/97-07/31/98	NSC87-2112-M-001-0
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表面化學研究	01/01/98-12/31/98	NSC87-TPC-M-001-0
胡進錕	用電腦研究凝聚態物質	08/01/97-07/31/98	NSC87-2112-M-001-0

主持人	計畫名稱	執行期間	計畫編號
胡進錕	統計物理與非線性動力學(Ⅱ)	08/01/97-07/31/98	NSC87-2112-M-001-046
張志義	重夸克物理之對稱破缺	08/01/97-07/31/98	NSC87-2112-M-001-002
梁鈞泰	斷裂現象與驅動擴散系統之相變	08/01/97-07/31/98	NSC87-2112-M-001-006
陳志強	表面活性濟引發不穩定性之實驗研究	08/01/97-07/31/98	NSC87-2112-M-001-020
陳洋元	重費米化合物與高溫超導之高壓比熱研究	08/01/97-07/31/98	NSC87-2112-M-001-019
陳洋元	重費米化合物與高溫超導之高壓比熱研究(中型儀器)	08/01/97-07/31/98	NSC87-2732-M-001-007
陳啓東	單電子三極體之電荷效應(1/2)	08/01/97-07/31/98	NSC87-2112-M-001-008
陳啓東	單電子三極體之電荷效應(中型儀器)	08/01/97-07/31/98	NSC87-2732-M-001-005
曾忠一	應用AVHRR資料在SPOT衛星影像之大氣糾正及估算植被指數	07/01/97-06/30/98	87-遙測-04(3)
曾忠一	半拉格朗日法在雲模式上的應用	08/01/97-07/31/98	NSC87-2111-M-001-001
曾詣涵	介子系統與超核子理論研究(Ⅱ)	08/01/97-07/31/98	NSC87-2112-M-001-004--Y
黃榮鑑	自由液面紊流場流況之數值研究	08/01/97-07/31/98	NSC87-2611-E-001-001
黃榮鑑	海洋污染及防治--重密度污染物海洋放流之擴散研究	08/01/97-07/31/98	NSC87-2611-E-001-002

主持人	計畫名稱	執行期間	計畫編號
劉鏞	磁性金屬薄膜,多層膜與超晶格之磁異向性與巨磁阻現象	08/01/97-07/31/98	NSC87-2112-M-001-01
鄭天佐	晶體表面原子動力學與量子物理性質之研究--晶體表面原子動力學與量子理性質之研究〈Ⅲ〉	08/01/97-07/31/98	NSC87-2119-M-001-01
鄭海揚	粒子物理現象之探討(2/3)	08/01/97-07/31/98	NSC87-2112-M-001-0
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之研製(Ⅰ)	08/01/97-07/31/98	NSC87-2112-M-001-0
鄧炳坤	重夸克及強作用物理之實驗探討(Ⅱ)子計畫四奇異重子衰變中CP不守恆現象之探討(Ⅰ)	08/01/97-07/31/98	NSC87-2112-M-001-0
謝雲生	可調諧雷射晶體之生長與研究(1/3)	08/01/97-07/31/98	NSC87-2112-M-001-0
顏迪佑	以強子氣模型探討重離子碰撞	08/01/97-07/31/98	NSC87-2112-M-001-0
魏金明	氫分子解離吸附在氧原子覆蓋鎳(111)表面加強效應研究	08/01/97-07/31/98	NSC87-2112-M-001-0

IV

Publication List of 1997/1998

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5. Darwin Chang, J.W. Bos, S.-C. Lee, Y.C. Lin and H.H. Shih, *The Okubo relation for the baryon magnetic monents and chiral perturbation theory*, hep-ph/9702272 submitted to Nuclear Physics B.
6. Darwin Chang, David Bowser-Chai and Wai-Yee Keung, *Electron Electric Dipole Moment from CP Violation in the Charged Higgs Sector*, hep-ph/9703435 Physical Review Letters **78**, 1988 (1997).
7. Darwin Chang, Chung-Yu Mou, Baruch Rosenstein and Ching-Long Wu, *The*

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11. Darwin Chang, David Bowser-Chao and Wai-Yee Keung, *Interplay between Strong and Weak CP Phases*, Chinese Journal of Physics **35**, 842 (1997). hep-ph/9803275
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Appendix: Statistics of Publications in 1997 SCI Journals

Keywords	Number of Items
Physics, Academia Sinica, Taiwan	84
Physics, Taiwan	488
Academia Sinica, Taiwan	602
Physics, Seoul National University	187
Physics, University of Tokyo	1033
Physics, Kyoto University	345
Physics, Hong Kong Univ. of Science and Technology	91
Physics, National University of Singapore	101
Physics, Academia Sinica, Peoples R. China	568
Physics, Beijing University, Peoples R. China	242
Physics, Tata Institute of Fundamental Research, India	46
Physics, The University of Melbourne	119
Physics, Tel Aviv University	337
Physics, University of Toronto	219
Physics, Harvard University	169
Physics, Cornell University	140
Physics, University of California, Berkeley	308
Physics, Princeton University	309
Physics, University of Chicago	132
Physics, Columbia University	624
Physics, Yale University	107
Physics, Leiden University	23
Physics, University of Cambridge	293
Physics, Technical University of Berlin	88
The Niels Bohr Institute, Copenhagen	185
Physics, University of Vienna	231
Physics, University of Oslo	132

V

Supporting Facilities

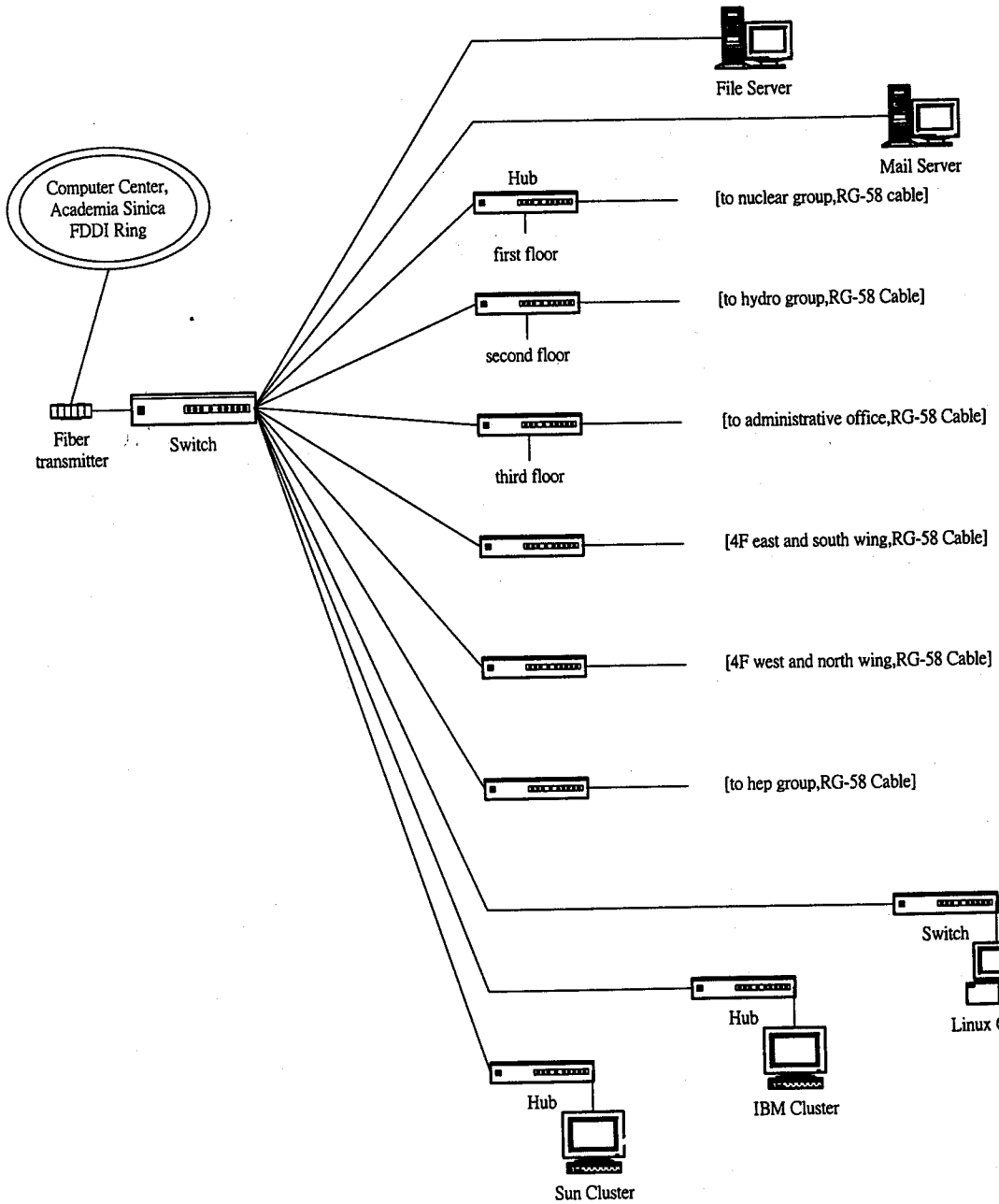
Computing Facilities

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 four-fold:(i) to provide high-speed computing environment for research using numerical simulations and symbolic manipulations; (ii) to maintain a high-speed connection via the Internet to other parts of the world; (iii) to maintain automation in the administrative office and the library; and (iv) to provide consultation and technical assistance in network-related matters.
Over the past few years, our computing facilities have been growing steadily. Currently we have two subnets of workstations: one consisting of a 4-cpu AlphaServer 2100 4/275, an Alpha workstation 1000A-5/400, six IBM RISC-6000 (three 3CT, one 550, 370 and 350), another consisting of ten SPARC stations (two 200MHz Ultra SPARC I and two 300MHz dual-CPU Ultra SPARC II, two SPARC-10 and four SPARC-5).

These are supplemented by another network of 24 Pentium-class processors running Linux, dedicated to intensive cost-effective computing.
The computer room also hosts several general-purpose personal computers and a wide range of peripheral devices and original software.

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.

As a part of the Institute of Physics, the institute director is automatically the head of the library. Under our director is a library committee which supervises and assists in policy making and daily affairs concerning the library. Members of the committee include research colleagues of the institute as well as full time librarians.

The library is located on the 3rd floor of the physics building and has a total area of over 6,100 sq. ft. There are reserved areas for the users to read books, journals and other library materials as well as a room for displaying preprints and reprints from colleagues within the institute.

For the fiscal year of 1998, the library has a total budget of NT8.5 million; 85% for journals and 15% for books.

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 of which 18 are from mainland China. In recent year, the library has been increasing its collections at an annual rate of 700 new books and 1500 newly bound volumes of journals. The library is currently subscribing 200 plus journals. Besides books and journals, the library also has a collection of microfiche (with back issues of 32 journals) and four CD-ROM databases. All the above mentioned items are easily accessible to research members of institute as well as scholars within the physics community in Taiwan.

OPERATION OF THE PHYSICS LIBRARY

The operation of the Physics library can be grouped into 3 main categories.

(I) Technical Services

The services we provide here include the collection and processing of library materials.

(a) Collection of Library Materials

(i) The research members of the institute make suggestions for purchases, the library committee will then review and make recommendations to the director for final decisions.

(ii) To have a fast grasp of new information in this modern era is an important topic for our research members. For this reason, the

librarians spend much of their time to enhance the collection of related information through various channels such as

---The library has "standing orders" on 30 plus reputable book series such as: Lectures notes in Physics, in order to reduce the time spent through correspondence.

---Beginning 1992, all foreign books purchased are sent to the library by air mail.

---There is also a plan to purchase back issues of certain journals that are valuable to the research members here.

---The library is constantly aware of publication news from most reputable publishing companies as references for new purchases.

(b) Processing of Library Materials

In order to facilitate the management and utilization of library materials, it is necessary to have a systematic way to take care of the library materials arrived. The physics library adopts the following methods:

(i) Cataloguing

We here use the Chinese Cataloguing Rules (CCR) and the Anglo-American Cataloguing Rules (AACR II) Systems to catalogue the library books and journals written in Chinese and foreign languages respectively. These rules catalogue the materials according to the title, author and other publishing related items. The cataloguing helps both the librarians and the users search the materials they need when they already have the name of the author, the title of the book or even the subject headings.

(ii) Classification

The library materials are also classified according to the "New Classification Scheme for Chinese Libraries" and "Library of Congress Classification" for books written in Chinese and foreign languages respectively. In this way, it allows both the librarians and the users to have a better understanding of the allocation of library materials in various fields and thus the direction of future purchases of the library. The organization of library materials is a job that needs a lot of thinking, judgments as well as man power. With the rapid advance of the computer technology, the man power problem is now partially solved.

(II) Referencing 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. New books are displayed on specific shelves twice every month. Reservation can be made during these periods.

---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 "Scitech 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".

---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 is also a fax machine in the library in order to reduce the amount of time for the transfer of information needed by the library users.

---Other facilities. There are four PCs(all with CD-ROM drivers) and a laser printer. There is a "feedback" mailbox where comments and criticisms from users are welcome for the improvement of library services.

(III) Library Automation

The Physics Library has just finished its library automation program.The goal of this program is to speed up the processing of library materials and thus improve the ability of information exchange. The Academia Sinica adopted the "INNOPAC" library automation system in 1991. The Physics Library, being a member of the "on-line" library system on campus, started an automation program in September, 1991. This program includes:

(a) The filing of library materials.

This is the core work of the first stage of the automation program. In order to reduce the man power we need and to speed up the filing work, the library adopted the CD-ROM database to help trace back some of the existing but old library materials and also as a reference for the cataloguing of new books.

(b) "On-line" processing of journals.

By the end of 1992, newly arrived journals are processed both "on-line" and manually. Journals check in, claim, etc. can all be done "on-line". Users can also use the INNOPAC system to find out the most

recent arrived journals.

(c) Circulation of library books.

The library has a user database of over 100 user records. All the check out books are recorded in this database. A user is able to obtain information of his/her own records through networks.

(d) Other features of the automation program.

---There are now more and more journals which have "on-line" versions. Examples are: Physical Review Letters (started July, 1995), Nuclear Physics A, B and Nuclear Physics B Supplement. 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.

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

CONCLUDING REMARK

To provide the best information service and to assist research workers in the institute on their research work is goal and responsibility of the Physics Library. In order to achieve this, the library needs both encouragement and surveillance from all of us.

APPENDIX

The following is a list of the information systems and CD-ROM databases in the library.

(1) Information Systems:

(a) LAS (Library Automation System)

One can look up library materials within the Academia Sinica Library System and other library informa tion systems around the world.

(b) PINET (The Physics Information Nwork of the American Institute of Physics).

This information system is developed by the American Institute of Physics (AIP). It provides updated Physics news, papers in physics related areas which will soon be published in journals and other useful information.

(2) CD-ROM Database Collections:

(a) Thomas Register 1995 Edition

This database contains a list of US and Canadian corporations.

(b) SCI (Science Citation Index) with A bstract, 1980-present

Citations of more than three thousand journals are included here. An authoritative database to evaluate the usefulness of a scientific article.

(c) INSPEC (Physics Section), 1989-present

An electronic version of Physics Abstracts, over three thousand journals, conference proceedings and technical reports in physics related areas are included.

(d) PDF-2 Database (Power Diffraction File) 1992 Edition

A database that contains information on properties of various materials.

Machine Shop

There is 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 five 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. Next year we plan to purchase a lathe and a folding machine. In this fiscal year, we have designed and made numerous parts that worth nearly one million dollars. In addition we also help our research faculties to solve their problems in various laboratories of our institute. At present, we are upgrading our technical support for vacuum systems. These include design, fabrication and assembly of vacuum chambers, maintenance and repair works of vacuum pumps. We also make some effort to stock commonly used vacuum parts and materials especially those used in UHF 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

We will establish an electronic workshop, the purposes are twofold: to help our colleagues to build or to repair their experiment electronic apparatus and to provide research students a good environment to learn about electronics. The workshop will have a technician and will be equipped with needed tools.

VI

Academic Activities

Attendance in International Conferences

中研院物理所八十七年度出席國際會議表

(1997年7月~1998年6月)

會議名稱	會期	舉辦地點	出席人員	經費來源
lirLAPW 計算程式--WIEN97 工作研討會	07/01/97-07/05/97	奧地利維也那	魏金明	本所+自理
國際第四十四屆場發射研討會	07/07/97-07/11/97	日本東京	鄭天佐	主題
元端量子物理研討會	07/09/97-07/11/97	馬來西亞吉隆坡	鄭天佐	主題
第八屆太平洋科學期距會議	07/13/97-07/19/97	斐濟	黃榮鑑	教育部
第十屆國際層流紊流數值研討會	07/21/97-07/25/97	英國威爾斯	彭逸凡	本所+自理
第十五屆物理數體問題國際會議	07/22/97-07/26/97	荷蘭 Groningen	曾詣涵	本所+自理
十五屆國際少體物理會議	07/22/97-07/26/97	荷蘭 Groningen	張志義	國科會
九九七磁性國際會議	07/27/97-08/01/97	澳洲 Cairns	陳洋元	本所+國科會
十三屆國際離子束分析會	07/27/97-08/01/97	葡萄牙里斯本	余岳仲	國科會
際磁性會議	07/27/97-08/01/97	澳洲 Cairns	柯松仁	主題+自理
九九七國際磁學會議	07/27/97-08/01/97	澳洲 Cairns	任盛源	國科會
二屆生物能國際研討會	08/07/97-08/10/97	美國夏威夷	王唯工	本所+自理

會議名稱	會期	舉辦地點	出席人員	經費來源
第十一屆國際傅立葉轉換光譜會議	08/10/97-08/15/97	美國雅典	何侗民	國科會
第二十三屆國際天文聯合會議	08/18/97-08/22/97	日本京都	吳建宏	國科會計劃
IUPAP 會議物理之創造性國際會議	08/19/97-08/23/97	匈牙利 Sopron	胡進錕	主題
第七屆亞太物理學大會	08/19/97-08/23/97	大陸北京	鄭天佐	本所
第七屆亞太物理會議	08/19/97-08/23/97	大陸北京	陳志強	國科會計劃
強關連系統與臨界現象	08/26/97-09/05/97	俄國	胡進錕	國科會
第十一屆半導體物理學術會議	09/07/97-09/11/97	大陸北京	鄭天佐	國科會
第一屆中德雙邊近代海洋工程發展研討會	09/08/97-09/15/97	德國 Hasenwinke	黃榮鑑	國科會+德方
第十八屆生醫工程與第十一屆醫學物理國際研討會	09/14/97-09/19/97	法國尼斯	王唯工	國科會
第十三屆軟磁材料研討會	09/24/97-09/26/97	法國 Grenoble	姚永德	本所+國科會
開發中國家對基地性固定設施於太空科技有效利用會議	10/02/97-10/05/97	義大利	簡來成	本院
第四十八屆國際太空聯盟(IAF)年會	10/06/97-10/10/97	義大利杜林	簡來成	本院
光纖讀出技術研討會	10/16/97-10/17/97	瑞典斯德哥爾摩	朱明禮	本所
量子色動力學修正與新物理之國際研討會	10/27/97-10/29/97	日本廣島	葉聰文	國科會+本所

會議名稱	會期	舉辦地點	出席人員	經費來源
國際 QCD 修正及新物理會議	10/27/97-10/29/97	日本廣島	余海禮	國科會
磁光記錄及光儲存聯合國際研討會	10/27/97-10/31/97	日本 Yamagata	姚永德	主題
粒子物理現象學研討會	10/31/97-11/02/97	韓國漢城	鄭海揚	本所
亞太粒子物理現象學會議	10/31/97-11/02/97	韓國漢城	葉聰文	本所
亞太區粒子物理會議	10/31/97-11/02/97	韓國漢城	王子敬	本所
第二屆東和大學統計物理會議	11/04/97-11/07/97	日本福岡	胡進錕	主題+自理
第二屆東和大學國際統計會議	11/04/97-11/07/97	日本福岡	陳志強	本所+國科會計畫
第二屆東和大學統計物理國際會議	11/04/97-11/07/97	日本福岡	梁鈞泰	本所
第三屆 RESCUE 國際研討會	11/11/97-11/13/97	日本東京	吳建宏	本所+自理
第十八屆 IUVSTA 研討會	11/17/97-11/21/97	澳洲新古堡	鄭天佐	本所
一九九七年新材料原子分析會議	11/23/97-11/28/97	美國夏威夷	鄭天佐	本所
一九九七年材料研究學會秋季年會	12/01/97-12/05/97	美國波士頓	黃英碩	國科會
第 13 屆超高速原子核-原子核碰撞國際研討會	12/01/97-12/05/97	日本 Tsukuba	顏迪佑	本所
第 78 屆統計力學會議	12/14/97-12/16/97	美國新澤西	胡進錕	計畫+自理
第七屆國際磁性及磁性材料聯合研討會	01/06/98-01/09/98	美國舊金山	柯松仁	主題

會議名稱	會期	舉辦地點	出席人員	經費來源
第七屆國際磁性及磁性材料聯合研討會	01/06/98-01/09/98	美國舊金山	姚永德	國科會
一九九八年國際光學工程學會光電子學研討會	01/24/98-01/30/98	美國聖荷西	陸念華	國科會
高登研究會議--磁性奈米結構	01/25/98-01/30/98	美國 Ventura	姚永德	委託計畫
高登研究會議--磁性奈米結構	01/25/98-01/30/98	美國 Ventura	李尚凡	本所+自理
第十一屆年度研討會--計算物理在凝態物理的最新發展	02/23/98-02/27/98	美國喬治亞州	陳昭安	主題
第十一屆年度研討會--計算物理在凝態物理的最新發展	02/23/98-02/27/98	美國喬治亞州	胡進錕	主題
JHF 科學研討會	03/02/98-03/08/98	日本東京	王子敬	本所
一九九八年美國物理學會三月會議	03/10/98-03/20/98	美國洛杉磯	杜其永	國科會+本所
美國物理學會(APS)1998 年三月年會	03/11/98-03/15/98	美國洛杉磯	黃英碩	本所+自理
美國物理學會三月會議	03/16/98-03/20/98	美國洛杉磯	李定國	本院主題
美國物理學會之春季會議	03/16/98-03/20/98	美國洛杉磯	何侗民	本所
美國物理學會三月會議	03/16/98-03/20/98	美國洛杉磯	朴永鎬	本院主題
美國物理學會三月會議	03/16/98-03/20/98	美國洛杉磯	陳企寧	本院主題
一九九八年美國三月物理年會	03/16/98-03/20/98	美國洛杉磯	陳洋元	應用科學中心
低能電子顯微術研習會	04/07/98-04/11/98	美國亞利桑那州	張嘉升	本所

會議名稱	會期	舉辦地點	出席人員	經費來源
美國國家科學院年會	04/25/98-04/28/98	美國	張立綱	本院學術審議
行政長官特設創新科技委員會	05/06/98-05/07/98	香港	張立綱	自理
第七十九屆統計物理會議	05/15/98-05/18/98	美國紐澤西州	Izmailian	主題
第七十九屆統計物理會議	05/15/98-05/18/98	美國紐澤西州	倪 達	主題
第十二屆工程力學研討會	05/17/98-05/20/98	美國聖地牙哥	蕭葆羲	本所
第八屆國際海洋工程會議	05/24/98-05/29/98	加拿大 Montreal	黃榮鑑	本所+自理
行政長官特設創新科技委員會	06/03/98-06/05/98	香港	張立綱	自理
微中子九八國際會議	06/04/98-06/09/98	日本東京	王子敬	本所
第八屆質子誘發 X 射線放射國際會議	06/13/98-06/18/98	瑞典 Lund	林爾康	本所
第八屆國際粒子誘發 X 射線產生及其分析應用會議	06/14/98-06/18/98	瑞典 Lund	余岳仲	本所
NANO'S 98 國際會議	06/14/98-06/19/98	瑞典	陳洋元	本所
第十九屆國際表面物理研討會	06/15/98-06/19/98	波蘭華沙	鄭天佐	本所+主題
第一屆計算物理之現代趨勢國際研討會	06/15/98-06/20/98	俄國	李定國	本所+自理
第一屆計算物理之現代趨勢國際研討會	06/15/98-06/20/98	俄國	魏金明	本所+主題

Institute Sponsored Meetings

1. **The First Asia-Pacific and the Fourth Taipei International Workshop and Symposium on Statistical Physics**
2. **40 Years of Experimental Works Since Parity Violation**
3. **The Second Joint Meeting of the World-Wide Chinese Physics in Honor of Prof. Ta-You Wu on the Occasion of His 90th Birthday**
4. **1997 Taiwan International Conference on Superconductivity & 5th Workshop on Low Temperature Physics**
5. **The 7th. Academia Sinica Workshop on Statistical Physics and Numerical Simulation**
6. **The 8th Academia Sinica Workshop on Statistical Physics and Numerical Simulation**
7. **The XII Spring School on Particles and Fields**
8. **The 9th Academia Sinica Workshop on Statistical Physics and Numerical Simulation**
9. **Taipei International Symposium on Surfaces & Thin Films**
10. **The 10th Academia Sinica Workshop on Statistical Physics and Numerical Simulation**
11. **The 11th Academia Sinica Workshop on Statistical Physics and Numerical Simulation**
12. **1998 Workshop on Statistical and Computational Physics**

臺北統計物理國際會議

StatPhys-Taipei-1997

New Directions in Statistical Physics

The First Asia-Pacific and the Fourth Taipei International Workshop and Symposium on Statistical Physics

3-11 August, Academic Activity Center,
Academia Sinica, Taipei, Taiwan

Sunday, 3 August 1997

Registration and Free Discussion

Monday, 4 August 1997

Opening and Welcome Addresses
Chin-Kun Hu (Chairman, StatPhys-Taipei-1997)
Yuan-Tseh Lee (President of Academia Sinica and Trustee of APCTP)
Tien-Tzon Tsong (Director of Inst. Phys. and Councillor of Phys. Soc., Taipei)

A1 Modeling Molecular Motors: Stochastics Ratchets in Biology and Physics(I)
Charles R. Doering (Univ. of Michigan)

A2 Modeling Molecular Motors: Stochastics Ratchets in Biology and Physics(II)
Charles R. Doering (Univ. of Michigan)

B1 Modeling Molecular Motors: Stochastics Ratchets in Biology and Physics(III)
Charles R. Doering (Univ. of Michigan)

B2 Simulated Annealing Techniques for Protein Folding Simulations
Yuko Okamoto (Institute for Molecular Science, Okazaki)

B3 Towards the Prediction of Protein Tertiary Structures from the First Principles
Yuko Okamoto (Institute for Molecular Science, Okazaki)

Tuesday, 5 August 1997

C1 Generalized-Ensemble Techniques for Protein Folding Simulations
Uli Hansmann (Institute for Molecular Science, Okazaki)

C2 A Thermodynamics of Fractals Based on Wavelet Analysis: Applications to Fully Developed
Turbulence Data, DNA Sequences, and Financial Time Series(I)}
Alain Arneodo (Centre de Research Paul Pascal)

D1 A Thermodynamics of Fractals Based on Wavelet Analysis: Applications to

Fully Developed
Turbulence Data, DNA Sequences, and Financial Time Series(II)
Alain Arneodo (Centre de Research Paul Pascal)

D2 A Thermodynamics of Fractals Based on Wavelet Analysis: Applications to Fully Developed
Turbulence Data, DNA Sequences, and Financial Time Series(III)
Alain Arneodo (Centre de Research Paul Pascal)

D3 Protein Folding Via Energy Landscape Analysis (I)
Jin Wang (NIH, USA)

Wednesday, 6 August 1997

E1 Protein Folding Via Energy Landscape Analysis (II)
Jin Wang (NIH, USA)

E2 Protein Folding Via Energy Landscape Analysis (III)
Jin Wang (NIH, USA)

Thursday, 7 August 1997

F1 Hydrogen Bonding Polymers
Philip Pincus (Univ. of California, Santa Barbara)

F2 Diversity, Stability, Recursivity, Hierarchy, and Rule Generation in a Biological System: Intra-inter Dynamics Approach
Kunihiko KANEKO (Univ. of Tokyo)

F3 Knowledge-Based Molecular Simulation of Protein Structures
Ming-Jing Hwang (Academia Sinica, Taipei)

F4 Proteins Unfold in Steps
Giovanni Zocchi (The Niels Bohr Institute)

G1 Dynamical Transitions in Biological Systems on Mesoscopic Scales: The Effect of Flexibility and Fluctuations
Wokyung Sung Pohang Univ. of Science and Technology

G2 Physical Instabilities During the Axonal and Dendritic Development of Neuronal Form
H. G. E. Hentschel Emory University

H1-H8 Short Talks

H1 Wormlike Polymer Brushes: a Scaling Theory
Zheng~Yu~Chen (University of Waterloo, Canada)

H2 Electrorheological and Dielectric Characteristics of Semiconductive Polyaniline-Silicone Oil Suspensions
H. J. Choi, M. S. Cho, and Kiwing To (Inha University, Korea})

H3 Abnormal Scattering of Polymer in Binary Solvent
Kiwing To (Academia Sinica, Taipei)

H4 Non-equilibrium Relaxation of a Stretched Polymer Chain
Y.-J. Sheng, P.-Y. Lai and H.-K. Tsao (Nat'l Central Univ., Taiwan)

H5 Fourier Transform for replicated Systems
Domenico M. Carlucci (Tokyo Institute of Technology)

H6 Critical Car Density of the BML Cellular Automaton traffic model
H. F. Chau, K. Y. Wan, and K. K. Yan (Univ. of Hong Kong)

H7 Relaxation Time Distributions in Disordered System: Dipole Glass versus Ferroelectric Relaxor
Bog-Gi Kim and Jong-Jean Kim (KAIST, Korea)

H8 Early-time Critical Dynamics of Lattices of Coupled Chaotic Maps
Philippe Marcq (Kyoto University)

Friday, 8 August 1997

I1 Universal Statistics of Fully Developed Turbulent Flows
Itamar Procaccia (The Weizmann Institute of Science)

I2 Experimental Studies in Turbulent Soap Films
Walter I. Goldburg (University of Pittsburgh)

I3 Fragmentation Scaling of the Percolation Cluster
Iksoo Chang (Pusan National University)

I4 Self-organized Criticality in Stick-slip Models with Periodic Boundaries
Kwan-tai Leung (Academia Sinica, Taipei)

J1 Analytical Results in the Models of Self-organized Criticality
Evgeni V. Ivashkevich (JINR, Russia)

J2 Branched Tree Structures: From Polymers to River Networks
S. S. Manna (Indian Institute of Technology)

J3 Unstable Growth and Coarsening in Molecular-Beam Epitaxy
L. H. Tang (Hong Kong Baptist University)

K1-K8 Short Talks

K1 Edge Scaling of Soap Froth
K.Y. Szeto and W.Y. Tam (Hong Kong Univ. of Science and Tech.)

K2 Gauge Model for Equilibrium and Nonequilibrium Phase Transitions
Sze Kui Ng (Hong Kong Baptist University, Hong Kong)

K3 Potential Effect on Instantaneous Normal Modes of Liquids
Ten-Ming Wu (National Chiao-Tung University)

K4 Stochastic Hopf Bifurcation in a Biased van der Pol Model
H. K. Leung (National Central University, Taiwan)

K5 Condensate and Fluctuating States of a Weakly Interacting Superfluid Helium-4 Slab
Sang-Hoon Kim (Mokpo National Maritime University)

K6 Theory of Fission for Two-component Lipid Vesicles
C. M. Chen (National Taiwan Normal University, Taipei)

K7 Neuro Shell and Multyfactor Analysis Coupling in the Solution of Some Space Physics Problems
A. V. Dmitriev (Moscow State University)

K8 Exact Spin-Spin Correlation Functions of Bethe Lattice Ising-type Spin Models in External Fields
N Sh. Izmailian and Chin-Kun Hu (Academia Sinica, Taipei)

Saturday, 9 August 1997

L1 Cluster Simulations Using Geometric Transformations
Henk W. J. Bloete (Delft University of Technology)

L2 Non-Hermitian Random Matrix Theory
A. Zee (University of California, Santa Barbara)

L3 Multicanonical Monte Carlo Simulations
Wolfhard Janke (Universitat Mainz)

L4 Random Sequential Adsorption, Series Expansions and Computer Simulations
Jian-Sheng Wang (National Univ. of Singapore)

M1 Physics Investigation of the Dynamics of a Stock Market Index
Rosario N. Mantegna (Universita' di Palermo)

M2 Localization in Non-Hermitian Quantum Mechanics and Flux-Line Pinning in Superconductors}
Naomichi Hatano (Univ. of Tokyo and Los Alamos Natl Lab.)

N1-N8 Short Talks

N1 New Sum Rule Identities and Duality Relation for the Potts n-point Correlation Function
F. Y. Wu and H. Y. Huang (Northeastern University, Boston)

N2 Universal Finite-Size Scaling Functions for the Potts Model
Chin-Kun Hu (Academia Sinica, Taipei)

N3 Cluster Monte Carlo Approach to Potts model on Kagome Lattice
Jau-Ann Chen (Academia Sinica, Taipei)

N4 Exact Analysis of Critical Properties of Ising Model on Migdal-Kadanoff Hierarchies
Feng-Tien Lee and Ming-Chang Huang (Chung Yuan Christian Univ., Taiwan)

N5 An Ising Spin-S Model on Generalized Recursive Lattice
N.Sh. Izmailian (Academia Sinica, Taipei and Yerevan Phys. Inst.)

N6 Deterministic Phase Flow of Macroscopic Quantum Dynamics
Te-Chun Wang and Yih-Hsiung Gou (Nat'l Chiao-Tung Univ., Hsinchu)

N7 Steady State and Dynamics of Driven Diffusive Systems with Quenched Disorder
Goutam Tripathy (Tata Institute of Fundamental Research)

N8 Semiquantal Dynamics of the Kicked Harmonic Oscillators
Bambi Hu, Baowen Li, Jie Liu, Jilin Zhou (Hong Kong Baptist Univ.)

N9 Diffusion and Localization in Chaotic Billiards
Baowen Li (Hong Kong Baptist Univ.)

Monday, 11 August 1997

O1 Exact Lattice Statistics in Three Dimensions
F. Y. Wu (Northeastern Univ., Boston)

O2 Kelvin Waves and the Orographic Effects on Easterly Cold Surges in Southern China
Kenneth Young (Chinese Univ. Hong Kong)

O3 Mean Field Theory of Learning in Rough Energy Landscape
K.Y.M. Wong (Hong Kong Univ. Science and Tech.)

O4 The Quantum Frenkel-Kontorova Model
Bambi Hu (Hong Kong Baptist University)

O5 Ab initio Molecular Dynamics Simulation and ts Application
Dongqing Wei (Centre de Recherche en Calcul Applique)

O6 Partition Function for 3D Ising Model by Random Walk
S.L. Lou (Tunghai University)
O7 New Gauge Model of QED and Phase Transitions
S.K. Ng (Hong Kong Baptist University)

40 Years of Experimental Works Since Parity Violation
Symposium in Memory of Academician Madame C.S. Wu

August 10, 1997
Institute of Physics, Academia Sinca, Tapei, Taiwan
Sponsored by Academia Sinica, National Central University and the
C.S. Wu Foundation

Program

Opening Session	Chairman: S.C.C. Ting [丁肇中]
09:00 - 09:10	Y.T. Lee (President of Academia Sinica) [李遠哲]
09:10 - 09:20	W.C. Chen (President of the C.S. Wu Foundation) [陳維昭]
09:20 - 10:10	H. Schopper, "40 Years of Experimental Works since Parity Violation"
10:10 - 10:20	Coffee Break
2nd Session	Chairman: Xide Xie [謝希德]
10:20 - 10:30	K.T. Lee (in place of C.H. Liu, President of National Central University) [李國鼎]
10:30 - 11:00	C. Jarlskog, "CP Violation"
11:00 - 11:30	Y.H. Chu, "High-Energy Astrophysics: from the Great Annihilator ot White Dwarfs" [朱有花]
11:30 - 12:00	F. Pauss, "The Experimental Challenge of Symmetry Breaking"
12:00 - 12:30	L.L. Chau, "Violation of Discrete Symmetries in Particle Physics: past, present and future" [喬玲麗]

第二屆全球華人物理學大會

The Second Joint Meeting of the World-Wide Chinese Physics In Honor of Prof. Ta-You Wu on the Occasion of His 90th Birthday

August 11-15, 1997, Academia Sinica, Taipei, Taiwan

Monday, August 11

SESSION A1

Protostellar Winds and Jets

.....Shu, Frank H.

Protostellar Disks and Extrasolar Planet

.....Ho, Paul T.P.

Formation of Solar Systems

.....Lin, Douglas N.C.

The Formation of Compact Binary Systems

.....Taam, Ronald

Fractal Dimension as a Shape Parameter for Modeling Cosmic Dust

.....Leung, Chun Ming

Solitons in Crab Nebula

.....Chiueh, Tzi-Hung

SESSION B1

Atomic Physics Tests of Fundamental Symmetries

.....Johnson, Walter R.

Quantitative Determination of Profile Parameters of an Atomic Resonance in the Absence of Ultra-high Energy Resolution

.....Chang, Tu-Nan

Atomic and Molecular Physics in Strong Fields

.....Chu, Shih-I

Theory of Electron-Impact Ionization of Atoms

.....Huang, Keh-Ning

Recent Developments in Radiationless Transitions

.....Lin, Sheng Hsien

A Boundary Condition Determined He Wave Function and He^2 Dimer Potential

.....Tang, K.T.

Relativistic Configuration-Interaction Calculations of Atomic Correlation of Correlation of Atomic Correlation

.....Cheng, Kwok-Tsang

SESSION C1

Design Considerations of Spallation Neutron Sources

.....Weng, Wu-Tsung

Challenges and Issues of Heavy Ion Fusion Accelerators

.....Yu, Simon

Research Activities on New Acceleration Techniques

.....Chen, Pisin

Nonlinear Dynamics in Beams

.....Lee, Shyh-Yuan

Conceptual Design of the HIRFEL-CSR

.....Wei, Bao-Wen

The Beam Physics Activities in Taiwan and Asia

.....Hsu, Ian

SESSION E1

Exact Lattice Statistics in Three Dimensions

.....Wu, F.Y.

Kelvin Waves and the Orographic Effects on Easterly Cold Surges in Southern hina

.....Young, Kenneth

Mean Field Theory of Learning in Rough Energy Landscape

.....Wong, Kwok-Yee Michael

The Quantum Frenkel-Kontorova Model

.....Hu, Bambi

Ab Initio Molecular Dynamics Simulation and Its Application

.....Wei, Dongqing

Partition Function for 3D Ising Model by Random Walk

.....Lou, Shyang-Ling

New Gauge Model of QED and Phase Transitions

.....Ng, S.K.

Shape Equations of Single-and Multi-Layers of Vesicles of Fluid Membrancs

.....Ou-Yang, Z.C.

Yangian Symmetries in Quantum Mechanics
.....Ge, M.L.

SESSION G1.

A Phenomenological Analysis of Heavy Hadron Lifetimes
.....Cheng, Hai-Yang

Large CP-Violation in the Effective Lagrangian and its Collider Phenomenology
.....Young, Bing-Lin

Leptonic Radiative B Decays
.....Geng, Chao-Qiang

Search for New Mechanism of CP Violation using Leptons
.....Tsai, Paul Yung Su

1/Nc Expansion for Excited Baryons
.....Pirjol, Dan

SESSION G1

Defect-Induced Optical Nonlinearity in Si/Ge Superlattices
.....Xiao, Xudong

Energy Loss of Charged Particles Moving near Solid Surfaces
.....Liu, Wing-Ki

New Technique for Surface Crystallography: Direct Inversion of Low-energy ikuchi Electron Diffraction Patterns
.....Hong, I.H.

The Developing Surface Sensitive Positron Beam Spectroscopies
.....Beling, C.D.

Noise-assisted Mound Coarsening in Epitaxial Growth
.....Tang, Lei-Han

Direct Observation of the Moving Liquid/Solid Interface During Nanosecond Pulsed Laser Annealing of Silicon
.....Hsieh, Der Ming

Tuesday, August 12

PLENARY SESSION

Search for the Fundamental Blocks of Nature
.....Ting, S.C.C.

Dynamics of Atoms and Molecules at Solid Surfaces
.....Tsong, T.T.

Symbolic Dynamics and the Problem of Complexity
.....Hao, Bai-Lin

Microscopic Motions in Strongly Coupled Dusty Plasmas-from Crystal to Chaos
.....I, Lin

SESSION B2

Nonlinear Spectroscopic Studies of Surface Reactions
.....Shen, Y.R.

Effects of Adsorbate Short-Range Order and Adsorbate-Substrate Interaction in Surface IR Spectroscopy
.....Dai, Hai-Lung

IR Spectroscopic Studies of Vibrational Relaxation and Hydrogen Etching on Diamond Single and Nano-Crystal Surface
.....Chang, Huan-Cheng

Second Harmonic Generation Study of Adsorbate Structure and Phase Transition at Surfaces and Interfaces
.....Ying, Zhiqiang

Multidimensional Dynamics in Surface Reactions
.....Zhu, Xiaoyang

Synchrotron Radiation Studies of Porous Silicon and Metal Silicides: Probing Complexity with a Versatile Tool
.....Sham, Tsun-Kong

Difference Frequency Generation Based CW Infrared Sources for Spectroscopy and Environmental Monitoring Applications
.....Chen, Weidong

SESSION C2

Future Outlook of Synchrotron Radiation Sources
.....Teng, Lee C.

The Status of the Hefei Light Sources
.....Jin, Yu-Ming

An Update on the Synchrotron Radiation Research Center
.....Sah, Richard

Accelerator Physics Issues at SRRC

.....Kuo, Chin-Cheng
Development of Orbit Feedback System and Transverse Coupled-Bunch Feedback System at Taiwan Light Source
.....Hsu, Kuo-Tung
The RF Gun Programs at SRRC
.....Ho, Ching-Hung
High Gain Free Electron Laser Development at BNL Sources
.....Yu, Li Hua

SESSION E2

The Molecular Origin of the Surface Tension
.....Huang, Cheng-Cher
First Passage Exponent and Survivors in 2D Soap Froth
.....Tam, Wing Yim
Monte Carlo Dynamics of Randomly Branched Polymers in a Good Solvent
.....Chen, Z.Y.Jeff
Unfolding a Collapsed Polymer in A Poor Solvent
.....Lai, P.Y.
Recent Neutron Scattering Studies of Interactions in Mixtures of Colloid and Polymer
.....Tong, Penger
Phase Separation Dynamics of Binary Liquid Mixture with Dissolved Polymer
.....To, Kiwing
Observation of Surfactant Driven Instability in a Hele-Shaw Cell
.....Chan, Chi-Keung
Phase Transition in a Spring-Block Model of Surface Fracture
.....Leung, Kwan-Tai
Stable Nanocrystals of Water Molecules at Room Temperature and Pressure
.....Lo, Shui-Yin
Determination of Deuterium Incorporation into RNA and Protein Components of the E.Coli Riobsome at Biosynthetic Deuteration by Small Angle Neutron Scattering
.....Fan, Lixin

SESSION F1

Observation of High Momentum Transfer and High x Events in Positron-Proton Collisions
.....Ling, Ta-Yung

Neutrino Physics and Astrophysics : An Experimental Overview
.....Wong, Henry Tsz-King
A Statistically Significant Periodicity in the Homestake Solar Neutrino Data
.....Chang, Chung Yun
Measurement of Top Quark Mass in Dilepton Channel in CDF
.....Yeh, Ping
Properties of Six-Jet Events at Fermilab Proton-Antiproton Collider
.....Chang, Paoti
Study of Two-Photon Resonances with the L3 Detector
.....Hou, Suen
High Energy Gamma Ray Astrophysics with Milagro
.....Shen, Benjamin C.

SESSION J1

QCD Sum Rules and Hyperon Decays
.....Henley, Ernest
Renormalization of Relativistic Self-Consistent Hartree-Fock Approximation
.....Wu, Shi-Shu
Condensates in QCD
.....Hwang, W-Y. Pauchy
Estimate of Isospin Breaking in the Quark Condensate from QCD Sum Rules
.....Yang, Kwei-Chou
Quenching Mechanism of Nuclear Spin Quantities
.....Arima, A.
The Relativistic Hartree-Bogoliubov Description of Halo and Giant Halo Nuclei at the Drip Line
.....Meng, Jie
Suppression of Core Polarization Halo Neuclei
.....Kuo, Thomas T.S.
Anomalous Suppression of J/ϕ and ϕ' in High-Energy Pb-Pb Collisions
.....Wong, Cheuk-Yin

Wednesday, August 13

SESSION E3

Room Temperature Ultraviolet Laser Emission from Microstructured ZnO Thin Film
.....Tang, Zi Kang

Recent Advances in Soft-X-Ray Magnetic Circular Dichroism
.....Chen, Chien-Te

Microstructured Crystals of Dielectrics for Nonlinear Optics and Related Fields
.....Ming, N.B.

Liquid Crystal Clad Fiber
.....Chen, S.H.

Optical Fiber Couplers with Liquid Crystals
.....Pan, R.P.

Gain Spectrum and Lasing Mechanisms of Room-Temperature UV Lasing ZnO Epitaxy Thin Films
.....Yu, Ping

Study on Light Emission and Formation Mechanisms of Porous Si
.....Zhang, S.L.

Study of Nuclear Resonant Bragg Scattering by Using Synchrotron Radiation
.....Zhao, Jiyong

Two-Dimensional Rayleigh Approach to Photon Scanning Tunneling Microscopy Image
.....Wang, Shu

Cathodoluminescence Study of MOCVD Grown ZnCdSe/InP(001)
.....Zhang, X.B.

SESSION G2

Integrable-System Approach to QFT: Yangian Algebras and K-Z Equations in Self-Dual Yang-Mills Theory
.....Chau, Ling-Lie

Nonabelian Bose-Einstein Interference and Factorization
.....Lam, Chi-Sing

Chiral Symmetry Breaking in an External Field.
.....Ng, Y. Jack

Massive Two Loop Integrals in Renormalizable Theories

.....Yao, York-Peng

CPT Invariance in the Presence of Gravity
.....Chang, Lay Nam

Mass Transmutation with Fermions
.....Chang, Ngee-Pong

SESSION I1

3MV Tandem Accelerator at Academia Sinica
.....Lin, Erh-Kang

7Li-45Sc Reactions Below Coulomb Barrier
.....Wang, Chang-Wan

Neutron Radiography and Neutron Activation Application
.....Yeh, Tunn-Ran

Multifragmentation in Heavy Ion Reactions
.....Tsang, ManYee Betty

What Have We Learned from the Relativistic Heavy-Ion Collisions ?
.....Xu, Nu

Flavor Symmetry of Sea Quark Distributions--Results from FNAL E866
.....Peng, Jen-Chieh

First Results from TJNAF
.....Gao, Haiyan

Double Beta Decay Experiments
.....Wong, Henry Tsz-King

SESSION K1

A New Theory of Plasma Emission Process: Some Preliminary Results
.....Wu, Ching-Sheng

Simulation Studies of Plasma Heating and Particle Accelerations in Collisionless Space Plasmas
.....Lyu, Ling-Hsiao

Double Discontinuity: A Compound Structure of Slow Shock and Rotational Discontinuity
.....Whang, Yun Chow

Interaction of Interplanetary Shocks and Discontinuities with the Earth's Bow Shock
.....Lin, Yu

Plasma Physics Problems of Magnetospheric Modeling

.....Hau, Lin-Ni
Magnetization Parallel Current Owing to the Magnetic Moment of Bounce Motion
.....Huang, Tian-Sen
Plasma Transports Induced by Alfven Waves
.....Chen, Liu

SESSION L2

Manipulation of Individual Atoms and Electrons
.....Huang, Dehuan
Modelling Growth of Quantum Dots in Heteroepitaxy
.....Hung, Ho Yuen
Surface Electron Affinity of Diamond Surfaces
.....Lee, Shuit-Tong
Electronic States of Interfaces of The Wide Gap Semiconductor Superlattices
.....Xie, Xide
Diffusion of Adatoms and Subsurface Self-Interstitial Atoms of Ge Surface
.....Yang, Weisheng

SESSION B3

Hydrogen Bond Connectivity Patterns of Normal and Supercooled Water
.....Mou, Chung-Yuan
Reaction Dynamics of Mg(^{1}P1,^{1}S1/2)with H2: Elucidation of Reaction Pathways for the MgH product
.....Lin, King-Chuen
Photodissociation of NO2 at 355 nm: Pair Correlation, Orbital Alignmanet, and mj-resolved Angular Distributions
.....Lee, Shih-Huang
Vibrational Reorganizational Energies and Photophysics Associated with Direct Photoinduced Electron Transfer Reactions in Inorganic Complexes
.....Phillips, David Lee
Laser Control of Molecular Excitation and Dissociation Using Frequency-Chirped Pulses
.....Yuan, Jian-Min
Photofragment Quantum State Correlations and Nonadiabatic Dissociation Dynamics
.....Qian, Charles
Crossed-Beam Studies of Radical Reaction Dynamics

.....Liu, Kopin

SESSION C3

A Proton Accelerator Facility For Medical and Scientific ResearchApplications in Taiwan. A Feasibility Study
.....Ngo, Frank Q.H.
BASER--a Coherent Beam of Heavy Particles
.....Lo, Shui-Yin
Present Status and Future Challenges of Superconducting Magnets and SRF Cavities in Accelerators for HEP,FEL and NP
.....Shu, Quan-Sheng
Beam Steering in the Linear Induction Accelerators
.....Chen, Yu-Jiuan

SESSION E4

Nonperturbative Canonical Formulation for Quantum Many-body Systems at Finite Temperatures
.....Toyoda, Tadashi
Thermal Stability of Magnetic Clusters
.....Liou, S.H.
Magnetic and Structural Studies in Metallic Multilayers
.....Yao, Y.D.
Tunneling Magnetoresistance of A Spin-Filter Junction
.....Chang, C.R.
Heavy-Fermion and Spin-Glass in Ce2PdGe6
.....Tien, C.
Conductance of Atomic Wires
.....Guo, Hong
Oscillatory Magnetoconductance of Dual-Quantum-Wires.
..... Gu, B.Y.
Interdiffused Non-square Quantum Wells for Applications in Optoelectronics
.....Chan, Kwok Sum
Persistent Current in a Ring under the Canonical Ensemble
.....Cheung, Ho-Fai

SESSION F2

Recent Results from the LEP Experiments.
.....Chang, Yuan-Hann

Physics at the LHC-the Next High Energy Frontier
.....Ling, Ta-Yung

Experimental Relativistic Heavy Ion Collisions
.....Fung, Sun-Yiu

Development of Silicon Pad Detectors
.....Lin, Willis T.

Status Report of the BELLE EFC Detector-a Hardware Project from the Taiwan BELLE Group
.....Wang, Ming-Zhu

Searching for Possible CP Violation in Hyperon Decays
.....Chen, Y.C.

The Possibility Study on the Measurement of R Value at BES /BEPC
.....Li, Jin

SESSIN H1

Waves in Open Systems
.....Young, Kenneth

Boundary Layer Length Scales in Rayleigh-Bénard Turbulence
.....Xia, Ke-Qing

Correcting Quantum Errors by Means of a Five Register Code for Systems with Higher Spins
.....Chau, Hoi Fung

Physics and Finance
.....Li, Daxi

Gravitational Energy: Quasilocal vs Pseudotensors
.....Nester, James M.

SESSION K2

Colisionless Electron Heating in Inductively Coupled Sources
.....Shaing, Ker Chung

Large Area Planar Plasma Source Excited a Tunable Surface Wave Cavity
.....Kou, C.S.

Phase Diagram of Dusty Plasma
.....Lee, Hoong-Chien

Plasma Effects on the Performance of Microwave Devices
.....Lin, Anthony T.

Anomalous Dynamics of Fast Ions with Emphasis on Fundamental Physics
.....Chen, Kuan-Ren

High Power KrF Laser for Laser Plasma Interaction Research
.....Yang, N.Y.

Application of X-ray Laser Interferometry to Probe High-Density, Laser-Produced Plasmas
.....Wan, Alan Szu-Hsin

Auxiliary Heating and High Beta-p Equilibria in Strongly Shaped Tokamak Plasmas
.....Lin, Liu, Yuh-Ren

Alpha Particle Physics in Tokamak Fusion Reactors
.....Wong, King-Lap

Thursday, August 14

PLENARY SESSION

From High Temperature Superconductors To Oxide Superlatices via Mesomaterial Engineering
.....Chu, Paul C.W.

Wave Transport Velocities in Resonantly Scattering
.....Sheng, Ping

Precision Measurement with Atom Interferometry
.....Chu, Steven

Quenching Mechanisms of Nuclear Spin Quantities
.....Arima, A.

SESSION A1

Modern Cosmology
.....Chiu, Hong-Yee

Computational General Relativistic Astrophysics
.....Suen, Wai-Mo

High Resolution CO Observation of Proto-Planetary Nebula IRAS22272-5435 Using BIMA mm-Wave Interferometer Array

.....Lee, Typhoon
Bar-driven Density Waves and Accretion of Gas-dominated Central Disks
.....Yuan, Chi
Acoustic Imaging in Helioseismology
.....Chang, Hsiang-Kuang
Gravitation Spin Effects and Magnetic Inclination Evolution
.....Zhang, Chengmin
Spectral Energy Distribution Using BATC System
.....Lu, Phillip K.

SESSION B4

Chemical Applications of Gaussian-2 Calculations
.....Li, Wai-Kee
The PFI-ZEKE Photoelectron Spectroscopy of Acetylene via Trans-Bent $\tilde{A}^{1}A_{u}$ State as the Intermediate
.....Hsu, Yen-Chu
Unravel Laser Photodissociative Processes with Time-resolved Fourier-Transform IR Spectroscopy
.....Lee, Yuan-Pern
Very High Resolution Photoelectron Spectroscopy Using Third Generation Synchrotron Radiation
.....Ng, Cheuk-Yiu
Fluorescence-Imaging Techniques and Reaction Dynamics
.....Chen, Kuo-Mei
VUV Laser-Induced Plasma Emissions for Ultra-Micro Spectrochemical Analysis of Liquid Samples
.....Cheung, Nai-Ho
Energy-Angle Distributions of Bremsstrahlung from Intermediate-Energy Electrons on Atoms
.....Tseng, H.K.

SESSION C4

Echo Effect in Accelerators
.....Chao, Alexander Wu
Crystalline Beams
.....Wei, Jie

Differential Lie Algebraic Methods Applied to the Study of Nonlinear Beam Dynamics
.....Yan, Yiton
Radiative Beam Cooling
.....Huang, Zhirong
Charged Particle Acceleration Using Wakefield Methods
.....Gai, Wei
The Muon Collider and the Phase Rotation
.....Zhao,Yongxiang
Transient Self-Interaction of a Bunch
.....Li, Rui
Beam Physics, Accelerators and the Correlative Specialty in Tsinghua University(Beijing)
.....Gui, Wei-Xie

SESSION E5

From Mirror to Window: Electron Correlations in Optically Switchable Rare Earth Hydrides
.....Zhang, Fu-Chun
Landau Fermi Liquid Theory - and Beyond
.....Ng, Tai-Kai
The Phase Diagram of the Extended Hubbard Model in One Dimension for Arbitrary Band Filling
.....Lin, H.Q.
A Diamondlike Photonic Crystal with a Sizable Band-Gap
.....Leung, K.M.
Correlation in the Energy Spectrum of Disordered Rings
.....Yip, Man-Kit
Magnetic Flux Dependent Superconducting Phase Transition in a Squid Device
.....Brink, A. Maassen van den
Solutions of the Anharmonic Molecular Crystal Model
.....Teh, Rosy
Macroscopic Fractional Quantization in Quantum Hall Effect
.....Wang, T.C.

SESSION G3

Electric Dipole Moment of Electron and Charged Higgs Mechanism of CP Violation
.....Chang, Darwin
Parton Degrees of Freedom from Euclidean Path Integral Formulation
.....Liu, Keh-Fei
Self-Organized Criticality and Interacting Soft Gluons in Diffractive Scattering
.....Meng, Ta-Chung
Direct CP Violation from Electroweak Penguins
.....Chia, Swee Ping
Spin and Flavor Structure of Proton
.....Li, Ling-Fong
Resumation Approach to Evolution Equations
.....Li, Hsiang-nan

SESSION H2

Universality in Random Matrix Theory
.....Zee, Anthony
Quantum Group Symmetry in the Landau Problem and the Chern- Simons Theory on a Torus
.....Ho, Choon-Lin
Quantum Holonomy and Topological Tensors in 3D Chern-Simons Theory
.....Lee, Hoong-Chien
Quantum Supergroups and Noncommutative Spaces
.....Zhang, Ruibin

FUNDING PANEL DISSUSION

Funding Trends in Physics--View towards the 21th Century
.....Chang, Lay-Nam, Xie, Xide, Young, Kenneth

Friday, August 15

PLENARY SESSION

Bose-Einstein Condensation
.....Yang, C.N.
String Theory and Mathematics
.....Yau, Shing-Tung

ASIAA and the Submillimeter-wave Array
.....Lo, Fred K.Y.
Status of BEPC/BES and Physics Results
.....Zheng, Zhi-Peng

POSTER SESSION

Resonance Tunnelling in Self-Organized InxGa1-x/GaAs Quantum Dots
.....Cheng, Hung-Hsiang
Magnetic Field Induced Anomalous Phase Transition in p-type Si/SiGe Heterostructures
.....Lin, Tai-Yuan
Electric Field Measurements of InGaAs/GaAs Quantum Dots by Photoreflectance
.....Tyan, S.L.
Study on the Si-Si Surface Vibrational States of Silicon
.....Young, Tai-Fa
Electronic Collective Excitations in Carbon Nanotube Bundles
.....Chuu, Der-San
Persistent Currents in Toroidal Carbon Nanotubes
.....Lin, Ming-Fa
The Noise in Resonant Tunneling through an Anderson Impurity
.....Ding, Guo-Hui
The Kinetic Investigation of the Reaction Mg(3s3p ^{1}P1) and CH4 over the Range of Temperature from 638 to 855 K
.....Nien, Jeff Chiafu
Reaction Dynamics of Na(4^2S1/2, 6^2S1/2) with H2: Insertion versus Harpoon Mechanism
.....Liu, Dean-Kuo
Thermal Emission Decay Fourier Transform Infrared Spectroscopy
.....Xiao, Peng
Opto-Thermal Transient Emission Radiometry for Non-Destructive Examination
.....Xiao, Peng
Elementary Excitations in an Electron-Gas Cylinder Bundle
.....Huang, Chien-Sheng
Radiative Transfer in Spiral Galaxies with Clumpy Dust
.....Lee, Ting-Hui

Systematic Features of the Structure of the Heavy ODD-Mass Sb Nuclides near N=82
.....Chung, C.
Simultaneous Measurement of Particles Size and Refractive Index Using ainbow Angle Method
.....Li, Shi-Mu

1997 台灣國際超導會議

1997 Taiwan International Conference on Superconductivity & 5th Workshop on Low Temperature Physics

August 13-16 1997, Taipei, Taiwan ROC

Organized by Institute of Physics, Academia Sinica

Sponsors: Academia Sinica, ROC National Science Council, ROC

Ministry of Education, ROC The Physical Society, ROC

Scentific Programs

Wednesday, August 13

Location：Institute of Earth Sciences **Rm201**

9:00-9:15 **Opening Remarks**
(President Yuan T. Lee &Director Tien T. Tsong)

Location：Institute of Earth Science
【Plenary】 **Chair：J.C. Ho** **Rm201**

9:15-10:00 **L-1** ***C.C. Tsuei** and J.R. Kirtley
Implications of $d_{x^2-y^2}$ Pairing Symmetry for High-Temperature Superconductivity

10:00-10:45 **L-2** ***M. Tachiki**
Josephson Vortex Lattice Structure and Josephson Plasma in High-Tc Superconductors

10:45-11:00 **Coffee break**

【Plenary】 **Chair：H.C. Ku** **Rm201**

11:00-11:45 **L-3** ***C.W. Chu,** Z.L. Du, Y.Y. Xue, Y. Cao, N.L. Wu, Y.Y. Sun and I.Rusakova
Search for Novel High Temperature Superconductors: The Ba-Ca-Cu-O System

11:45-12:30 **L-4** ***F. Steglich,** P.Gegenwart, R.Helfrich, C. Langhammer, F. Kromer, M. Lang,T. Michels and G.R.Stewart
UBe_{13}: Another Phase Transition Below Tc?

12:30-14:00 **Lunch**

【Application of High-Tc】 **Chair：H.E. Horng** **Rm201**

14:00-14:30 **H-1** ***J. Clarke,** E. Dantsker, S. Tanaka and K. Kouznetsov
High-Tc SQUIDS And Gradiometers

14:30-15:00 **H-2** ∗ **H.C. Yang,** B.L. Young, J.H. Lu, H.W. Yu, D.C. Cho, Michelle P.H. Chang, J.D. Chern, W.L. Lee, M.J. Chern, M.F. Lai and L.M. Wang
Characteristics of High-Tc $YBa_2Cu_3O_y$ SQUIDs

15:00-15:30 **H-3** ∗ **H. Adrian,** U. Frey, P.Iiaibach, G. Jakob, H. Meffert and A. Schaattke
Devices Based on High-Tc Films and Teterostructures

15:30-15:45 **H-5** **I.G. Chen,** Jen-Chou Hsu, Gwo Jamn and M.K. Wu
Magnetic Levitation/Suspension Force of Single Graind YBCO Materials

15:45-16:00 **M-5** **C.C. Chin**
The Superconductivity Receiver for Submillimeter Array

16:00-16:15 **Coffee break**

【Materials】 **Chair : C.C. Chi** **Rm212**

14:00-14:30 **M-1** ∗ **T. Morishita,** H. Zama, N. Tanaka, F. Wang, J.G. Wen and Y. Shiohara
Homoepitaxial Growth of YBa_2Cu_3Oy Films

14:30-15:00 **M-2** ∗ **M.K. Wu,** D.Y. Chen, D.C. Liang, P.Z. Chien, Y.Y. Chen and H.C. Ren
Superconductivity In Ru-Based Double Perovskite Oxides

15:00-15:30 **M-3** ∗**K. Togano**
Development of $Bi_2Sr_2Ca_1Cu_2O_x$/Ag Conductors and Coils for High Field Generation

15:30-15:45 **M-4** **T.B. Tang** and C.R. Li
Synthesis of Carbon-Free Bi-2223

16:00-16:15 **Coffee break**

【Symmetry & Superconductivity】 **Chair : C.C. Tsuei** **Rm201**

16:15-16:45 **S-1** ∗**J. Mannhart,** H. Hilgenkamp and Ch. Gerber
Wave Function Symmetry and its Influence on Grain Boundary Devices

16:45-17:00 **S-2** **D. Chang,** C.-Y. Mou and C.L. Wu
Static and Dynamical Anisotropy Effects in Mixed State of D-Wave Superconductors

17:00-17:15 **S-3** **H.W. Cheng,** Li-Fu Chang, C.C. Chi and M.K. Wu
Quasi-particle Tunneling of d-wave Superconductors

17:15-17:30 **S-4** L.J. Chen and **J.T. Lue**
The Transition from the d- to s-state due to Thermal Fluctuation for High-Tc Superconductors as an Evidence from the Microwave Penetration Depth Measurement

18:30- **Banguet**

Thursday, August 14

Location : Auditorium of Activity Center
【Joint Session with Second Joint Meeting of the World-Wide Chinese Physics 】

9:00-9:40 **P2a-1** ∗**Chu, Paul C.W.**
From High Temperature Superconductors To Superlatices via Mesomaterial Engineering

9:45-10:25 **P2a-2** ∗**Sheng, Ping**
Wave Transport Velocities in Resonantly Scattering

10:30-11:00 **Coffee break**

11:00-11:40 **P2b-1** ∗**Chu, Steven**
Precision Measurement with Atom Interferometry

11:45-12:25 **P2b-2** ∗**Arima, A**
Quenching Mechanisms of Nuclear Spin Quantities

12:30-14:00 **Lunch**

Location : Institute of Earth Sciences
【Vortex I】 **Chair : Z.D. Wang** **Rm201**

14:00-14:30 **V-1** ∗**P. Ao**
Theory of Hall Anomaly in the Mixed State

14:30-15:00 **V-2** ∗**X.-M. Zhu** and B.Sundqvist
Determine Transverse Force on a Single Vortex

15:00-15:30 **V-3** ∗**C.-Y. Mou**
New Findings in the Electromagnetic Response of Superconductors

15:30-15:45 **V-4** D. Chang, C.-Y. Mou and **C.L. Wu**
An Interpretation of Neutron Scattering Data on Flux Lattices of Superconductors

15:45-16:00 **V-5** **W.Y. Chen,** M.J. Chou and C.J. Lin
The Effects of Pinning on Vortex-Pair Production in Superconducting Films

16:00-16:15 **Coffee break**

【CMR & Other Materials】 Chair : R.S. Liu Rm212

14:00-14:30 O-1 ***Z.Y.Weng**

Chern Number Description of the Metal-Insulator Transition in Condensed Matter Physics

14:30-15:00 O-2 ***W.Y. Liang**

Impurity Model for Strongly Correlated Electron Systems

15:00-15:15 O-3 **J.J. Lin,** Y.L. Zhong and C.Y. Wu

Electron-Phonon Scattering Time In Disordered Conductors

15:15-15:30 O-4 **C. Tien& C.S. Wur,** E.V. Charnaya and Yu.A. Kumzerov

Critical Fields of Superconductors in Porous Glass

15:30-15:45 O-5 **C.R. Wang** and S.T. Lin

The Metal -Insulator Trasition in A1-Pd-Re Quasicrystals

15:45-16:00 O-6 **J.G. Lin,** R. Gundakaram, C.Y. Huang, J.B. Wu and R.S. Liu

FMR Studies on $Nd_{0.7}(Sr_{0.3-x}Ca_x)MnO_3$

16:00-16:15 O-7 **C.Y. Huang,** J.R. Leu and J.G. Lin

FMR Studies on Granular Magnetic Ni-SiO_2

16:15-16:30 **Coffee break**

Location : A4, Center of Academic Activities

【Joint Session with Second Joint Meeting of the World-Wide Chinese Physics 】

14:00-14:25 E5-1 **Zhang, Fu-Chun**

From Mirror to Windows: Electron Correlations in Optically Switchable Rare Earth Hydrides

14:25-14:50 E5-2 **Ng, Tai-Kai**

Landau Fermi Liguid Theory- and Beyond

14:50-15:10 E5-3 **Leung, K.M.**

A Diamondlike Photonic Crystal with a Sizable Band-Gap

15:10-15:30 E5-4 **Yip, Man-Kit**

Correlation in the Energy Spectrum of Disordered Rings

15:30-15:50 E5-5 **Brink, A. Maassen van den**

Magnetic Flux Dependent Superconducting Phase Transition in a Squid Device

15:50-16:10 E5-6 **Teh, Rosy**

Solutions of the Anharmonic Molecular Crystal Model

16:10-16:30 E5-7 **Wang, T.C.**

Macroscopic Fractional Quantization in Quantum Hall Effect

【Poster】 Chair : T.K. Lee & Y.D. Yao Rm212

16:15-17:30

P-1 N. Tralshawala, J.R. Claycomb, **H.-M. Cho,** M.Boyd , J.H. Miller, Jr.

High-Tc SQUID Based Nondestructive Testing Instrument for Use in a Magnetically Noisy Environment

P-2 **D.Chang,** C.-Y. Mou, C.L. Wu and B. Rosenstein

The Effect of Anisotropy on Vortex Lattice Structure and Flux Flow in d-Wave Superconductors

P-3 **Yu.V. Medvedev,** Yu.M. Nicolaenko and E.N. Ukraintsev

Frequency Dependent Resistive Response of YBCO Film to Microwave Power

P-4 **Yu.V. Medvedev** and S.J. Lewandowski

Specific of Suppression of the Superconductivity in Layered High-Tc Materials

P-5 T.I. Hsu, Y.Y. Hsu, **J.U. Lin,** Y.H. Toh and H.C. Ku

Anomalous Magnetic Properties of the 2212-type Rare Earth Cuprates (Bi, Pb, Cu)2(Sr, Ba)2RCu2O8+δ(R=Pr, Gd, Y)

P-6 **C.W. Chang,** J.G. Lin, C.Y. Huang, C.Y. Chang and R.S. Liu

Thermoelectric Power Studies on High-Tc Oxides With Different Doping-State

P-7 **R.Gundakaram,** N. Gayathri, A. Arulraj, A.K. Raychaudhuri and C.N.R. Rao

Exchange Interactions in the Rare-earth Manganates: A Study of the Systems La0.7Ca0.3M1-xCoxO3 and LaMn1-xCrxO3

P-8 **T.S. Lai,** W.F. Liao, H.F. Cheng and I.N. Lin

Epitaxial Growth and Characteristics of the YBCO/STO/YBCO Tunneling Junctions

P-9 S.Y. Lee,T.M. Chen and **J.S. Ho**

High-Pressure Synthesis and Characterization of Rare-Earth Substituted (Y,R)2Ba4Cu7O14+δ(R=La, Tb, Yb, Lu) Cuprates

P-10 S.L. Yarng, T.M. Chen and **J.P. Lin**

High-Pressure Synthesis and Characterization of Some Ca-Doped R2Ba4Cu7O14+δ(R=Y, Dy, Sm) Cuprate Superconductors

P-11 **J.L. Chen**

Effect of the Surface Irregularity on the Bean-Livingston Barrier

P-12 **L. Horng** and K.Chen

Voltage Criterion of Transport Critical Current Density for a Bi-Based Superconducting Tape

P-13 **M.F. Tai,** K.J. Chia and M.W. Lee

The Trend of Irreverssibility Lines for b3C60 and K3C60 Single Crystals

P-14 **M.F. Tai,** K.J. Chia, W.H. Lee

Vortex-Lattice Melting in T1(Sr1.5R0.5)CaCu2Oy System with R=Rare Earth Elements

P-15 C.H. Lin, H.C.I. Kao and **C.M. Wang**

Kinetic Study of Yba1.5Sr0.5Cu3Oy Superconductor in Water

P-16 **H.W. Yu,** H.C. Yang, B.Young, D.C. Jou, M.J. Chen, H.E. Horng, J.M. Wu and S.Y. Yang

Characteristics of High-TcYBa2Cu3Oy dc-SQUID Magnetometer

P-17 **D.C. Jou** and H.C. Yang

Characteristics of High-Tc YB2Cu3O7 Step-Edge dc-SQUIDs

P-18 **M.S. Zhang** and Z. Yin

Structural Phase Transitions in ABO3 OXIDES

P-19 H.C. Yang, C.H. Chen, C.T. Chen, L.M. Wang, **P.H. Chang,** H.E. Horng and F.F.Lin

Hall Effect of YBa2Cu3Oy /Nd1.85Ce0.15CuO4 Multilayers

P-20 H.C. Yang, C.Y.Lin, C.H. Chen, **L.M. Wang** and H.E. Horng

Superconducting Properties of YBa2Cu3Oy /SrRuO3 Multilayers

P-21 H.C. Yang, **L.M. Wang,** H.E. Horng and F.F. Lin

Longitudinal and Transverse Hall Resistivites in High-Tc Superconducting Multilayers

P-22 **S.X. Dou,** W,G, Wang, J. Horvat and H.K. Liu

Improvement of Critical Current Density of Bi-(Pb)-Sr-Ca-Cu-O Superconductors

P-23 **S. Wu ,** M. Ciszek and W.Y. Liang

Microstructural and Magnetic Properties of LI-Doped TL -1223 Superconductors

P-24 **S.Y. Yang,** W.L. Lee,H.E. Horng,H.W. Yu and H.C. Yang

Fabrication of Biepitaxial Yba2Cu3O7-Y Josephson Junctions and SQUIDs

P-25 **J.M. Wu,** S.Y. Yang, H.E. Horng and H.C. Yang

Effects Of Currents On The Normal State Noises Of YBCO Thin Line

P-26 **E.M. Kaidashev,** V.G. Dneprovski and R.N. Sheftal

YBCO Thin Films Grown by Combination Off-Axis Pulsed Laser Deposition and Hot Wall Methods

P-27 **S.H. Tsai,** S.C. Law, C.C. Chi and M.K. Wu

A Method of Growing High Quality YBa2Cu3Oy thin Films on Mismatched Substrates

P-28 **S.H. Tsai,** J.R. Chiou, C.C. Chi and M.K. Wu

A New Method of Growing YBa2Cu3Oy 45° bi-epitaxial thin Films on MgO Substrate

P-29 **T.J. Lee,** T.S. Lin, C.Y. Wan, T.I. Hsu and H.C. Ku
Growth and Characterization of a Single Crystal Bi2Sr2PrCu2Oy

P-30 C.J.C. Chen, **H.C. Yang,** H.E. Horng
Transport Properties of YBa2Cu3O7-□/CaMoO3 Multilayers in a Magnetic Field

P-31 **H.H. Sung,** W. L. Lee, S.Y. Yang, H.C. Yang and D.S. Lee
Atomic Force Microscope Studies of $YBa_2Cu_3O_{7-y}$ thin Films with CeO_2 Buffer Layers

P-32 Y.D. Yao, **G.H. Ho,** Y. Liou, I.Klik and C.K. Lo
Low Temperature Electrical and Magnetic Studies of Permalloy thin Films

P-33 **A.N. Ulyanov**
Transport of Alternating Current by Superconductors

P-34 **C.Y. Wu,** Y.D. Yao and J.J. Lin
Magnetoresistance Behavior of Ni Layer Interior and Under Cu Films

P-35 **Y.Y. Chen** and Y.D. Yao
Low Temperature Magnetic and Thermal Properties of Nanocrystalline $CeAl_2$

P-36 **H.K. Fun,** T.S. Lin, C.Y. Wan, X.K. Li and T.J. Lee
Precise Structure Determination of $Bi_2Sr_{1.5}Pr_{2.5}Cu_2O_y$ by X-ray Diffraction Methods

P-37 **S.N. Bai,** Y.D. Yao, Y. Liou and W.H. Lee
Flux Jumps in Pb/Ag Multilayer Superconductors

P-38 **H.K. Liu,** W.G. Wang, R.Bhasale, B. Zeimetz, J. Horvat and S.X. Dou
Effect of Phase Evolution on the Critical Current Density in Bi-2223/Ag Tapes

P-39 C.Y. Wu, **Y.D. Yao** and Y.L. Song
Low Temperature Properties of SbTeSe Phase-Change Media

18:30- **Dinner**

Friday, August 15

Location : Auditorium of Activity Center
【Joint Session with Second Joint Meeting of the World-Wide Chinese Physics 】

9:00-9:40 **P3a-1** **＊Yang, C.N.**
Bose-Einstein Condensation

9:45-10:25 **P3a-2** **＊Yau, Shing-Tung**
String Theory and Mathematics

10:30-11:00 **Coffee break**

11:00-11:40 **P3b-1** **＊Lo, Fred K.Y.**
ASIAA and the Submillimeter-wave Array

11:45-12:25 **P3b-2** **＊Zheng, Zhi-Peng**
Status of BEPC/BES and Physics Results

12:30-14:00 **Lunch**

Location : A1, Center of Academic Activities
【Structure & Thermal Properties】 Chair : W.Y. Guan

14:00-14:30 **I-3** **＊D.K. Finnemore**
Free Energy Surface for Stripe Phase Superconductors

14:30-15:00 **R-2** **＊H.C. Ku**
Anomalous Pr Ordering High-Tc Cuperates System

15:00-15:15 **R-3** S.R. Chen, **J.-Y. Lin,** C.F. Chang, H. L. Tsay and H.D. Yang
Magnetic Field Dependence of the Low Temperature Specific Heat of $La_{2-x}Sr_xCu_{1-y}Zn_yO_4$

15:15-15:30 **R-4** **I.L. Landau,** A.V. Danilov, S.E. Kubatkin, I.A. Parshin and L.Rinderer
Insulating Modifications in Cold Deposited films of Metals

15:30-15:45 **R-5** **J.M. Chen,** R.G. Liu, R.S. Liu, H.C. Lin, T.M. Uen, J.Y. Juang and Y.S. Gou
Polarized X-ray Absorption Studies in Double-Thallium-Layer Superconducting Thin Films

15:45-16:00 **R-6** **T.J. Lee,** C.H. Chou, C.Y. Wan, H.C. Ku, J.C. Huang, C.H. Cheng, S.R. Sheng and M.K. Wu
Characterization of the $PrBa_2Cu_4O_8$ Compound by X-ray Diffraction Analysis Corporate with the Resistivity and Magnetic Susceptibility Measurements

16:00-16:15 **Coffee break**

Location : A4, Center of Academic Activities
【Magnetic & Transport Properties】 Chair : S.H. Liou

14:00-14:30 **G-1** ***Y.W. Park,** J.H. Lee, G.T. Kim, S.-J. Hwang, J,-H. Choy
The Electrical Transport of Intercalated BSCCO

14:30-15:00 **G-2** ***H. D. Yang,** S.S. Weng, J.-Y. Lin, T.H. Meen and H.L. Tsay
Absence of the Superconductor-Insulator Transition in the 'R1248' Phase?

15:00-15:30 **G-3** ***S.I. Lee** and M.-O. Mun
Magnetic Field Effect on the Transport Properties of Quaternary Intermetallic Superconductors, RNi_2B_2C(R=Y and Lu)

15:30-15:45 **G-4** **W.H. Lee** and P.Y. Liu
Time-dependent Magentization of Polycrystalline $LuNi_2B_2C$ Superconductor

15:45-16:00 **G-5** **T. M. Chen** and D.S. Liou
A Study on the Electrical Transport and Superconductivity in the Metal-Superconductor Composite Systems M-$Ba_2Cu_4O_8$(M=Ag,Au)

16:00-16:15 **Coffee break**

Location : A1, Center of Academic Activities
【Structure & Transport Properties】 Chair : T.B. Tang

16:15-16:30 **N-1** **I.L. Landau** and L.Rinderer
Resistance and Superconductivity in Cold Deposited Films

16:30-16:45 **N-2** **C.M. Fu,** J.H. Lee, V.V. Moshchalkov and Y. Bruynseraede
Magnetoresistance and Conductivity Fluctuations in Oxygen Deficiency $YBa_2Cu_3O_y$ Superconductor

16:45-17:00 **N-3** **H.-C. I. Kao,** M.Y. Lin and C.M. Wang
Rietveld Analysis of Superconducting $RBa_{1.5}Sr_{0.5}Cu_3O_v$(R=Rare-eatrth)

17:00-17:15 **N-4** **I.L. Landau** and L. Rinderer
Influence of Illumination on Transport Properties of HTSC

17:15-17:30 **N-5** **R.S. Liu,** J.M. Chen, R.G. Liu and S.F. Hu

Relationship Between Hole Distribution and Superconductivity in High-Tc Tl- and Hg-based Cuprates as Determined by X-ray Absorption Near Edge Structure

Location : A4, Center of Academic Activities
【Vortex II】 Chair : C.Y. Mou

16:15-16:45 **W-1** ***Z.D. Wang** and Q.-H. Wang
Vortex Dynamics in Unconventional Superconductors

16:45-17:15 **W-2** ***D.L. Yin,** W.P. Bai and Jun Chen
Nonlinear Response due to Flux Depinning and Tunneling in Type-II Superconductors

17:15-17:30 **W-3** **H.E. Horng,** S.Y. Yang, J.T. Jeng and H.C. Yang
Study on the Dimensionality of Flux Dynamics in Superconducting YBCO/PYBCO Superlattices

18:30- **Dinner**

Saturday, August 16

Location : A4, Center of Academic Activities
【Theory】 Chair : M. Tachiki

9:00-9:30 **T-1** ***C.S. Ting,** Z.Y. Weng and D.N. Sheng
Magnetic Properties of the Two Dimensional t-J Model

9:30-10:00 **T-2** ***T.K. Lee,** C.T. Shih, Y.C. Chen and H.Q. Lin
Superconductivity in the Two-Dimensional t-J Model

10:00-10:15 **T-3** **K. Hirata,** H. Takeya, S.Miyamoto, T. Mochiku and K.Togano
Peak Effect and Vortex Line Lattice Melting in Single Crystalline YNi_2B_2C

10:15-10:30 **T-4** **K. Yu. Arutyunov,** D.A. Presnov and L.Rinderer
Galvanomagnetic Properties of Quasi 0-D and 1-D Superconductors

10:30-10-45 **T-5** **S.C. Cheng**
Collapse of Integer Hall Gaps in a Two-Dimensional Hole System

10:45-11:00 **Coffee break**

【Magnetic Properties & Closing Remarks 】 Chair : H.C. Yang

11:00-11:30 **I-1** ***Z.G. Khim,** S.H. Chun and H.J. Lee
AC Susceptibility Of $YBa_2Cu_3O_{7-\square}$ Single Crystal

11:30-12:00 **I-2** ***P.H. Hor** and S.T. Ting
A Study of The Meissner and Shielding Effects in Annealed $La_2CuO_{4+\delta}$

12:00-12:30 **R-1** ***J.C. Ho**

Low Temperature Heat Capacities of Pr-Containing Cuprates

12:30-12:35 **Closing Remarks**

12:35- **Lunch**

14:00- **Tour**

The 7th. Academia Sinica Workshop on Statistical Physics and Numerical Simulation:
Critical Phenomena and Strong Correlated Systems

Place: Lecture Room at the First Floor of the Institute of Physics of Academia Sinica

2 January 1998 (Friday)

10:00 Peter Kleban (Dept. of Physics, Univ. of Maine, USA)
"Conformal Field Theory and Percolation (1)"

11:00 Break

11:15 Peter Kleban (Dept. of Physics, Univ. of Maine, USA)
"Conformal Field Theory and Percolation (2)"

12:15 Lunch Break

13:30 Yan-Chr Tsai (Institute of Physics, Academia Sinica)
"Effective Action for Generalized Antiferromagnetic Heisenberg Spin Ladders"

14:20 Break

14:30 Youngho Park (Institute of Physics, Academia Sinica)
"DMRG approach to the 2 chain Hubbard model"

15:20 Break

15:40 Kok-Kwei Pan (Dept. of General Studies, Chung Gung Univ.)
"Spin-1/2 Heisenberg Antiferromagnet in a magnetic field"

18:00 Dinner

5 January 1998 (Monday)

11:00 Peter Kleban (Dept. of Physics, Univ. of Maine, USA)
"Conformal Field Theory and Percolation (3)"

12:00 Lunch Break

14:15 Peter Kleban (Dept. of Physics, Univ. of Maine, USA)
"Conformal Field Theory and Percolation: Exact Results at 2-D Percolation Point"

15:15 Break

15:30 Chin-Kun Hu (Institute of Physics, Academia Sinica)
"Some Recent Numerical Results for Percolation Problems"

The 8th. Academia Sinica Workshop on Statistical Physics and Numerical Simulation:
Numerical Simulation of Classical Systems

Place: Lecture Hall of the Institute of Mathematics of Academia Sinica

Date: Monday, 16 March 1998

10:00 Yutaka Okabe (Dept. of Physics, Tokyo Metropolitan Univ.)
"Monte Carlo Simulation of Phase Separation under Shear Flow"

10:50 Break

11:10 Zoctan Neda (Inst. of Physics, Academia Sinica)
"Stochastic Resonance in Ising Systems"

12:00 Lunch Break

14:00 Yutaka Okabe (Dept. of Physics, Tokyo Metropolitan Univ.)
"Finite-size Scaling Functions for the Ising Model"

第十二屆粒子與場春季學校
The XII Spring School on Particles and Fields

March 16 - 19, 1998
Academia Sinica

講員及講題 (LECTURES)

* Aneesh Manohar (Univ. of California, San Diego)
  Large N QCD
* Michael Peskin (SLAC and Stanford Univ.)
  Properties of Strongly-coupled Supersymmetric Gauge Theories
* Luca Trentadue (Parma Univ., Italy)
  Selected Topics in QCD

演講 (SEMINAR)

* Paul Yung Su Tsai (SLAC)
  Do Leptons Participate in CP Violation?

The 9th. Academia Sinica Workshop on Statistical Physics and Numerical Simulation:
Modelling Economic Activities

Date: Tuesday, 24 March 1998
Place: Room 111 (1F) of the Inst. of Mathematics

10:00	Youngki Lee (Dept. of Phys., Boston University)
	"Growth Dynamics of Economic System (I)"
10:50	Break
11:10	Hwai-Chung Ho (Inst. of Statistics, Academia Sinica)
	"Nonlinear Structures of Stock Returns"
12:00	Lunch Break
14:00	Youngki Lee (Dept. of Phys., Boston University)
	"Growth Dynamics of Economic System (II)"
14:50	Break
15:10	Youngki Lee (Dept. of Phys., Boston University)
	"Growth Dynamics of Economic System (III)"
18:00	Dinner

國 際 表 面 及 薄 膜 科 學 研 討 會
Taipei International Symposium on Surfaces & Thin Films

March 24-27, 1998, SRRC, Hsinchu, Taiwan

March 24 (Tuesday)

09:10 - 09:20	Welcome by T.T. Tsong (Director, IOP, Academia Sinica)
09:20 - 09:40	Introduction to SRRC by K.S. Liang (Deputy Director, SRRC)
Session I	Chairman: T.T. Tsong (Academia Sinica)
09:40 - 10:20	Morrel H. Cohen (Exxon)
	Concepts in the Surface Chemistry of Metals
10:40 - 11:20	Robert J. Hamers (U. Wisconsin)
	Cycloaddition Chemistry: A New Route to Ordered Organic Films on Silicon Surfaces
11:20 - 12:00	J. Wintterlin (Fritz-Haber)
	STM Studies of Surface Catalytic Reactions
Session II	Chairman: H.L. Hwang (NTHU)
13:40 - 14:20	M. Aono (RIKEN)
	New Methods Based on STM to Measure Electric, Optical, and Magnetic Properties of Nanostructures
14:20 - 15:00	Y. Kuk (Seoul U.)
	Measurement of Static and Dynamic Carrier Density Profile by Scanning Capacitance Microscopy
15:00 - 15:40	F. Besenbacher (U. Aarhus)
	Dynamics of Diffusion, Nucleation and Growth on Metal Surfaces Studied by Scanning Tunnelling Microscopy
16:00 - 16:40	G. Rosenfeld (U. Twente) Dynamics and Stability of 2D Crystals on Metal Surfaces
16:40 - 17:20	J. O'Connor (U. Newcastle)
	What Drives the p4g Structure?
19:00 - 20:30	Reception and Poster Session

March 25 (Wednesday)

Session III	Chairman: Y.L. Wang (Academia Sinica)
09:10 - 09:50	R.M. Tromp (IBM) In-situ Electron Microscopy of Surface Dynamical Processes
9:50 - 10:20	D.S. Lin (NCTU) Real-time Atomic-level Investigation of the Growth Mode and Surface Reconstruction in Si(100) Chemica Vapor Deposition
10:20 - 10:50	Group Photo and Tea/Coffee Break
10:50 - 11:30	E. Vlieg (FOM) The Influence of Impurities/Surfactants on Crystal Growth
11:30 - 12:00	I.S. Hwang (Academia Sinica) Nucleation and Growth of Ge on Pb Covered Si(111) Surfaces
14:00 - 14:30	Tour to Surface Lab. of IOP, Academia Sinica
15:20 - 17:30	Tour to National Palace Museum
18:00 -	Symposium Banquet at Asia World Plaza Hotel

March 26 (Thursday)

Session IV	Chairman: T.J. Chuang (Academia Sinica and NCU)
09:10 - 09:50	B. Kasemo (Chalmers U.) Surface Reaction Kinetics at the nm Scale
09:50 - 10:30	Y. Iwasawa (U. Tokyo) Dynamic Oxide Surfaces for Chemical Processes and Catalysis
10:50 - 11:30	K. Domen (Tokyo Tech.) Short-lived Surface Reaction Intermediated by Picosecond SFG Measurements□
11:30 - 12:00	T.C. Leung (Chung Cheng Faceting Induced by Ultrathin Metal Films: A First Principles Study
Session V	Chairman: Y. Hwu (Academia Sinica)
13:40 - 14:20	E.H. Conrad (Georgia Tech.) Phase Stability through Step Formation on Vicinal Tungsten Surfaces

14:20 - 15:00	S. Kono (Tohoko U.) Study of Initial-Stage Interface and Surface Electromigration on Si(001)
15:00 - 15:40	H. You (Argonne Lab.) X-ray Scattering and Photoluminescence Measurements of Porous Silicon
16:00 - 16:40	J. Kudrnovsky (Academy of Science, Czech) Effects of Disorder on Interlayer Exchange Coupling
16:40 - 17:20	P. Borthen (U. Duesseldorf and U. Ulm) The Application of the X-ray Absorption Spectroscopy in the Reflection Mode for the Study of Near Surface Regions
17:20 - 18:00	W. Huebner (Max-Planck) Theory of Nonlinear Magneto-Optics

March 27 (Friday)

Session VI	Chairman: K.D. Tsuei (SRRC)
09:10 - 09:50	S. Bugl (KFA) Magnetism and Surface Structure
09:50 - 10:30	A. Stampfl (La Trobe U. Photoemission of Lightly Bound Electrons in Metals
10:50 - 11:30	C. Campuzano (U. Illinois) Photoemsiion from the High Tc Superconductors: Many Body Effects
11:30 - 12:10	H. Schulte (U. Bochum) Characterization of Thin Films with Ion Beams
13:40 -	Tour to United Microelectric Corporation

The 10th. Academia Sinica Workshop on Statistical Physics and Numerical Simulation:
Chaos and Nonlinear Dynamics

Date: Tuesday, 21 April 1998
Place: Lecture Room (1F) of the Inst. of Physics

10:00 Prashant M. Gade (Dept. of Phys., Hong Kong Baptist Univ.)
"Synchronization and its Instabilities in Spatially Extended Systems"
10:50 Break
11:10 Y.-H. Shiau (Inst. of Physics, Academia Sinica)
"Stochastic Postponement of the Domain Transitions and Destabilization of Current in the Gunn Diode"
12:00 Lunch Break
14:00 Prashant M. Gade (Dept. of Phys., Hong Kong Baptist Univ.)
"Self Organized Criticality in non-cascade Dynamics""
14:50 Break
15:00 Weimin Zhang (Inst. of Physics, Academia Sinica)
"Quantum Chaos and Its Recent Development"
15:50 Break
16:10 Prashant M. Gade (Dept. of Phys., Hong Kong Baptist Univ.)
"Stochastic Resonance in Maps and Coupled Map Lattices"
18:00 Dinner

The 11th. Academia Sinica Workshop on Statistical Physics and Numerical Simulation:
Numerical Studies of Protein and Spin Models

Date: 25-26 May 1998
Place: Lecture Room (1F) of the Inst. of Physics

Monday 25 May 1998

15:30 Chao Tang (NEC Research Institute, Princeton, USA)
"Protein Folding Problems (I)"
16:20 Break
16:40 Chao Tang (NEC Research Institute, Princeton, USA)
"Protein Folding Problems (II)"
18:00 Dinner

Tuesday 26 May 1998

10:00 Seiji Miyashita (Osaka Univ., Japan)
"Phase Transitions in 3D Frustrated Systems"
10:50 Break
11:10 Neda (Academia Sinica, Taipei)
"On the Applicability of Quantum MC Simulations for Electron Systems"
12:00 Lunch Break
14:00 Seiji Miyashita (Osaka Univ., Japan)
"Quantum Monte Carlo Methods on Low Dimensional Spin Systems"
14:50 Break
15:10 Y.-C. Chen (Tung-Hai University, Taichung)
"Handscomb Quantum Monte Carlo Method and its Applications in Quantum Spin Models"
16:00 Break
16:20 Seiji Miyashita (Osaka Univ., Japan)
"New Developements in MC Methods"
18:00 Dinner

1998 Workshop on Statistical and Computational Physics

Date: 25-27 June 1998

Place: Institute of Physics of Academia Sinica

Program

Thursday, 25 June: Exact and Numerical Approaches to Critical Phenomena

F. Y. Wu (Dept. of Phys., Northeastern Univ., Boston, 23/6-4/7)

1. Duality relation of the Potts correlation functions
2. Exact results on partition function zeroes of the Ising model

N. Sh. Izmailian (Inst. of Phys., Academia Sinica)

Exact phase diagrams for an ultrathin magnetic film

Simon-C. Lin (Inst. of Phys., Academia Sinica)

PC farm and scientific computing

Jian-Sheng Wang (National University of Singapore, 22/6-30/6)

Transitional Monte Carlo method and nonlocal Monte Carlo dynamics

M.-C. Huang (Dept. of Phys., Chung Yuan Christian Univ., Chung-Li)

Bond percolation on random lattices: two and three dimensions

Friday, 26 June: Protein and Biomembrances

J. Timothy Sage (Dept. of Phys., Northeastern Univ., Boston, 23/6-30/6):

1. Solvent effects on protein structure and dynamics
2. Protein dynamics in solution and in crystals

Yen-Chuan Liao (Institute of Molecular Biology, Academia Sinica)

TBA

Jenn-Kang Hwang (Dept. of Life Sciences, Nat'l Tsing Hua Univ.)

How important are the quantum mechanical nuclear motions in enzyme catalysis?

Chiming Chen (Dept. of Phys., Nat'l Taiwan Normal Univ.)

Physics of biomembranes: from model systems toward biological systems

Saturday, 27 June: Analysis of Biological Data and Computing Algorithms

C.-K. Peng (Harvard University, Boston, 26/6-30/6)

1. A statistical physicist's view on human heart rate dynamics.
2. Is human walking a "random walk ?"

Bai-lin Hao (CTS, Nat'l Tsing Hua Univ.)

Visualization of bacterial complete genomes and under-represented strings in DNA sequences

Ching-Chi Hsu (Dept. of Computer Science, Nat'l Taiwan Univ.)

Combing genetic algorithm and annealing method to solve NP-hard problems

Wen-Yew Liang (Insts. of Phys., Academia Sinica)

Introduction to Parallel Computing via PVM

Seminars
中央研究院物理所八十七年度演講一覽表
（1997 年 7 月～1998 年 6 月）

演　講　題　目	演講者姓名	所屬機構	日　期
Surface Group Meeting:Introduction to Mesoscopic Phenomena	陳啟東	中研院物理所	07/04/86
A Two Higgs Doublet Model for the Top Quark	Chung Kao	Univ. of Wisconsin	07/11/86
Microcontroller and Its Applications in Physics Experiments	王煥玉	中研院物理所	07/14/86
Magnetization Reversal and Microstructure of Magnetic Thin Films	R. W. Chantrell	Univ. of Wales, Bangor,UK	07/15/86
Acoustic Imaging in Helioseismology	Hsiang-Kuang Chang	Tsing Hua University	07/18/86
The influence of eddies on large scales circulations	Alberto Alvarez	中央大學物理系	07/21/86
重費米超微粒之特性	陳洋元	中研院物理所	07/22/86
Surface Trapped X-Ray	劉健	美國哈佛大學	07/25/86
超晶格界面本質的拉曼光譜學研究	張樹霖	北京大學物理系	07/29/86
MRI imaging of three dimensional foams	J. Glazier	Univ. of Notre Dame	07/30/86
Metal-Insulator Transition in 2-Dimensional Si-MOSFETS-Anyon Superconductivity?	Fu-Chun Zhang	IPAS & Univ. of Cincinnati	07/30/86
How do Cells Know where to go?	J. Glazier	Univ. of Notre Dame	07/30/86

演　講　題　目	演講者姓名	所屬機構	日　期
New dynamic light scattering techniques for studies of turbulent flows	Penger Tong	Oklahoma State University	08/07/86
Recent velocity and temperature measurements in turbulent thermal convection	Penger Tong	Oklahoma State University	08/08/86
Excessive mesons in nuclei	吳式樞	吉林大學	08/08/86
Direct Numerical Simulations of Fluid Flows	蔡武廷	台灣海洋大學	08/08/86
Solid State Journal Club: Magnetic Clusters and Magnetic Force Microscopy	劉思煌	Univ. of Nebraska Lincoln	08/25/86
Development of Biomagnetic Fluid Dynamics	Ching-Jen Chen	Dean of Engineering, Florida A & M University-Florida State University	09/04/86
Lifetime of b. Hadrons at CDF	張博舜	中研院物理所	09/22/86
Seminar on Statistical Physics and Numerical Simulations	林財鈺	中研院物理所	09/25/86
Time Series in Genetic Algorithm	司徒國業	香港科技大學	09/26/86
矽晶成長介紹	邱錦楨	中德電子材料公司	10/01/86
Large-N.C QCD and Baryon Physics	Dan Pirjol	Technion, Israel	10/01/86
Universality of finite-size corrections to the number of clusters at percolation critical point	胡進錕	中研院物理所	10/02/86
Morphological Instabilities in a Growing Yeast Colony: Experiment and Theory	陳志強	中研院物理所	10/06/86

演　講　題　目	演講者姓名	所屬機構	日　期
The Z° Width Measurement Using the OPAL Detector	賴文彬	中研院物理所	10/06/86
The N-chain Hubbard model and related topics	林秀豪	UC Santa Barbara	10/06/86
Long Tailed Trapping Time and Levy Flights in a SOC granular System	黎璧賢	中央大學物理系	10/13/86
Symbolic Dynamics and Complexity	郝柏林	中央大學物理系	10/15/86
Flavor Changing Neutral Higgs Coupling and Top Charm Production at NLC and LHC	候維恕	台灣大學物理所	10/17/86
Nature of Driving Force for Protein Folding	李定國	中研院物理所	10/20/86
短波長雷射及其與物質之作用	樓祺洪	上海光機所	10/21/86
Electron Electric Dipole Moment From CP Violation in the Charged Higgs Sector	張達文	清華大學物理所	10/24/86
雷射光捕捉與冷卻中性原子	余怡德	清華大學物理系	10/27/86
Suppression of Chaotic diffusion by quenched disorder	陳義裕	台灣大學物理系	10/27/86
Statistical Properties of Fracture Precursors	杜其永	中研院物理所	11/03 /86
Fermi Contours and Surface Dynamical Phenomena	Stephen D. Kevan	Department of Physics, Univ. of Oregon, U.S.A	11/03/86
Recent Global QCD Analyses by CTEQ	賴宏亮	清大物理所	11/07/86
疊乘過程與冪次行爲	曾文哲	中研院物理所	11/10/86
The LSND Neutrino Oscillation Experiment	李浩斌	台灣大學物理系	11/10/86
Recent Progresses in Small X Physics	李湘楠	成功大學物理所	11/11/86

演　講　題　目	演講者姓名	所屬機構	日　期
The Proton Spin Problem: A Status Report	鄭海揚	中研院物理所	11/14/86
Fluctuations, Shape transformation, and topological transitions	陳啟明	師大物理系	11/17/86
Vortex	黃美嬌	台灣大學機械系	11/19/86
Gamma Ray Bursts	黃崇源	中研院天文所	11/21/86
Tunneling Magnetoresistance in $Co/Al_2O_3/Co$ System	李尚凡	中研院物理所	11/28/86
Disoriented Chiral Condensates: Formation and Observation in Nuclear Collisions	Jorgen Randrup	LBNL	11/28/86
Statistical Equilibrium of 2D Ideal Fluid	陳培亮	中央大學物理系	12/01 /86
Anticommuting integrals and the two-dimensional ising model 1.Introduction2.Grassmann variables	V. N. Plechko	BLTP, JINR, Dubna, Russia	12/01/86
Gamma Ray Bursts Detection	施逸君	中研院物理所	12/01/86
矽探測器在高能物理實驗之應用	張元翰	中央大學物理系	12/03/86
MOCVD Technique	K. Ogi	Mitsubishi Material Research Center Japan	12/04/86
Spin Structure Functions in the Resonance Region	董宇兵	台大物理所	12/05/86
Simultaneous Action of Electric Fields and Nonelectric Forces on a Polyelectrolyte:Motion and deformation	陸駿逸	中央大學物理系	12/08/86
Excitation Function of Flow in Relativistic Heavy Ion Collisions	章文箴	Univ. of California, Riverside	12/11/86
Turbulence on Earth and in Space	Peter Goldreich	California Institute of Technology	12/15/86

演　講　題　目	演講者姓名	所屬機構	日　期
量子漲落的起源	吳成禮	中原大學物理系	12/17/86
Micromachining and Lithography with Deep X-ray	Barry Lai	Argonne National Laboratory U.S.A	12/17/86
Initial Stages of Growth on Si [100] Substrate	吳式玉	Univ. of Louisville	12/18/86
A Measurement of the Tau-Polarization at the 2-resonance with the DELPHI detector at LEP	黃達年	中研院物理所	12/22/86
Beyond the Big Bang	P. J. Steinhardt	Univ. of Pennsylvania	12/22/86
最近準晶的構造研究	蔡安邦	日本竹筑金屬材料技術	12/23/86
The Phase Transitions and the Cosmological Constant	V. Burdyuzha	Astro-Space Center, Russian Academy of Sciences	12/23/86
Complex Organized Structure in Surfactant/Silicate Solution	牟中原	台灣大學化學系	12/24/86
Oxide Thin Films in FRAM Applications	黃志軍	仕士頓大學, 超導中心	12/24/86
Searching for the Higgs Boson of the Minimal Supersymmetry at the LHC	Chung Kao	Univ. of Wisconsin	12/26/86
Island Density Calcalation in the Initial Stage of Growth	盧炎田	成功大學	12/29/86
Capillary flow explains how Coffee Leaves its mark	梁鈞泰	中研院物理所	12/29/86
多聚醣羥致癌機理之研究	李匡邦	美國麻州大學	12/31/86
Bound States and Impurity Averaging in Unconventional Superconductors	Robert Joynt	Univ. of Wisconsin-Madison	12/31/86
Spin-1/2 Heisenberg Antiferromagnet in a magnetic field	潘國貴	長庚大學通識中心	1/02/87

演　講　題　目	演講者姓名	所屬機構	日　期
Cryogenic Detector with Superheated Superconducting Granules	陳晉平	中研院物理所	1/05/87
Diffractive QCD and Pomeron Physics	曾　龍	國立成功大學物理研究所	1/06/87
On radiative CP violation in two Higgs doublet model	林豐利	Virginia Tech. University	1/08/87
Skewed Height Distributions in Kinetically Roughened Films	Peter Kleban	University of Maine	1/12/87
More on Language and Complexity-Inspirations from Dynamical Language	郝柏林	理論科學中心	1/14/87
原子核資料庫之建立及應用	蘇宗滌	北京原子能科學院	1/15/87
Nuclear Microscopy and its Applications	Geoff W. Grime	Univ. of Oxford Department of Materials	1/19/87
Nanocrystals	Chris Murray	IBM Corporation, T.J. Watson Research Centre	2/04/87
Model for Subharmonic Waves in Granular Materials	賈魯強	中央大學物理系	2/09/87
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1.Multifractal Approach to and Frustration in Spin and Gauge Models 2.The Classification of Possible States in BEG MOdel	N. Ananikian	Yerevan Physics Institute, Armenia	2/16/87
Chaotic Properties of Q State Potts Model:Q<2	N. Ananikian	Yerevan Physics Institute, Armenia	2/17/87
Introduction to the ROOT Package	葉　平	中研院物理所	2/17/87

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Stability of non-radial eigenmodes of uniformly chargged elastic globule	Sergei Bastrukov	Joint Institute for Nuclear Research Dubna, Russia	2/23/87
台灣研究用反應器改善計畫（TRRII）之現況	林立夫	核能研究所副所長	2/25/87
Supernova Neutrinos	許晴程	台灣大學物理系	03/02/87
LEEN/STM Studies of the Striped Phase on Si(100) and its relation with surface stress anisotropy	Prof. Ia Tsong.	Dept. of Physics, Arizona State Univ	03/02/87
Softmatter and Statistical Physics Journal Club: Controlling Spiral Waves in Confined Geometries by Global Feedback in BZ Reaction	陳志強	中研院物理所	03/02/87
Gauge field approach to theory of underdoped cuprate superconductors	Prof. Lu Yu	International Center for Theoretical Physics Trieste , Italy	03/03/87
A modified BFKL equation with Q dependence	林志隆	交通大學電子物理研究所	03/06/87
Softmatter and Statistical Physics Journal Club : Collective motion on a system of motile elements dependence	周一志	中研院物理所	03/09/87
Solitary Structure of Cosmic Magnetic Field	胡文瑞	中國科學院國家微重力實驗室	03/11/87
Flavor Asymmetry and the Origin of the Nucleon Sea	彭仁傑	Los Alamos National Lab.	03/13/87
On the Metal Nanoparticles : Syntheses and Optical Properties	王崇人	中正大學化學系	03/13/87
Morphology and Electron Emission Properties of Nanocrystalline CVD Diamond Thin Films	Alan R. Krauss	Araonne National Laboratory, Material Science and Chemistry Div.	03/16/87

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Hydrogen-related Transient Effects in Carbon-doped Heterostructure Bipolar Transistors: Its Mechanism and Applications	Jim-Young Chi	AMP-MACOM, MA, USA	03/18/87
Two Body Hadronic Decays of Λb and Bs	Mohinder P. Khanna	Dep. Of Phys., Panjab University , India	03/20/87
Microgravity Fluid Physics	胡文瑞	中國科學院國家微重力實驗室	03/23/87
Detection of Supernova Neutrinos	許晴程	台灣大學物理研究所	03/23/87
Softmatter and Statistical Physics Journal Club: Measuring the Spring Constant of a Single Polymer	黃仲仁	中央研究院物理所	03/23/87
Color Octet Contribution to B→J/4 Xs decays	Xias Gang He	台灣大學物理研究所	03/27/87
聖嬰現象　El Nino	范光龍	台灣大學海洋所	03/27/87
Neutrino Electron Scattering	李浩斌	台灣大學物理系	03/30/87
SO(5) and t-J Model	Robert Eder	Institut fuer Theoretische Physil, Universitaat Wueraburg, Germany	04/02/87
A Chiral Alternative to the Standard Model of Particle Physics & Gravitation	許祖彬	新竹清華大學理論科學中心	04/03/87
Crystal Structure Analysis of Magnetic Thin Film	P.W. Wang	Stormedia Research Center, Calif. U.S.A.	04/13/87
Recent Progresses in Superstring Theory and M Theory	Yong-Shi Wu	Department of Physics, Univ. of Utah	04/15/87
Blaming the Whole Universe on the Change Higgs	張達文	國立清華大學物理所	04/17/87

演　講　題　目	演講者姓名	所屬機構	日　期
Evidence for Supermassive Black Holes	魯國鏞	中研院天文所及天文物理研究所籌備處	04/22/87
Near Field Optics: New Eyes on the Nano-World	Howard E.. Jackson	Department of Physics, University of Cincinnati	04/27/87
Softmatter and Statictical Physics Journal Club: Singel Polymer Dynamics in an Elongational Flow	杜其永	中央院物理研究所	04/27/87
Extended Comformal Algebra Associated with The Constrained KP Hierachy And Their Free Field Realizations	杜明憲	清華大學物理研究所	05/01/87
Mitsubishi Materials, CRI 未來性先端科技材料之發展與演進	Takuo Takeshita (武下拓夫)	三菱材料綜合研究所所長	05/04/87
Metallic State at ν=1/2 Fractional Quantum Hall System	文小剛	MIR 和國家理論科學研究中心	05/05/87
ab initio Relativistic Electron Theory of Magnetism in Metallic Multilayers	郭光宇	英國 Daresbury 實驗室及台大物理系	05/06/87
Softmatter and Statistical Physical Journal Club: Formation of tubular structured of lipid membranes	陳啓明	國立師範大學	05/11/87
Unconventional electrodynamics of high-Tc Superconductors : a study by far-infrared and Raman spectroscopy	劉祥麟	Department of Physics, University of Illinois at Urban-Champaign	05/14/87
Polymer Science and New Materials-The Shifting Research Frontiers	王進賢	中正大學物理系	05/15/87
Looking for New Physics at The Beauty Factory	A. I. Sanda	Nagoyo University, Japan	05/15/87

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Gauge Theories in Condensed Matter Systems	文小剛	國立理論科學中心	05/18/87
軟 X 光能譜學之最新發展	陳建德	同步輻射研究中心主任	05/20/87
Crystal Growth Research Activities in Japan and International Collaboration	T. Fukuda	日本東北大學金屬材料研究所	05/21/87
Quasi Normal Models of Dilaton Black Hole	林煒富	國立成功大學物理研究所	05/22/87
Handscomb Quantum Monte Carli Method and Its Applications in Quantum Spin Models	陳永忠	東海大學	05/26/87
Non-relativistic QCD and Heavy Quarkonium Decays	張嘉泓	國立理論科學中心	05/29/87
Physics of Disordered Mesoscopic Superconductors	Ying Liu	Penn State University	06/02/87
Critical Behavior of Binary Liquid Mixture with Polymer Additive	杜其永	中央研究院物理研究所	06/03/87
Formation of Colony Patterns by a Bacterial Cell Population I. Introduction	Matsushita	Chuo University	06/08/87
Formation of Colony Patterns by a Bacterial Cell Population II. Experimental Details	Matsushita	Chuo University	06/11/87
Formation of Colony Patterns by a Bacterial Cell Population III. Modeling	Matsushita	Chuo University	06/11/87

Visiting Scholars

中央研究院物理所八十七年度訪問學人表

(1997 年 7 月~1998 年 6 月)

訪問人姓名	國籍	訪問期間	備註
高　鐘	中國	07/07/97--07/13/97	短期訪問
J. A. Glazier	美國	07/29/97--08/02/97	短期訪問
梅維寧	美國	07/15/97--08/04/97	短期訪問
Hyuk K. Pak.	韓國	07/23/97--08/06/97	短期訪問
童彭爾	中國	08/01/97--08/07/97	短期訪問
喬玲麗	美國	08/01/97--08/10/97	短期訪問
吳式樞	中國	08/07/97--08/10/97	短期訪問
馬中騏	中國	08/07/97--08/10/97	短期訪問
戴元本	中國	08/07/97--08/10/97	短期訪問
李　金	中國	07/16/97--08/15/97	短期訪問
梁培德	美國	07/16/97--08/15/97	短期訪問
司徒國業	加拿大	08/04/97--08/17/97	短期訪問
劉思煌	台灣	07/30/97--08/31/97	短期訪問
張富春	美國	07/17/97--09/16/97	客座研究員
蔡定平	中華民國	07/01/97--06/30/98	本所
吳濟民	中國	08/07/97--08/10/98	短期訪問
杜東生	中國	08/07/97--08/10/97	短期訪問
黃　濤	中國	08/07/97--08/17/97	短期訪問
丁肇中	美國	08/08/97--08/15/97	邀請國際重要人士

訪問人姓名	國籍	訪問期間	備註
朱經武	美國	08/10/97--08/17/97	邀請國際重要人士
朱隸文	美國	08/10/97--08/17/97	邀請國際重要人士
陳景仁	美國	09/03/97--09/10/97	短期訪問
葉銘漢	中國	09/13/97--09/21/97	短期訪問
樓祺洪	中國	10/20/97--10/24/97	短期訪問
Judy R. Franz	美國	11/04/97--11/08/97	短期訪問
唐洪慶	中國	11/17/97--11/24/97	短期訪問
周祖英	中國	11/17/97--11/24/97	短期訪問
蘇宗滌	中國	11/24/97--03/23/98	合作研究
普雷奇可	RUSSIA	11/26/97--12/25/97	來華講學
蘇武沛	美國	12/14/97--12/21/97	短期訪問
Paul. Joseph Steinhardt	美國	12/16/97--12/22/97	短期訪問
Yasushi Suto	日本	12/17/97--01/06/98	短期訪問
張厚英	中國	12/18/97--12/26/97	短期訪問
陳和生	中國	12/18/97--12/26/97	短期訪問
李匡邦	美國	12/24/97--01/31/98	短期訪問
克理本	美國	12/29/97--01/13/98	短期訪問
Grime	英國	01/17/98--01/20/98	短期訪問 並發表演講
C.B. Murray	美國	02/03/98--02/08/98	短期訪問
J.J.Rhyme	美國	02/03/98--02/08/98	短期訪問
崔瑩鎮	韓國	02/10/98--02/25/98	短期訪問

訪問人姓名	國籍	訪問期間	備註
Aanaikyan	美國	02/15/98--02/22/98	短期訪問
莊小東	美國	02/28/98--03/06/98	短期訪問
胡文瑞	中國	03/10/98--03/25/98	短期訪問
Mohinder P. Khanna	印度	03/13/98--03/19/98	來華短期演講
Nelson E. Bickers	美國	06/10/98--06/17/98	來華訪問研究
T. Nakano	日本	06/21/98--06/30/98	短期訪問
劉思煌	台灣	05/18/98--06/16/98	短期訪問
Heinrich Rohrer	瑞士	05/07/98--05/13/98	短期訪問
Toshio Sakurai	日本	05/10/98--05/12/98	短期訪問 並參加研討會
Yutaka Okabe	日本	03/15/98--03/21/98	短期訪問
Youngki Lee	韓國	03/20/98--03/26/98	短期訪問
Prashant M. Gade	印度	04/18/98--04/24/98	短期訪問
梁宗嶽	美國	06/13/98--06/26/98	短期訪問
Matsushita	日本	六月中旬	短期訪問
Keum	韓國	六月	短期訪問
James C. Ho	台灣	六月	短期訪問
吳曉倫	美國	06/18/98--07/10/98	短期訪問
湯超	中國	05/24/98--05/30/98	短期訪問
Seiji Miyashita	日本	05/24/98--05/30/98	短期訪問
Mikhail Altaisky	俄國	05/25/98--05/28/98	短期訪問
崔瑩鎮	韓國	06/15/98--06/28/98	短期訪問

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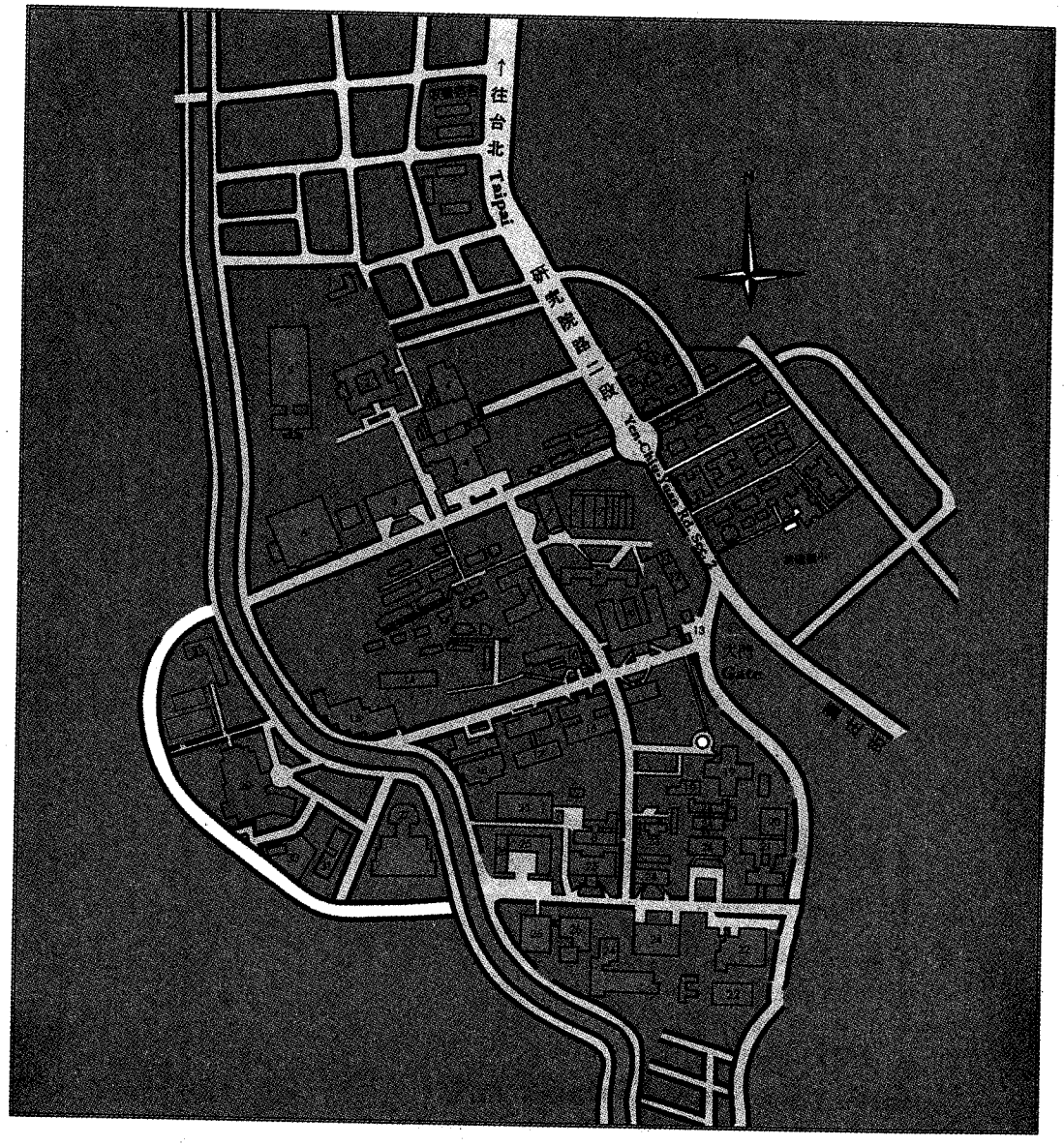

1. 幼稚園 Kindergarten
2. 動物研究所 Institute of Zoology
3. 分子生物研究所 Institute of Molecular Biology
4. 生物醫學科學研究所 Institute of Biomedical Sciences
5. 動物中心 Animal Center
6. 生物化學研究所 Institute of Biological Chemistry
7. 天文及天文物理研究所 Institute of Astronomy and Astrophysics
8. 植物研究所 Institute of Botany
9. 台灣史研究所 Institute of Taiwan History
10. 行政大樓及計算中心 Administration and Computing Center
11. 數學研究所 Institute of Mathematics
12. 郵局 Post Office
13. 車庫 Garage
14. 大門 Gate
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16. 統計科學研究所 Institute of Statistical Science
17. 化學研究所 Institute of Chemistry
18. 中山人文社會科學研究所 Sun Yat-Sen Institute for Social Sciences and Philosophy
★19. 資訊科學研究所 Institute of Information Science
20. 物理研究所 Institute of Physics
21. 國科會科資中心 Information Center of National Science Council
22. 經濟研究所 Institute of Economics
23. 民族學研究所 Institute of Ethnology
24. 胡適紀念館 Hu Shi Memorial
25. 歷史語言研究所 Institute of History and Philology
26. 社會學研究所 Institute of Sociology
27. 近代史研究所 Institute of Modern History
28. 歐美研究所 Institute of European and American Studies
29. 地球科學研究所 Institute of Earth Sciences
30. 中國文哲研究所 Institute of Chinese Literature & Philosophy
31. 活動中心 Center of Academic Activities
32. 游泳池 Swimming Pool
33. 網球場、籃球場

中央研究院物理研究所年報

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