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ANNUAL REPORT
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I. Review of Research Activities

Projects conducted by the members of our group involve both basic and applied researches. The basic researches include studies on turbulence, two-dimensional flow, physics of soap film dynamics, sonoluminescence, phase transitions of complex fluid, fluid properties in porous medium and nonlinear oscillations problem. In applied researches, we are studying 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 description of these ongoing projects are given below.

1. Basic Research in Hydrodynamics

a. *Effects of Flow Shear and Wall 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 developemnt when the ambient conditions are changed.

b. *Effect of Turbulence Intensity on The Mean Flow Behind Two Cylinders:*

Turbulence has been one 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 arrangment is 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 Reynolds Stress variation under different turbulence intensity case in the future.

c. *Mixing and Diffusion 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 modelling that can account for the effect of density-stratification. The results of the numerical scheme will be compared to our experimental data.

d. *Wake Instability and Control :*

In order to understand the instability mechanism of wake flows, a code using the spectral element method has been developed and performed on the Convex 3840 at National Center of High-speed Computing, Taiwan as weel as the Delta Touchstone parallel computer at Caltech, USA. The transition phenomena between different solutions (wake flow and non-wake counterpart) of incompressible Navier-Stokes equations have been explored. The numerical results of the onset instability are found to be in reasonable agreement with the predictions of the absolute/convective instability theory. Future work will be concentrated on the nonlinear effects involved in the flows and the effects of various controlling instruments on the wakes.

2. Numerical Methods

a. *Flux-Vector-Splitting Scheme for Dilute Gas-Particle JPL Nozzle Flow:*

A time-dependent numerical algorithm is developed for the two-fluid model Eurler of thin layer Navier-Stokes (TLNS) equations. The analysis is based on a monotone upstream central scheme for conservation laws (MUSCL) type flux-vector-splitting scheme with the multi-level technique. This algorithm is applied to investigate JPL (Jet Propulsion Laboratory) nozzle flow. Results for both one- and two-phase flows are found to be efficient and satisfactory in accounting for the particle influence on the flow field.

b. *Solutions to A General Forced Non-Linear Oscillations Problem:*

A mixed "multiple time scale-harmonic balance"(MHB) method for a general non-linear oscillations problem subject to a periodic force is developed. The MHB differs from the more traditional multiple time scale (MS) method in that it uses two separate procedures for the solutions: (1) obtaining the form of solution using an almost trivial procedure and (2) balancing of the harmonic terms with a simple iteration. These procedures are demonstrated to be valid and accurate for transient and steady state solutions to the superharmonic, subharmonic and primary resonances.

3. Atmospheric Physics

The cloud analysis chart as derived from the satellite image data is valuable in weather analysis and forecasting. 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 satellite images are always masked by the atmosphere, modelling of radiative transfer to account for the atmospheric effects is

needed to obtain cloud parameters. 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 were 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 nephanalysis was performed to get the high, middle and low clound amount, which were in good agreement with the parameterized cloud amount.

4. Physics of Complex Fluids

a. *Sonoluminescence:*

We have successfully observed the phenonmenon of sono-luminescence of a single bubble. Using photomultiplier and photodiodes, we recorded the intensity of the light emitted and the size of the bubble during sonoluminescence. Pressure sensors and actuators are employed to monitor and control the ambient pressure of the bubble. We find that the luminescence is very sensitive to the change in ambient pressure. Also, we find a new phase of sonoluminescence in which the intensity of the light oscillates in a period of a few seconds. Numerical calculations are being done to understand the mass transport effect of the change in ambient pressure.

b. *Bursting Dynamics of Soap Films:*

In order to study the very fast hydrodynamics in bursting of soap film; especially the formation of aureole ahead of the bursting rim, we used optical intereference and line scan CCD photography to record the thickness changes during the bursting process. We found that the formation of the aureole and shock wave on the film depend on the surfactants being used. Furthermore, we are able to record the bursting profile which has never been reported before. Theoretical calculations are now being done to understand the experimental findings.

c. *Polymer Conformation in Binary Solvent:*

Polymer solution is one kind of complex fluid that exhibits rich phase behaviour because of the extra degree of freedom from polymer conformation. Using static and dynamic light scattering technique we found that the polymer (polyethylene oxide) precipitate from water (which is a good solvent) when isobutyric acid (which is another good solvent) is added. Our results suggest that when isobutyric acid is added, the molecular size of polyethylene oxide increases and becomes comparable to the molecular distance. At such situation intermolecular attraction among the polymer molecule leads to precipation of the polymer. In the future, we plan to study the behavior of the polymer solution close to the critical point of the binary solvent, to investigate how the composition fluctuation of the solvent composition affect the polymer conformation.

d. *Binary Mixture in Porous Medium:*

The properties of fluid inside porous medium is very different from that of the bulk fluid. Due to the geometrical confinement and the presence of a lot of surfaces, the

change in the static and dynamical behavior of phase separation can be significant if the pore size is small. By measuring the resistivity of the binary liquid mixture (isobutyric acid/water, IW) that saturate a packing of 40 mm glass beads, we found that the phase separation temperature is shifted down by less than0.05℃ which is consistent with the presence of a wetting layer of 20 nm at the bead surface. We also found that after phase separation, fluid exchange from the packing to the outside is prohibited for 130 mm and 40 mm diameter beads packings. This suggests that the characteristic domain size inside the packing cannot grow bigger than the capillary length so that gravity assist demixing cannot proceed.

II. Facilities

1. Water Channel Laboratory

In the Water Channel Laboratory, we have a water channel to study the hydro-dynamic phenomena of under water flow when controlled air current is imposed above the water surface. The channel has a cross section of 60cm X 60cm and 8m long. Flow can be realise by a towing track mounted on the channel or by a closed loop typ 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 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 two dimension laser Doppler velocimeter, a commercial gonio-meter for static and dynamic light scattering measurement, two digital correlators, an optical microscope, 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 light scattering setup for sonoluminescence experiment. Recently we are building a rotating stage in vaccum chamber to study two-dimensional flow separation.

B. NUCLEAR PHYSICS GROUP

I. Experimental Nuclear Physics and Accelerator-Based Physics

1. Neutrino oscillation, pilot experiment
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8. L x-ray production in rare-earth elements by helium ions
9. Ion beam analysis in material characterization using 3 MV tandem accelerator
10. Application of PIXE for elemental analysis of ancient Chinese artifacts
11. Study of normal and vitrified carnation leaves using proton induced x-ray emission
12. Backscattering studies of ^{7}Li, ^{12}C and ^{16}O ions at energies between 3 and 15 MeV
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5. $B \to \pi \ell \nu$ form factors calculated on the light-front
6. Symmetry breaking effects in chiral dynamics of heavy mesons
7. Nucleonic strangeness and $p\bar{p}$ annhihilation branching ratio.
8. Liquid-to-gas transition of nuclear matter in a semi-empirical approach.
9. Effect of projectile shape on cross sections and momentum distributions of fragments from heavy-ion reactions.
10. Minimum norm method for the determination of the charge density from elastic electron scattering data.

In the past year, research works in both experimental and theoretical nuclear physics were carried out. The experimental nuclear physics program was focused on the accelerator- based physics and ion beam technology. The main facility of our accelerator laboratory is a 3 MV 9SDH-2 tandem accelerator installed in mid-1989, it is capable of producing light and heavy ion beams in the MeV range for a variety of research purposes. Druing the calendar year 1995 a total of ~4000 hours of the accelerator beam was delivered for the scheduled researchers. A fraction of the machine time (~20%)was allocated to users from local universities and institutions such as National Tsinghua University, National Taiwan University, and Industrial Technology Research Institute. Protons, deuterons, ^{3}He-and ^{4}He-ions, and light heavy ions such as ^{12}C and ^{16}O have been accelerated for various experiments.

The efforts of the theoretical nuclear physics research members were devoted to the investigation of medium energy physics and nuclear properties. Some specific topics include nuclear many-body problems, nucleon-nucleon effective interaction, nuclear deformation, quark models, and heavy quark physics.

At present, our group consists of nine staff members (six research fellows, one associate research fellows and two assistant research fellows) and one postdoctoral research associate. Among them, six are experimentalists and three theoreticians. In recent years one of our group members has spent a great deal of time in developing the experimental high-energy physics program for the Institute. The size of the group in 1995-96 is the same as in 1994-95.

The accelerator system is now equipped with six beamlines, including the one set up in a position 45° from the switching magnet with a scattering chamber and detection system designed for off-beam gamma-spectroscopy and radiative capture experiments. Other facilities of the laboratory include a micro Vax II computer and networks, including a fast electronic system for data acquisition (with fast NIM modules and CAMAC modules). In addition to the micro Vax II computer, our computing facilities for experiments also include three work stations, a VaxStation 3100/76, a VaxStation 3100/34 and SUN SPARC 330. These three stations are mainly used for the data replay and off-line analyses. For theoretical calculations, we have access to the SUN4 and IBM/RISC/6000 work stations located in the computer room of the Insitute.

The following overview is not intended as a summary of all the work done in the period of 1995-1996; instead it describes briefly some selected research projects completed during this time period.

I. Experimental Nuclear Physics and Accelerator-Based Physics

1.Neutrino oscillation, pilot experiment

The Nuclear Power Reactors of Taiwan Power Company can potentially provide the most ideal and powerful antineutrino $\bar{\nu}_e$ sources for researches on neutrino oscillation. Its result can lead to definitive answers to the questions on fundamental

properties of the neutrinos, as well as, on the cosmological puzzles such as the deficit of solar neutrinos and the properties of Dark Matter.

Searching for neutrino oscillation is the most sensitive and effective measurement on neutrino mass and flavour mixing. We propose 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.

2. Reaction channels of $^{51}V + ^{7}Li$ system below coulomb barrier

Investigation was made for ^{7}Li ions and thick vanadium target collisions in the energy range 4.2 -- 10.85 MeV. Gamma-rays following inelastic scattering, $^{51}V(^{7}Li, ^{8}Be)^{50}Ti^*$, $^{51}V(^{7}Li, ^{6}Li)^{52}V^*$, $^{52}V \rightarrow ^{52}Cr^* + \beta + \bar{\upsilon}_e$, and $^{51}V(^{7}Li, ^{5}He)^{53}Cr^*$ channels were observed. Energy dependent gamma-ray yield for each channel was measured. Calculation of Coulomb excitation and DWBA analyses were made for data obtained for thick target yields. Reduced E2 transition probabilities of low-lying ^{51}V states were deduced and compared to the reported values.

3. In and off-beam gamma-spectroscopy

The off-beam γ -spectroscopy and radiactivity measurements have been performed in this laboratory. The radioactive samples were prepared by thermal neutron irradiation in the Tsinghua reactor. The singles, coincidence spectra and the $\gamma - \gamma$ directional correlation functions for the selected cascades are being measured for studying the nuclear structure parameters, the results are compared with IBA and collective calculations. In order to double check the spin and parity of the measured excited states a linear polarization measurement of the emitted γ -ray is under developed. Results of Monte Carlo calculations for the asymmetric Compton Supression Spectrometer in this series study have been published in Nucl. Phys.

An in-beam life-time and nuclear structure measurement with the DSAM has been set up. The system includes a special scattering chamber, a 16-strip PIPS position sensitive detector, four-HpGe detector and large NaI(Tℓ) Compton shielding to measure the emitted charged particles and γ -rays from the (d, pγ), (p, dγ) and (α, pγ) reactions. The pf-shell nuclei such as ^{54}Cr, $^{49, 50, 51}Ti$ have been measured in the past years. A very low energy facility be set up in order to investigate the few-body interaction below 100 keV region.

4. Charge-state dependence of K-shell x-ray production in aluminum by 2—12 MeV carbon ions

Charge state dependence for K-shell x-ray production cross sections in $_{13}Al$ bombarded by 2—12 MeV $_{6}C$ ions with charge states from 2+ to 6+ was measured using a Si(Li) detector with a 7.6 μm Be window. An Al target of thickness 0.14 μg/cm^2 was used to ensure single collision conditions. Contributions of the electron capture as well as direct ionization to the inner-shell ionization were determined by an analysis of the charge state dependence of the target x-ray production. 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 carbon ions without K-vacancies while it overpredicts the data for carbon ions with K-vacancies. The significant underprediction of the data at the lowest energy is likely associated with the molecular orbital effect that is not accounted for in the ECPSSR theory. The results will be published in Phys. Rev.

5. Charge-state dependence of M-shell x-ray production in $_{67}Ho$ by 2—12-MeV carbon ions

Charge-state dependence of M-shell x-ray production cross sections of $_{67}Ho$ bombarded by 2 — 12-MeV carbon ions, with and withoug K-shell vacancies, were measured using a windowless Si(Li) x-ray detector with a full-width-at-half-maximum resolution of 135 eV at 5.9 keV. Carbon ions of different charge states were produced using a postacceleration, nitrogen gas stripping cell. The carbon ions were then magnetically analyzed to select the desired charge state and energy before entering the target chamber. The total M-shell and Mζ, Mα, Mβ, and Mγ x-ray cross sections were measured. The electron-capture (EC) contributions as well as the direct-ionization (DI) contributions can be determined by making a comprehensive study of the projectile-charge-state dependence of the target x-ray production cross sections for targets in which the single-collision realm is maintained. Both EC and DI contributions and the total M-shell x-ray production cross sections are compared to both the first Born theory and to the perturbed-stationary-state theory with energy-loss, Coulomb-deflection, and relativistic corrections. The results have been published in Phys. Rev.

6. Charge state dependence of L-shell x-ray production cross sections of copper by 4-14 MeV oxygen ions

Charge state dependence of L-shell x-ray production cross sections in $_{29}Cu$ bombarded by 4—14 MeV $_{8}O$ ions with charge states from 3+ to 8+ was measured using a Si(Li) x-ray detector with a resolution of 135 eV at 5.9 keV. An Cu target of thickness 0.55 μg/cm^2 was used to ensure single collision conditions. Contributions of the electron capture as well as direct ionization to the inner-shell ionization were determined by an analysis of the charge state dependence of the target L-shell x-ray production. The measurements are compared to the prediction of the ECPSSR theory (the perturbed-stationary-state theory with energy-loss, Coulomb-deflection, and relativistic corrections to the first Born theory) using a single-hole fluorescence yield.

7. L-shell x-ray production in $_{50}Sn$ by heavy ions

L-shell x-ray production cross sections of $_{50}Sn$ were measured for 0.17-5 MeV/amu proton, alpha-particle, lithium, carbon, and oxygen ions bombardment. The emitted L-shell x-rays of target Sn following ion-atom collision were detected by an Canberra

Ge(Li) x-ray detector and, simultaneously, the scattered ions from the target were measured by a surface barrier detector. The L-shell x-ray production cross sections were calculated by normalizing x-ray counts to scattered particle ones. The L-shell ionization cross sections were converted from the L-shell x-ray production cross sections by using atomic parameters (including L-shell x-ray fluorescence yields, Coster Kronig transitions, and radiative widths). The results were compared with the ECPSSR theory which is improved from plane-wave Born approximation (PWBA) with corrections of (i) energy loss (E) and Coulomb deflection (C) effects of the incident ion interacting with the target atom, (ii) the increasing binding energy and the polarization effects of the target inner-shell electron during the ion's passing (calculated by perturbed-stationary state method, PSS) and (iii) the electron relativistic velocity (R) effect. Detail measurements and discussion will appear in Nucl. Instr. and Meth. in Phys. Res.

8. L x-ray production in rare-earth elements by helium ions

L x-rays of the elemtns in the rare-earth region including La, Nd, Gd, Er, and Lu were measured for helium bombardment in the energy range 1-5 MeV. From obtained data we extracted the individual $L\alpha$, $L\beta$, $L\gamma$, and $L\ell$ production cross sections and their ratios. For the measurements, very thin target foils were used, and yields of elastic scattering ions were measured simultaneously. The results are compared with the ECPSSR (Energy-loss and Coulomb deflection effects, Perturbed-Stationary State approximation with the Relativistic correction) and UA-ECPSSR (United-Atom) theories of inner-shell ionization.

9.Ion beam analysis in material characterization using 3 MV tandem accelerator

Ion beam analysis (IBA) in material characterization such as PIXE (Particle-Induced X-ray Emission), RBS (Rutherford Backscattering Spectrometry), Ion Channeling, NRRA (Nuclear Reaction and Resonance Analysis), ... etc. is being used in an ever widening range of fields including semiconductor technology, high temperature superconductor development, geophysics, mineralogy, art, archeology, environmental science, biomedicine, and many branches of chemistry. The IBA is not only a very time-saving method but also and accurate quality and quantitative analysis. Together with the development of micro-probe beam, the IBA can explore the minute world in three dimensions down to the range of micro-meter. Those techniques developed from atomic and nuclear physics in research and application are being installed or started in the Institute of Physics of Academia Sinica .

10.Application of PIXE for elemental analysis of ancient Chinese artifacts

We made an application of PIXE analysis for a series of ancient Chiese coins from the Tang Dynasty to the Ming Dynasty (AD 618 - 1679). Ninety-six PIXE spectra were obtained from forty-eight samples of the ancient coins with the use of a Ge(Li) x-ray detector. On each sample two spots at different positions on the flat surface were irradiated per run by 3 MeV protons. The major and minor component elements were determined. Variations in the composition with a time span of about one thousand years

for the examined coins were observed. Our data obtained for the Ming coins provide evidence that the change of using ancient Chinese brass coins from the bronze coins appeared in the reign of Jia-jing Emperor (1528 - 1567). The results have been published in Nucl. Instr. and meth. in Phys. Res.

11.Study of normal and vitrified carnation leaves using proton induced x-ray emission

In this work, we made an application of external-beam PIXE for biological samples and an attempt is made to study the phenomenon of vitrification of carnation plants cultured in vitro. One hundred and twenty PIXE spectra were obtained from forty samples prepared in form of thin film for both normal and vitrious carnation leaves. At each irradiation with 3 MeV protons from 9SDH-2 Pelletron tandem accelerator the beam spot was made to cover the area of the sample. From the detailed analysis on the examined samples, the distribution of elements (P, S, K, Ca, Mn, Fe and Zn) in the samples for the normal and vitrious carnation leaves and their significant difference in element contents were found. The detailed results have been published in Nucl. Instr. and Meth. in Phys. Res.

12. Backscattering studies of ^{7}Li, ^{12}C and ^{16}O ions at energies between 3 and 15 MeV

In this work, we made a backscattering analysis of 3 -- 15 MeV ^{7}Li, ^{12}C and ^{16}O ions produced from a 3 MV tandem accelerator. Energy resolution and mass resolution for these ions were measured on a double layered Au/Cu thin film (50 Å thick) from backscattering spectra using a passivated implanted planar Si (PIPS) detector (Canberra PD 50-11-300). The backscattering data from top Au film (25 Å thick) and natural Cu layer were used to determine the detector resolution and mass resolution, respectively. The measured spectra show an advantage of using PIPS detector for ^{7}Li-ion in resulting a good energy resolution. The measured value (FWHM) is 21 keV for 5 MeV ^{7}Li-ion as compared to 36 keV obtained previously using a partially depleted Si detector (Nucl. Instr. and Meth. B85 (1994) 51). As for mass resolution for ^{7}Li, ^{12}C and ^{16}O-ions our measured spectra at 6, 9 and 12 MeV show a clear deparation of ^{63}Cu and ^{65}Cu peaks. To examine the accuracy of the stopping power for these heaver ions in different elements predicted by TRIM-95, we measured the backscattering spectra on thin films of Al, Cu and Ag, and determined the corresponding thickness from a RUMP analysis and a comparison of the backscattering data for the ^{4}He-ion. The detailed results will be published in Nucl. Instr. and Meth. in Phys. Res.

13. Collaborative research

a. *Growth and Characterization of CeO_2 Films on Sapphire Substrates by Sputtering Process*

Two-inch in diameter CeO_2 films have been prepared using an on-axis rf magnetron sputtering method. The effect of thermal annealing, sputtering gas pressure and substrate temperature on the orientation, crystallinity and surface morphologies of the CeO_2 films have been investigated. The (100)-preferred CeO_2 films with the best

crystallinity are grown at 800°C and 0.1 Torr and have 0.2° of the FWHM value of the rocking curve of (200) planes. The maximum thickness deviation of CeO_2 films between the center and the edge across the 2-inch substrate was about 13%. The c-axis oriented $YBa_2Cu_3O_x$ (YBCO) films grown on sapphire substrates with (100)-preferred CeO_2 buffer layer of 100 nm are made. The superconducivities of the YBCO films are Tc of 88-90 K and Jc (77K, OT) of (1-3) $\times$ 10^6 A/cm^2. This work was performed with collaboration of the Tsing hua University and Materials Research Laboratories, ITRI.

b. *Study of analog transitions in sd-shel nuclei and the isovector part of optical potential using (p,n) reaction*

Quasielastic (p,n) reaction has been studied for sd-shell nuclei at incident proton energy of 35 MeV at Cyclotron and Radioisotope center (CYRIC), Tohoku University, Japan. Differential cross section for isobaric analog $\triangle J=0^+$ (Fermi transtion; F) and their angular distribution have been measured in a variety of $N>Z$ target nuclei ranging $17<A<48$; namely ^{17}O, ^{18}O, ^{22}Ne, ^{25}Mg, ^{26}Mg, ^{27}Al, ^{30}Si, ^{34}S, ^{38}Ar, ^{40}Ar, ^{42}Ca, ^{44}Ca and ^{48}Ca. Results have been analyzed by distroted wave Born approximation (DWBA) with macroscopic Lane-model optical potential. The isovector part of Lane-model has been derived by fitting experimental cross section for these nuclei.

c. *Collaboration with the Tsinghua accelerator laboratory*

In recent years the accelerator at the National Tsinghua University has been upgraded. Since their new 3MV tandem accelerator installed in mid-1995, collaboration with their accelerator laboratory has been initiated. We started setting up there a low energy beam (Ep=75 keV) transmission system. Developments of a fast electronic system and a modernized DAQ will follow later.

d. *High-energy physics experiments (in collaboration with Fermi National Accelerator Laboratory, USA)*

We have been collaborating with the Fermilab E789 fixed-target experiment since 1989. The project has been supported by the National Science Council. The objective of E789 is to study the production and decay of heavy flavor physics in proton-nucleus collision.

In charm physics, the J/Ψ production has been studied via their decays to $\mu^+\mu^-$ pairs over a wide range of x_F.

The beam dump measurements of J/Ψ production from berllium and copper targets provides data in the range $0.30<x_F<0.95$. The differential cross sections are compared with the predictions of the semilocal duality model for several sets of parton density functions. No evident for a suggested intrinsic charm contribution to the cross section is observed. The ratio of the differential cross sections for Cu and Be targets confirms the suppression of J/Ψ production in heavy nuclei at large x_F.

D-mesons from berllium and gold targets were measured via their decays $D\rightarrow K\pi$. The measured differential cross section for neutral D-meson production at $x_F = 0.031$ is $58\pm3\pm7$ μb. The integrated cross section by extrapolating the measured differential cross section to all x_F if $17.7\pm0.9\pm3.4$ μb pernucleon which is consistent with previous measurements. No nuclear dependence is found, with a measured α = $1.02\pm0.03\pm0.02$.

The $D\rightarrow\mu^+\mu^-$ decay is sensitive to flavor-changing neutral-currents (FCNC), which is forbidden at tree level in the Standard Model. In our measurement, a limit of $BR(D\rightarrow\mu^+\mu^-)<3.1\times10^{-5}$ at 90% confident level is set.

Beauty sensitivity is provided in the modes $B\rightarrow J/\Psi + X$ and $B\rightarrow$dihadrons. The $b\rightarrow J/\Psi\rightarrow\nu^+\nu^-$ decays in 800 GeVc proton-gold interactions were observed. The integrated b-quark production cross section obtained is $\sigma(pN\rightarrow b\bar{b}+X) = 5.0\pm1.3\pm1.2$ nb/nucleon.

II. Theoretical Nuclear Physics

1. Dark matter-nucleus scattering

We apply the BCS approximation to calcualte the nuclear structure functions for the dark-matter scattered from nuclei. The nuclear angular momentum coupling and other nuclear structure considerations have been carefully treated. By putting a proper effective interaction in, we are able to predict theoretically the dark matter-nucleus scattering cross sections to a high degree of accuracy. Numerical calculations are done for several possible candidates of dark matter. Comparisons are also made between contributions from one quasi-particle and from three quasi-particle states.

2. Delta excitation on the shell-model effective nucleon-nucleon interactions

We have calculated the $\triangle$particle-nucleon hole core polarization diagram $G_{pp\triangle h}$ to investigate the effect of the Δ three-nucleon force on the shell-model effective interactions. A realistic $NN\leftrightarrow N\Delta$ transition G-matrix $G_{N\Delta}$ is derived using a Δ-subtracted Paris potential and the coupled-channel approach of Lee and Matsuyma. The core-polarization diagrams $G_{pp\Delta h}$, second order in $G_{N\Delta}$, are found to be very small for the sd-shell valence nucleons. Satisfactory convergence is reached by including Δ excitations up to 20 oscillator shells for the summation of the Δ intermediate states in $G_{pp\Delta h}$.

3. Green's function method with energy-independent vertex functions

dependent. However, a model-space Green's function method where the vertex function is manifestly energy independent can be formulated using energy-independent effective interaction theories based on folded diagrams and/or similarity transformations. This is discussed in general and then illustrated for a 1p1h model-space Green's function applied to a solvable Lipkin many-fermion model. The poles of the conventional Green's function are obtained by solving a self-consistent Dyson equation and model space calculations may lead to unphysical poles. For the energy-independent model-space Green's function only the physical poles of the model problem are reproduced and are in satisfactory agreement with the exact excitation energies.

4. Heavy quark effective theory on the light-front

The light-front heavy quark effective theory is derived to all orders in $1/m_Q$. In the limit $m_Q \to \infty$, the theory exhibits the familiar heavy quark spin flavor symmetry. This new formalism permits a straightforward canonical quantization to all orders in $1/m_Q$; moreover, higher order terms have rather simple operator structures. The light-front heavy quark effective theory can serve as an useful framework for the study of non-perturbative QCD dynamics of heavy hadron bound states.

5. $B \to \pi \ell \nu$ form factors calculated on the light-front

A consistent treatment of $B \to \pi \ell \nu$ decay is given on the light-front. The B to π transition form factors are calculated in the entire physical range of momentum transfer for the first time. The valence-quark contribution is obtained using relativistic light-front wave functions. Higher quark-antiquark Fock-state of the B-meson bound state is represented effectively by the $|B^* \pi>$ configuration, and its effect is calculated in the chiral perturbation theory. Wave function renormalization is take into account consistently, which reduces the amplitude by about ten percent. We find that, in the region $0 < q^2 < 20$ GeV^2, the valence-quark contribution is rather well described by a monopole curve with pole-mass equals $m_{B^*}>$. The $|B^* \pi>$ contribution dominates near zero-recoil point ($q^2 \cong 25$ GeV^2), and becomes negligible for $q^2 < 10$ GeV^2. The combined result is not too far from a monopole q^2-dependence in the whole momentum range, provided that the $BB^* \pi$ coupling constant is as low as $g \cong 0.2$.

6. Symmetry breaking effects in chiral dynamics of heavy mesons

Two types of symmetry breaking effects in the chiral Lagrangians for heavy mesons are studied: Heavy quark symmetry breaking due to finite heavy quark masses, and SU(3) symmetry breaking induced by the inequality of the light quark masses.

7.Nucleonic strangeness and $p\bar{p}$ annihilation branching ratio.

According to the naive consitituent quark model, the proton wave function contains just uud quarks. According to OZI rules, diagrams with disconnected quark lines should be negligible. Therefore the production of the ϕ meson is a particularly sensitive probe of the OZI rule because the ϕ is almost a pure $s\bar{s}$ state. However, apparent violations

of the OZI rules have recently been observed in $p\bar{p}$ annihilation at the Low Energy Antiproton Ring (LEAR) at CERN. It was hoped that these data can be understood in terms of the ``shake-out" and ``rearrangement" contribution is considered second-order. Meanwhile harmonic oscillator wave functions are used, in which a proper Jacobi coordinate system is adopted so that the CM motion can be treated correctly. Since we do not know the generic strength of these transitions, only the branching ratios can be calculated meaningfully. In addition, the $p\bar{p}$ initial state interaction and a realistic phase space has been taken into account as well. As a result, good agreements with experiments have been obtained for branching ratios of $p\bar{p}$ annihilation at rest into ϕ and one of π^0, η, ρ, and ω mesons.

8. Liquid-to-gas transition of nuclear matter in a semi-empirical approach.

We extend previous work on a semi-empirical approach in determining the properties of nuclear matter of finite temperature at which the liquid-to-gas transition takes its place. At the temperature where the bulk and surface terms in the finite-temperature semi-empirical mass formula vanish, a liquid-to-gas transition occurs. Our results indicate that such a transition takes place in nuclear matter at temperature around 10 MeV. Further works on the effect of this approach in nuclear equation of state and the neutrino production in stellar processes are in progress.

9. Effect of projectile shape on cross sections and momentum distributions of fragments from heavy-ion reactions.

Reaction cross sections, inclusive fragment cross sections and momentum distributions were calculated using two different theoretical models for the proton and neutron density distributions in the projectile nucleus. The results are compared with the experimental values for reactions of ^{12}C and ^{11}Li on a carbon target. The measurement of the reaction cross section and the inclusive cross sections for fragments in which the projectile has lost one neutron or one proton provide a powerful method for investigating the neutron, proton and total densities in the surface of the projectile.

10. Minimum norm method for the determination of the charge density from elastic electron scattering data.

Unphysical behavior in the QR algorithm based least squares determination of the expansion coefficients of the charge density obtained from limited information about the charge form factor occurs when the spread of the singular values in the matrix relating these quantities becomes too large. Setting the smallest singular values equal to zero in the singular value decomposition used in the minimum norm method yields much more reasonable determination of the charge density. Increasing the size of the basis without increasing the range of the prior information about the charge form factor leads to ambiguties in the determination of the charge density. Numerical results in an analytic model are presented.

C. SOLID TATE AND BIOPHYSICS GROUP

I. Solid State Physics

1. Surface Physics

a. Atomic exchange phenomena on Ir(100) surface

b. Ascending motion of step atoms on Ir(111) surface

c. Basic principles of atomic manipulation

d. Boundary-confined new two dimensional periodic structures at reconstructed Pt(100) surface

e. Surface dynamic phenomena on Si(111)-7×7 surfaces

f. Kikuchi electron holography

g. Synchrotron radiation application

h. Growth mechanism of thin films

2. Superconductivity

3. Crystal Growth And Optical Properties of Non-linear Crystals

a. Enhanced raman scattering studies

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d. Single crystal growth and their optical properties

4. Magnetism

a. Magneto-impedance in amorphous materials

b. Magnetic, optical and electric properties of magnetic alloy films

c. Magneto-Kerr effect

5. Thermodynamic Physics

a. Two dimensional thermodynamic and magnetic properties in nano-crystalline materials

b. Low temperature specific heats of palladium nanocrystals

c. Structure, crystal fields, magnetic interactions and heavy fermion behavior in $(Ce_{1-x}\ La_x)_3Al$

d. Thermoelectric effect

6. Physical Property of Nanocrystalline Particles

II. Biophysics

The main areas of our research activities are surface physics, superconductivity, Crystal growth and optical properties of non-linear crystals, magnetism, thermodynamic physics and biophysics etc. During the last few years, a significant progress has been made. Current research projects focus on some of the fundamental problems of surface physics, solid state physics, as well as materials science. The following summary is not intended to cover all the work done in this group; instead, it describes briefly only some of our recent researches in these areas.

I. Solid State Physics

1. Surface Physics:

Our research efforts focus on basic physics of solid surfaces and thin films. The surface physics laboratory is currently equipped with general surface science analytical instruments having the following spectroscopic techniques: ESCA, UPS, LEED, AES, HREELS etc., and microscopic techniques: STM, AFM, FIM and Atom-Probe FIM. The thin film laboratory has a microwave plasma chemical vapor deposition system and a mini MBE system. At Synchrotron Radiation Research Center (SRRC), Hsinchu, a UHV system completed with angle-resolved electron energy analyzer (VG), cylindrical mirror analyzer (CMA, Perkin-Elmer) is dedicated for photoemission measurements using synchrotron radiation, A photoelectron emission microscope (PEEM, Staib) is also located at SRRC for synchrotron spectromicroscopy. In addition, we have an active theoretical program in surface physics. Recent works accomplished and research projects in progress are summarized below.

a. *Atomic Exchange Phenomena on Ir(100) Surface:*

The temperature dependent behaviors of Ni, Fe and Co adatoms on the (1x1) and (5x1) Ir(100) surfaces have been studied using low energy helium ion scattering. Ni, Fe and Co atoms were deposited on well cleaned and treated surfaces kept at 110 K. For the (1x1) surface, the ion bombardment induces a continuous exchange of adatoms with substrate atoms. In addition, rapid rises in the Ir signal intensities are found when the surface temperature is gradually raised. The onset of thermally induced atomic exchange between the adatoms and substrate atoms is at 200 K for Ni and 180 K for both Fe and Co. No such exchanges are found on the (5x1) surface. These results are published in Phys. Rev. Lett.

b. *Ascending Motion of Step Atoms on Ir(111) Surface:*

The behavior of diffusing adatoms and edge atoms at the lattice steps plays an important role in the growth mode of crystals and epitaxial thin films from the vapor phase, crystal shape change and the morphology of crystal surfaces at high temperatures. From a field ion microscopic study, we have discovered that step edge atoms of the Ir(111) can ascend to the upper terrace as likely as dissociate to the lower terrace. We have also measured the activation energy for the ascending motion. This surprising result is submitted to Phys. Rev. Lett.

c. *Basic Principles of Atomic Manipulation:*

With the application of voltage pulses, mounds of 20 nm in diameter and 2 nm in height on the average can be created on a gold surface with very high efficiency in nonconducting liquid from a gold tip. The created mounds are similar to those produced in air. Tungsten and PtIr tips are also used in this study and the dominant shapes of created structures are craters and volcano-like mounds, respectively. Our data show that these nanometer structures are created by a mechanical contact between the tip and the sample. These results will appear in Appl. Phys. Lett.

Two methods for the controllable creation of nanometer scale holes at the Pt surface in air and silicone fluid with a scanning tunneling microscope are found. Holes with sizes down to 2 nm can be created with a proper choice of the pulse voltage and duration when the gap between the tip and the sample is within 10 to 40 Å in both media. When the gap is less than 10 Å, a different process dominates, which results in different generated features. These results are published in J. of Appl. Phys.

An invited review article of this subject will appear in the June issue of Jpn. J. Appl. Phys.

d. *Boundary-Confined New Two Dimensional Periodic Structures at Reconstructed Pt(100) Surface:*

New 2-D periodic structures are observed in the regions of the reconstructed Pt(100) surface which are confined by domain boundaries or lattice steps. These structures can be seen only in a narrow energy window near the Fermi level, and they are strongly correlated to the original atomic arrangement of the surface. We explain these structures to arise from a quantum confinement effect of the electrons of Fermi energy, and their distribution is screened by the ion cores of the surface in a periodic manner. This coupling is invoked to minimize the surface free energy of a confined region. These results will appear in Surf. Sci. Lett. and Jpn. J. Appl. Phys.

e. *Surface Dynamic Phenomena on Si(111)-7x7 Surfaces:*

We studied surface point defects on Si(111)-7x7 with a high-temperature scanning tunneling microscope (STM). The defects caused by reaction of the surface with various gases (such as, H_2, O_2, CH_4, and C_2H_4) were identified. We can also create vacancies (missing Si adatoms) by applying an electric pulse on the tunneling tip. The diffusion of surface defects were measured and their dynamical behaviors at high temperatures were carefully studied.

f. *Kikuchi electron Holography: New Technique for Surface Crystallography:*

Direct inversion of the diffraction patterns of Kikuchi electrons, using integral-energy phase-summing method, is found to yield three-dimensional Patterson function of the near-surface structure. The results on the systems such as metal, semiconductor, and metal/semicoductor are obtained. High-fidelity, artifact-free three-dimensional images of nearby atoms measured from the emitters are obtained with a high-resolution (~1Å) in all direction. Special attention is paid to the correct role of background subtraction in

removing artifacts. The work has demonstrated the surface sensitivity of Kikuchi electron holography and led to direct surface structural determination by inverting measured Kikuchi patterns.

g. *Synchrotron Radiation Application:*

Synchrotron radiation is used to perform 1) Photoemission spectroscopy, 2) X-ray absorption and 3) secondary electron emission spectromicroscopy. The combination of these methods give detailed information concerning the relation between the electronic structure and the surface chemical inhomogeneity. The Sr inhomogeneity was directly observed on the surfaces of BiSrCaCuO family of high temperature superconductors and its effect on the electronic structure and interface properties were identified.

h. *Growth Mechanism of Thin Films:*

(1) Diamond Thin Films:

Epitaxial textured diamond films grown on different substrates has been studied by microwave and hot-wired plasma enhanced chemical vapor deposition techniques. Substrate orientations, carbon concentrations in the gas mixtures and substrate temperatures are the crucial factors for the highly oriented textured diamond growth. The increase of the nucleation density of the diamond crystals by substrate biasing enhances the textured diamond growth.

(2) Single Crystal Metal Thin Films and Superlattices:

Single crystal metal films and superlattices are grown by molecular beam epitaxy and sputtering technique. Different high purity metal sources, such as Co, Fe, Cr, Mo are evaporated by electron beam evaporation method. The structure of epitaxial films and superlattices are characterized by in-situ reflection high energy electron diffraction (RHEED) and X-ray diffraction. The magnetic properties, such as magnetization and magnetoresistance, are studied by using a superconducting quantum interference device (SQUID) system. Anomalous anisotropic magnetoresistances for Co films and Co/Cr superlattices grown on different substrates are found to be related to the crystal symmetry between the Co layer and underlayer structures.

2. Superconductivity:

A number of significant researches concerning high temperature superconductivity in various systems have been reported during recent years. We have obtain a lot of experience in the fabrication and the physical properties of various high Tc oxides. It is evidently that the high Tc superconductors have much better potential for the future applications. Therefore, it is worthwhile for us to study the details and to find the mechanism and to improve the quality of high Tc superconductors. Besides we will study the physical properties of Multilayer system with superconducting layers.

3. Crystal Growth and Optical Properties of Non-linear Crystals:

a. *Enhanced Raman Scattering Studies:*

Crystal growth is a science of high application. The various crystals can be used in manufacturing electronic, semiconductor as well as solid state laser devices and also are important materials for optical and instrument industry. Lithium Triborate(LiB_3O_5) single crystal was first successfully grown using the Flux pulling technique in 1987 by Fu-Ji Institute of material structure, Chinese Academic of Science. Due to its important scientific and business potential, it is suitable to choose LiB_3O_5(LBO) crystal as the material for studying the growth of nonlinear optical crystals. We hope the success of this project can provide crystals to other research institutes for academic and technique research.

b. *Raman and Infrared Spectra Study:*

The aim of this proposal is using the large diameter LBO single crystals grown by Top Seed Solution Growth method to perform X-ray diffraction and laser Raman scattering techniques in order to identify its structure and to inspect the quality of LBO single crystal. 1.06μm light of Nd:YAG laser is also used to study the second harmonic generation effect. It is hope that the experience obtained from this project could be used for further nonlinear crystals study, such as SBN, BSO, BGO, BBO and other new crystals.

c. *Excitation 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 spin-orbit splitting of the valence band of silicon. We are going to use the high-temperature diffusion technique to introduce beryllium, a group II element, into silicon. Beryllium is a substitutional acceptor and has several impurity centers in silicon. Due to the spin-orbit splitting of the valence band, each impurity center of beryllium will have two series of energy levels. From the infrared spectrum obtained from the optical transitions from the ground state to excited states, we plan to identify the existence of the splitting of the valence band as well as to calculate the magnitude of the splitting.

d. *Single Crystal Growth and Their Optical Properties:*

Crystal growth is a science of high application. The various crystals can be used in manufacturing electronic, semiconductor as well as solid state laser devices and also are important meterials for optical and instrument industry. Lithium Niobate single crystal was first successfully grown using the Czochralski technique in 1965 and its possible applications include optical storage, second harmonic generator, SAW, OPO , phase conjugation and integrated optics devices. Due to its important scientific and business

potential, it is suitable to choose $LiNbO_3$ crystal as the starting meterial for studying the growth of nonlinear optical crystals. We hope the success of this research can provide crystals to other research institutes for academic and technical research.

The aim of this research is to grow large diameter $LiNbO_3$ single crystals using Czochralski pulling method. X-ray diffraction and laser Raman scattering tech-niques are employed to identify its structure and to inspect the quality of $LiNbO_3$ crystal. 1.06 um light of Nd:YAG laser is also used to study the second harmonic generation effect. It is hoped that the experience obtained from this research could be used for further nonlinear crystals study, such as SBN, LBO, BBO and other new crystals.

4. Magnetism:

a. *Magneto-Impedance in Amorphous Materials:*

Magneto-impedance is a high frequency phenomenon in ferromagnetic materials. It means the change of impedance (including the resistance and the reactance), if an external field is applied on the sample. At low frequencies it is mostly resistive, and at high frequencies it becomes inductive. The samples used include some commercialized metallic glasses, and some rapidly quenched ones. They are all in ribbon forms. It is found that magneto-impedance effect is closely related to the saturation magneto-striction in the material. Consequently, the stress and domain distribution in the sample should play a vital role. This subject has caught people's attentions, because its potential use as a sensor. Our test showed that among the metallic glasses, the bias field could be below 50 Oe, the highest magneto-impedance ratio is about 150%, and the sensitivity is around 10%/Oe.

b. *Magnetic, Optical and Electric Properties of Magnetic Alloy Films:*

The main goal in this is to study the magnetic, optical and the electric properties of magnetic alloy films. Especially, we shall pay attentions to those physical properties at various temperatures. As the magnetic properties, the measured quantities include magnetization, magnetoresistance, and magnetostriction etc. As to the electric properties, electrical resistivity and heat capacity of these specimens will be measured. For optical properties, the measured quantities include absorption, transmittance and reflectance etc.

c. *Magneto-Kerr Effect:*

A Magneto-Kerr effect apparatus has been built. With this instrument we have observed the magnetised state in the Co/Cr 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.

comprise the Co layer. Generally speaking, the magnetic behavior depends on the structure of the Co films.

5. Thermodynamic Physics:

a. *Two Dimensional Thermodynamic and Magnetic Properties in Nanocrystalline Materials:*

Due to the negligible amount of surface mass in bulk materials, it is almost not feasible to directly measure the surface macroscopic properties such as specific heat and magnetic susceptibility. Whereas if materials are fabricated in the form of ultra fine particles with the size in the order of a few tens of angstroms to a couple of hundreds of angstroms, their surfaces can be considerably increased and their physical properties can be seen. In this work we performed the measurements of low temperature specific heat and magnetic susceptibility of TiO_2 and Ni nanorystals with particle size around 200 Å, it is found that the specific heat and magenetic susceptibility of TiO_2 and Ni nanocrystals exhibit the characteristics of two dimensional conduction electrons and lattice phonons which are associated with the surface area, electron density of states and probably with the defects, disorders and inter-grain boundaries in TiO_2 and Ni nanocrystals.

b. *Low Temperature Specific Heats of Palladium Nanocrystals:*

We have performed measurements of the low-temperature specific heat for T = 0.7-20 K and magnetic susceptibility for T = 1.8-300K of Pd nanocrystals with average particle size 84 Å. An enhancement of the specific heat is observed at temperatures T>3.5 K for 84-Å Pd nanocrystals. This enhancement is primarily related to the softening of and the size effect on the phonons. The temperature coefficient of specific heat γ decreases to a lower value as compared to that of bulk Pd. An estimated surface coefficient of specific heat γ_s is about 30% that of the bulk. This is also reflected in a reduction of the magnetic susceptibility of the Pd nanocrystals. The peak of the magnetic susceptibility observed at~80 K in bulk Pd is not observed in the nanocrystals; this could be due to a change of the energy band structure in the Pd nanocrystals.

c. *Structure, Crystal Fields, Magnetic Interactions and Heavy Fermion Behavior in (Ce1-xLax)3A1*

We report measurements of the resistivity ρ, susceptibility χ and specific heat C of the alloys $(Ce_{1-x}La_x)_3Al$. At room temperature these form in the hexagonal Ni_3Sn structure (α–Ce_3Al); at low temperatures a structural transition to a monoclinic phase occurs for $0 \leq x \leq 0.3$ (γ-Ce_3Al); and a transition with a similar feature in the resistivity occurs for $0.75 < x \leq (\gamma$-$La_3Al)$. Crystal fields have strong effects on these measurements: analysis of the specific heat suggests that for Ce_3Al two excited doublets occur at temperatures $T_{1cf} \approx 75k$ and $T_{2cf} \approx 130K$ above the ground state doublet, and that these splittings decrease significantly on alloying; this causes a similar decrease in

range of temperature for all x ($0 \leq x < 1$), which is a characteristic sign of heavy fermion (Kondo) behavior; various measures of the Kondo temperature T_K, taken from the analysis of ρ, χ and C, consistently suggest that T_K decreases by an order of magnitude on alloying, from $\approx$ 10K for small x to $\approx$ 1K for large x. Fits to the low temperature specific heat which include a lattice contribution, a crystal field contribution and an S = 1/2 Kondo contribution describe the data well for x = 0.95; but for $0.3 \leq x \leq 0.82$ the specific heat peak is larger and narrower than predicted by Kondo theory and a peak occurs in the resistivity, suggesting that coherence due to magnetic correlations plays a role for these concentrations. For the monclinc phase, peaks in ρ, χ and C indicate antiferromagnetic order, where the Neel temperature decreases with x from its value T_N = 2.5K for x = 0. The specific heat is linear at the lowest tewmperatures, even in the antiferromagnetic phase, which suggests that the magnetic order coexists with Kondo behavior.

d. *Thermoelectric Effect:*

This is a low-temperature measurement. Temperature variations are from 2 to 10K. At present, our lab. has the following equipments: (a) two calibrated semiconductor type diode sensors, and (b) a He-4 insertable cryostat. We plan to attach a heater to one end of the sample so that there is a temperature gradient dT/dx along the sample length. Because it is essential to keep dT/dx as steady as possible, we need a constant current source, which has a low ripple, to control the heater power. Finally, the analyzing work will be put in two perspectives: (a) Two-current model for thermoelectricity, and (b) Thermoelectric power $S = d\ln\sigma / dE$, where σ is the electrical conductivity and E is the electronic energy.

6. Physical Property of Nanocrystalline Particles:

For the researches of nanocrystalline particles, many investigations of the properties and the industrial applications such as new materials for catalysts sensors, and magnets etc. have been reported, in addition to the study of the growth technique. During the past several years, we have studied the physical properties of Fe, Cu, Pd etc. nanocrystalline particles. Recently we are interested in studying the electrical, magnetic, and thermal properties of nanocrystalline particles. From our experimental data, we will get new results for both academic and industrical contributions.

II. 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 will derive the transverse wave propagation equation in the artery and study 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 will be performed to evaluate the accuracy of the equation. In clinical application, because the swelling of an organ, blocking of the small artery, changing of elasticity of the arterial wall.... all will be shown in the resonant frequency of this organ. The resonance model will be evaluated about the possibility of using resonance frequencies to studies the cadiac artery disease.

D.THEORETICAL PHYSICS GROUP AND HIGH ENERGY PHYSICS PROJECT

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3. Nonlinear dynamics, quantum chaos and open systems
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VII. High-Energy Experimental Physics Project

I. General Theory

1.Study of some fundamental issues in electroweak standard model and scale invariant theories

In recent years, there are a few issues within the standard model that arebothering people. One of them is that the Higgs particle has not yet been seenand the mass of its lower bound keeps increasing. Another thing worth studyingis that there are several theoretical groups giving arguments that the physicalquantities calculated by people are actually gauge dependent. With all these inmind, we here want to investigate the issues of gauge invariance and renormalizability of scale invariant and electroweak standard model when oneactually computes physical quantities and uses them to compare withexperimental result.

2. Light-front field theory and light-front QCD

We developed an approach to determine the low-energy bound states in nonperturbative QCD as a weak-coupling problem.The key to eliminating necessarily nonperturbative effects is the use of the bare QCD Hamiltonian in which quarks and gluons have nonzero constituent masses rather than the zero masses of the current picture. The weak-coupling approach potentially reconciles the simplicity of the Constituent Quark Model with the complexities of Quantum Chromodynamics. The penalty for achieving this weak-coupling picture is the necessity of formulating the problem in light-front coordinates and of dealing with the complexities of renormalization which such a formulation entails, then set up a precise similarity renormalization scheme and exhibit calculations to second order. The further investigations remains to be carried out: There is an initial nonperturbative calculation of the hadronic masses, with binding energies required to be fourth order in coupling constant. Next there is a calculation of the leading radiative corrections to these masses within the renormalization scheme.The real struggle of finding the right extensions to weak-coupling approach to study the strong-coupling behavior of bound states can then begin.

Currently, the significant achievement in hadronic physics is the heavy hadron dynamics. The discovery of heavy quark symmetry and the development of heavy quark effective theory has largely simplified our understanding to heavy hadrons. But all the nontrivial properties of heavy hadrons associated with the nonperturbative QCD have not been solved. To provide a possible understanding of nonperturbative QCD in heavy hadron dynamics, we developed the light-front heavy quark effective theory from QCD. This new formalism permits a straightforward canonical quantization to all orders in $1/mQ$, and manifests naturally the heavy quark symmetry in heavy mass limit. It can serve as an useful framework for the study of non-perturbative QCD dynamics of heavy hadron bound states. We have constructed the consistent light-front heavy meson bound state within the framework of LFHQET and calculated the Isgur-Wise function for arbitrary recoil velocities. Further applications to the exclusive and inclusive heavy meson decays and the $1/mQ$ corrections are in progress.

In order to study the nonperturbative dynamics of heavy hadrons in QCD, we derived the quark-antiqaurk confining interaction from QCD on the light-front for heavy quark system. By using the similarity renormalization group scheme and the light-front heavy quark effective theory we developed, we constructed an effective light-front QCD Hamiltonian in $Q\overline{Q}$ sector at the hadronic scale, which manifests the coexistence of a confining potential and a Coulomb potential. The light-front quark confinement mechanism is discussed and the light-front heavy quark bound states (BS-type equation) within this confinement mechanism is being explored based on our weak-coupling approach of light-front field theory.

Light-front field theory also makes the manifestation of chiral symmetry and its breaking through the helicity dependent quark interactions on the light-front. Combining with PCAC, it allows us to construct the effective interactions which are the effect of spontaneous chiral symmetry breaking. We expect that this will give us an alternative approach to explore the second nontrivial property of QCD, the chiral dynamics. Further investigation is in plan.

3. Nonlinear dynamics, quantum chaos and open systems

The basic concept to study chaos in nonlinear dynamical systems is *integrability*. To study quantum chaos, we developed the concept of quantum nonintegrability, as viewed from geometry and dynamical symmetry breaking. Quantum noninte-grability is defined from the mathematical structures of quantum mechanics. We have shown that there is a natural geometrical description for a quantum system, which provides a suitable stage to investigate the time-honored question of quantum to classical transition, as well as the underlying problem of nonintegrability in quantum mechanics. The implication of dynamical symmetry breaking to quantum nonintegrability and chaos is revealed. A practical approach to study quantum chaos, which we named it the "semiquantal description" has also been developed. We further explored the global controlling of occurrence of quantum chaos from the intrinsic geometrical properties of quantum system. Many examples have been examined to determine such a dependence.

The most significant progress in the study of quantum chaos is the discovery of quantum suppression of chaos in the kicked rotor model. Later on it has been found in many other systems. Therefore such a phenomenon has been considered as a universal property of quantum manifestation of chaos. However, a clear picture to the origin of quantum suppression has yet to be provided. We use the semiquantal dynamics to study chaotic behavior in the kicked rotor model. A quantal mapping which contains the classical standard mapping as a limit is derived. The quantum suppression of chaos is manifestedexplicitly in the effective control parameter from which a simple picture of the origin of quantum suppression of chaos emerges.

For a deep understanding of quantum to classical transition, we further study open systems which results in dissipative systems in certain conditions. We studied the wavepacket spreading for a special dissipative system with various nonlinear external potentials. We show that the position uncertainty of a Gaussian wavepacket is dictated

by quantum correlation and the behaviors of its evolution can be vividly displayed. The spreading of the wavepacket is inevitably suppressed by the dissipation. This could provide us some insights on the fundamental problems of quantum to classical transition. We are also developing a new description of quantum mechanics from the classical Langevin equation in which the stochastic motion is determined from the interaction between the system and its environment. The Schrodinger equation may be derived from the classical equations of motion without quantization, and the stochastic classical trajectories can determine the evolution of quantum systems. In this framework, chaos could be the crucial concept to allow us to describe quantum dynamics in terms of classical mechanics.

4. Quantum nucleation of vortex string loops

We investigate quantum nucleation of vortex string loops in the relativistic quantum field theory of a complex scalar field by using the Euclidean path integral. In particular, we focus in the case that the initial metastable homogeneous field configurations carry a spacelike current. It turns out that the path integral is dominated by the $O(3)$ symmetric bounce solution. When the current is much smaller that certain critical value and the self-interaction is weak, we find the nucleation rate and the critical vortex loop size. Because of the effect of quantum nucleation, initial current will gradually decays to zero, since the induced current inside vortex loops is opposite to the initial current. We also discuss a similar process in Maxwell-Higgs systems, and possible relevance to systems exhibiting superfluidity.

5.The Chern-Simons coefficient in supersymmetric Yang-Mills Chern-Simons the-ories

We study one-loop corrections to the Chern-Simons coefficient in N = 1,2,3 supersymmetric Yang-Mills Chern-Simons systems. It is known that in the pure bosonic case, one-loop correction modifies the Chern-Simons coefficient k to $k + c_V$, where c_V is the quadratic Casimir of the gauge group. In the $N = 1$ case, the fermionic contribution cancels the bosonic contribution by half and the shift is $k \to k+c_V/2$, making the theory anomalous if c_V is an odd integer. In the N = 2,3 cases, the fermionic contribution cancels the bosonic contribution completely and there is no correction. We also calculate the mass corrections, showing the supersymmetry is preserved. As the matter fields decouple from the gauge multiplet in the pure Chern-Simons limit, this work sheds some light on the regularization dependence of the correction in the pure Chern-Simons systems. We also discuss the implication of our result to the case when the gauge symmetry is spontaneously broken due to additional matter fields.

6. Generalization of the Coleman-Hill theorem

In terms of the effective action, we show to one-loop order the Coleman-Hill the-orem can be generalized to systems with spontaneous symmetry breaking. Although the correction to the parity-odd part of the vacuum polarization looks complicated in the Higgs phase, it turns out that the correction to the Chern-Simons term is identical to that in the symmetric phase, with the difference coming only from the contribution of the

would be Chern-Simons term. We also discuss the implication of our result to nonabelian systems.

II. Particle Phenomenology

1. 1/M corrections to baryonic form factors in the quark model

In the heavy quark effective theory (HQET), there are two different types of $1/mQ$ corrections to the hadronic form factors: one from the $1/mQ$ correction to the current operators, and the other from the presence of higher dimensional operators in the effective Lagrangian. The latter amounts to the hadronic wave-function modifications. In general, the predictive power of HQET for $1/mQ$ effects is very limited by the fact that we do not know how to carry out first-principles calculations for the hadronic matrix elements in which higher dimensional kinetic and chromo-magnetic operators O_1 and O_2 are inserted. Consequently, several new unknown functions are necessarily introduced besides the leading Isgur-Wise functions. For example, to order $\Lambda QCD/mc$, there are four new subleading Isgur-Wise functions $\eta(\omega),\chi_1(\omega),\chi_2(\omega)$ and $\chi_3(\omega)$ for B→D transition, whose normalizations are not determined except that χ_1 and χ_3 vanish at the zero-recoil point $\omega\equiv\upsilon\cdot\upsilon'=1$. Since the Isgur-Wise functions are not calculable from perturbative QCD or HQET, a calculation of them should be resorted to some models. It is known that the Isgur-Wise functions have some simple expressions in the quark model. Denoting the heavy meson wave function by $\psi=\psi_0+\psi_{kin}+\psi_{mag}+\ldots$, where ψ_0 is the wave function in the heavy quark limit, ψ_{kin} and ψ_{mag} are the $1/mQ$ corrections to the wave function due to the operators O_1 and O_2 respectively, the Isgur-Wise function $\xi(\upsilon\cdot\upsilon')$ simply measures the degree of overlap between the wave functions $\psi_0(\upsilon)$ and $\psi_0(\upsilon')$, while $\chi_1(\chi_3)$ can be expressed as the overlap integral of ψ_{kin} (ψ_{mag}) and ψ_0.

Weak current-induced baryonic form factors at zero recoil are evaluated in the rest frame of the heavy parent baryon using the nonrelativistic quark model. Contrary to previous similar work in the literature, our quark model results do satisfy the constraints imposed by heavy quark symmetry for heavy-heavy baryon transitions at the symmetric point $\upsilon\cdot\upsilon'=1$ and are in agreement with the predictions of the heavy quark effective theory for antitriplet-antitriplet heavy baryon form factors at zero recoil evaluated to order $1/mQ$. Furthermore, the quark model approach has the merit that it is applicable to any heavy-heavy and heavy-light baryonic transitions at maximum q^2. Assuming a dipole q^2 behavior, we have applied the quark model form factors to nonleptonic, semileptonic and weak radiative decays of the heavy baryons. It is emphasized that the flavor suppression factor occurring in many heavy-light baryonic transitions, which is unfortunately overlooked in most literature, is very crucial towards an agreement between theory and experiment for the semileptonic decay $\Lambda c\to\Lambda e+\nu e$. Predictions for the decay modes $\Lambda_b\to J/\psi\Lambda$, $\Lambda_c\to p\varnothing$,$\Lambda_b\to\Lambda\gamma$, $\Xi_b\to\Xi\gamma$,and for the semileptonic decays of Λ_b, $\Xi_{b,c}$ and Ω_b are presented.

2. Form factors for B→π and D→π transitions

A reliable determination of the quark mixing matrix element V_{ub} from the semileptonic decay mode $\overline{B}\to\pi\ell\overline{\upsilon}$ (ℓ = e, μ) requires a knowledge of the $\overline{B}\to\pi$ transition form factor $f_+^{B\pi}$ at $q^2=0$. In the past, this form factor has been calculated using the nonrelativistic quark model, QCD sum rules, and heavy quark symmetry in synthesis with chiral symmetry. A systematic analysis of the $1/mb$ correction to the weak form factors $f_\pm^{B\pi}$ was recently studied in the framework of the heavy quark effective theory. In the method of heavy quark symmetry, form factors $f_\pm^{B\pi}$ can be related in a model-independent way to the form factors $f_\pm^{D\pi}$ in the kinematic region close to zero recoil. In order to extract $f_+^{B\pi}(0)$ from the available experimental information of $f_+^{D\pi}(0)$, an extrapolation of the form factors from zero recoil to maximum recoil (i.e. q2=0) has to be assumed. However, unlike the well measured form factor $f_+^{DK}(0)$, the present experimental data on $f_+^{D\pi}(0)$ are still plagued with large statistic and systematic errors. Fortunately, this situation was changed recently, Two new measured SU(3)-breaking effects in charm decays to be discussed later are very sensitive to the relative magnitude of the form factors $f_+^{DK}(0)$ and $f_+^{DK}(0)$. By fitting to the data, we found a best fit of $f_+^{D\pi}(0)/f_+^{DK}(0)$, and hence $f_+^{D\pi}(0)$. In this paper, heavy quark symmetry is applied so that $f_+^{B\pi}(q^2)$ is related to $f_+^{D\pi}(q^2)$ near zero recoil. In the second stage, the requirement of heavy quark symmetry is relaxed, namely it applies only to soft pion emissions from the heavy meson.

Armed with the information on the form factor $f_+^{D\pi}(0)$ inferred from recent CLEO measurements of SU(3)-breaking effects in charmed meson decays, we have studied the form factor $f_+^{B\pi}$. In the heavy quark limit, $f_+^{B\pi}(q^2)$ is related to $f_+^{D\pi}(q^2)$ in the kinematic region close to zero recoil. Assuming pole dominance for its q^2 dependence, $f_+^{B\pi}(0)$ is estimated to be ≈ 0.39. If the requirement of heavy quark symmetry is relaxed so that it applies only to soft pion emissions from the heavy meson, we find that $f_+^{B\pi}(0)$ is more likely of order 0.55~0.60.

3. Extraction of a_1 and a_2 from B→$\psi K(K^*)$, $D(D^*)\pi(\rho)$ decays

The fact that the D^+ meson has a longer lifetime than the D^0 is already manifest at the exclusive two-body decay level: The number of two-body D^+ decay modes is about two times less than that of the D^0 and there exists a large destructive interference in the Cabibbo-allowed decays $D^+\to\overline{K}^0\pi+$, $\overline{K}^0\rho+$, $\overline{K}^{*0}\pi+$, which is also known as the Pauli interference at the inclusive level. The recent CLEO data on B→Dπ, Dρ, D*π, D*ρ decays exhibit a rather unexpected result: The interference between the two different amplitudes contributing to exclusive two-body B^- decays are evidently constructive, contrary to the charmed meson case. This feature is quite stunning since the rule of retaining only the leading terms in the $1/N_c$ expansion (N_c being the number of color

degrees of freedom), which is empirically operative in charm decays, fails in $B \to D(*)\pi(\rho)$ decays. Quantitatively, the ratio of the parameters a_1 and a_2 corresponding to the external and internal W-emission amplitudes is found to be positive with the magnitude $a_2/a_1 = 0.23 \pm 0.04 \pm 0.04 \pm 0.10$.

Based on the factorization approach, we show that the CLEO data for the ratio $\Gamma(B \to \psi K^*)/\Gamma(B \to \psi K)$ and the CDF measurement of the fraction of longitudinal polarization in $B \to \psi K^*$ can be accounted for by the heavy-flavor-symmetry approach for heavy-light form factors provided that the form factor F_0 behaves as a constant, while the q^2 dependence is of the monopole form for F_1, A_0, A_1, and of the dipole behavior for A^2 and V. This q^2 extrapolation for form factors is further supported by $B \to K^* \gamma$ data and by a recent QCD-sum-rule analysis. We hen apply this method to $B \to D(D^*)\pi(\rho)$ decays to extract the parameters a_1 and a_2. It is found that $a_1(B \to D(*)\pi(\rho)) = 1.01 \pm 0.06$ and a2(B→D(*)π(ρ)) = 0.23\pm 0.06. Our result $a_2/a_1 = 0.22 \pm 0.06$ thus significantly improves the previous analysis that leads to $a_2/a_1 = 0.23 \pm 0.11$. We argue that, contrary to what anticipated from the leading $1/Nc$ expansion, the sign of $a_2(B \to \psi K^*)$ should be positive and $a_2(B \to \psi K^*) \gtrsim a_2(B \to D(*)\pi(\rho))$.

4. Vector dominance effects in weak radiative decays of the B mesons

Recently the weak radiative decays of B mesons and bottom baryons have been systematically studied. At the quark level, there are two essential mechanisms responsible for weak radiative decays: electromagnetic penguin mechanism and W-exchange (or W-annihilation) bremsstrahlung. The long distance vector-meson-dominance (VMD) effects on the weak radiative decays $B \to \rho\gamma$ and $B^0 \to D^{*0}\gamma$ are studied. For $B \to \rho\gamma$ decays, the VMD contribution is (10-20)% of the short-distance penguin amplitude. The pole effect is as important as the VMD one in the decay $B^- \to \rho^- \gamma$, but it is suppressed in $B^0 \to \rho^0 \gamma$. The branching ratio of ,$B \to \rho\gamma$, estimated to be of order 10^{-6}, strongly depends on the sign of the Wolfenstein parameter ρ. A measurement of any deviation of the ratio $R = \Gamma(B^- \to \rho^- \gamma)/\Gamma(B^0 \to \rho^0 \gamma)$ away from the isospin value 2 will provide a probe on the long-range contribution and possibly indicate the sign of ρ: R>2 for $\rho<0$ and R~2 for $\rho>0$. The decay $B^0 \to D^{*0}\gamma$ does not receive short-distance contributions, and its branching atio, predicted to be 0.9×10^{-6}, is dominated by W-exchange accompanied by a photon emission.

5. Hadronic weak decays of heavy mesons and nonfactorization

It is customary to assume that two-body nonleptonic weak decays of heavy mesons are dominated by factorizable contributions. Under this assumption, the spectator meson decay amplitude is the product of the universal parameter a_1 (for external W-emission) or a_2 (for internal W-emission), which is channel independent in D or B decays, and hadronic matrix elements which can be factorized as the product of two independent hadronic currents. The universal parameters a_1 and a_2 are related to the Wilson

coefficient functions c1 and c2 by $a_1 = c_1 + \frac{1}{N_c} c_2$, $a_2 = \frac{1}{N_c} c_2$, with N_c being the number of colors. It is known that the bulk of exclusive nonleptonic charm decay data cannot be explained by this factorization approach. For example, the predicted ratio of the color-suppressed mode $D^0 \to \overline{K}^0 \pi^0$ and color-favored decay $D^0 \to K^- \pi^+$ is in violent disagreement with experiment. This signals the importance of the nonfactorizable effects.

The parameters $\chi_{1,2}$, which measure nonfactorizable soft gluon contributions to hadronic weak decays of mesons, are updated by extracting them from the data of D,B→PP,VP decays (P: pseudoscalar meson, V: vector meson). It is found that χ_2 ranges from -0.36 to -0.60 in the decays from $D \to \overline{K}\pi$ to $D^+ \to \varnothing\pi^+$, $D \to \overline{K}^* \pi$, while it is of order 10% with a positive sign in $B \to \psi K$, $D\pi$, $D^*\pi$, $D\rho$ decays. Therefore, the effective parameter a_2 is process dependent in charm decay, whereas it stays tairly stable in B decay. This is in accordance with the picture that nonfactorizable soft gluon effects become stronger when the relative momentum of the decay particles becomes smaller. As for D, $B \to VV$ decays, the presence of nonfactorizable terms in general prevents a possible definition of effective a_1 and a_2. This is reinforced by the observation of a large longitudinal polarization fraction in $B \to \psi K^*$ decay, implying nonfactorizable effects contributing differently to $S-$, $P-$ and D-wave amplitudes. We found that $A^{nf}_1/A_1 > 0 > A^{nf}_2/A_2$, V^{nf}/V (nf standing for nonfactorization) for $B \to \psi K^*$ decay and $0 > A^{nf}_1/A_1 > A^{nf}_2/A_2$, V^{nf}/V for $D \to \overline{K}^* \rho$ decay. A measurement of longitudinally and transversely polarized decay rates Γ_L and Γ_T in color-suppressed decay modes $\overline{B}^0 \to D^{*0}\rho^0, D^{*0}\omega$ and $D^+ \to \varnothing\rho^+$ is urged.

III. Gravitation and Cosmology

1.Temperature and polarization correlation for cosmic microwave background

The Cosmic Background Explorer's (COBE) detection of cosmic microwave background radiation (CMBR) temperature anisotropies opens a window to our understanding of physics associated with the initial conditions of the early Universe. The temperature anisotropy of CMBR are induced by the density perturbations (scalar mode), the primordial gravitational waves (tensor mode) or both.

Our earlier calculations indicated that the degree of polarization of the CMBR is somewhat different for the scalar and tensor modes, and it can be used as a potential method to distinguish these two modes of. We extend the previous work to study the polarization-temperature and polarization-polarization correlations on the cosmic microwave sky induced by an initial spectrum (both scale invariant and non-scale invariant) of scalar and tensor fluctuations. They serve as a further test of this approach. This consideration has some advantages for experiments in which noise in the polarization is limiting, for it averages to zero.

We are setting up a numerical code to solve the radiative transfer equation, and calculate the anisotropy and polarization correlation functions. A system of about a

thousand coupled first order differential equations is solved numerically by using the fourth-order Runge-Kutta method. The Gaussian quadratures method is employed to compute all the multi-dimension integrals. Vectorization of the code is performed on the CONVEX C3840 and C3400 computers at National Center for High-Performance Computing and Academia Sinica respectively. Parallel computation is an approach that can provide faster computing speed. Among different algorithm of parallel computation, we will employ the Parallel Virtual Machine (PVM) software in tackling our numerical work.

2. Primordial gravitational waves

The evolution of scale-invariant gravity waves from the early universe is analyzed using an equation of state which smoothly interpolates between the radiation dominated era and the present matter dominated era. We find that for large wavenumbers the standard scale-invarant wavefunction for the gravity wave severely underestimates the actual amplitude of the gravity wave. Moreover, there is a definite shift in the *temporal phase* of the gravity wave as it crosses the radiation-matter phase transition. The tensor-induced anisotropy of the cosmic microwave background and the present spectral energy density of the gravity wave is then calculated, and compared with previous work. It is found that the phase shift has significant effect on the power spectrum of the CMB.

The phases of primordial gravity waves is analysed in detail within a quantum mechanical context following the formalism developed by Grishchuk and Sidorov. It is found that for physically relevant wavelengths both the phase of each individual mode and the phase *difference* between modes are randomly distributed. The phase *sum* between modes with oppositely directed wave-vectors, however, is not random and takes on a definite value with no rms fluctuation. The conventional point of view that primordial gravity waves appear after inflation as a classical, random stochastic background is also addressed.

IV. Equilibrium Statistical Physics

1. Cell-to-cell renormalization group transformation

We have found that the critical point determined by cell-to-cell renormalization group transformations converges much quickly than cell-to-site renormalization group transformations.

2. Boundary Conditions, lattice shapes and scaling functions

We have found that the finite-size scaling functions of the existence probability E_p and the percolation probability P of percolation models depend sensitively on boundary conditions, definitions of percolating clusters, and lattice shapes. However, the critical point, critical exponents, and thermodynamic order parameters calculated from E_p and P do not depend on such factors. Such results are illustrated by bond percolation on square lattices. Hu has pointed out that periodic boundary conditions in his paper are different from

periodic boundary conditions in Hovi and Aharony's paper. Therefore, they have obtained different value of E_p at the critical point (Phys. Rev. Lett. **76**, 3875, 1996).

3. Universal scaling functions and quantum Hall effects

In 1984, Privman and Fisher (PF) proposed the idea of universal scaling functions and nonuniversal metric factors (Phys. Rev. **30**, 322, 1984), which was not confirmed for about 20 years. We have found that by choosing appropriate aspect ratios for each lattice and very small number of nonuniversal metric factors, six percolation models on planar lattices have universal scaling functions (Phys. Rev. Lett. **75**, 193, 1995). We have also found that the probability Wn for the appearance of n, n =1,2, ..., percolating clusters has very good scaling behavior. We have found that six percolation models on planar lattices have universal scaling functions for Wn (Phys. Rev. Lett. 77, July, 1996). The values of Wn at critical point may be used to compare with experimental data of quantum Hall effects.

4. Percolation on a self-dual lattice

We use a histogram Monte Carlo method to evaluate the probability $Wn\ (L_1, L_2, p)$ for the appearance of n top-to-bottom percolating clusters of bond percolation with bond probability p on finite $L_1 \times L_2$ self-dual square lattices with periodic boundary conditions in the horizontal direction of linear length L_1 and free boundary conditions in the vertical direction of linear dimension L_2. We find that, for a given aspect ratio L_1/L_2 all data of Wn (L_1, L_2, p) near the critical point p_c fall on the same scaling function $Fn(L_1/L_2,x)$, where $x = (p\text{-}p_c)\, L^{1/\nu}$, $Fn(L_1/L_2,\text{-x}) = Fn(L_1/L_2,x)$, and ν is the correlation-length exponent.

5. Percolation and critical behavior of disks

We use Monte Carlo simulations to study continuum percolation of soft disks and hard disks in two dimensions. We find convincing evidences that critical exponents and finite-size scaling functions of soft disks are in the same universality class as lattice percolation models. Our results also indicate that critical exponents of hard disks are the same as soft disks, but scaling functions of hard disks are different from those of soft disks.

6. Critical point of Kagome lattice Potts model

A cluster Monte Carlo renormalization group method is used to determine the critical point of the q-state Potts model on the Kagome lattice. Our results are compared with the predictions of a conjecture by king and Wu concerning the lower bound of the critical point.

V. Nonequilibrium Statistical Physics

1. Universality in Dynamic Critical Phenomena

We use heat bath dynamics and Glauber dynamics to evaluate the dynamic critical exponent z and the dynamic finite-size scaling function of an Ising model on square, planar triangular, and honeycomb lattices. We find convincing evidence that z is universal and, by choosing appropriate nonuniversal metric factor for each lattice, the scaling function is also universal.

Using an ultra fast multi-spin coding for the spin-exchange dynamics (Ising-like) of driven diffusive system, a detailed comparison between field theoretic predictions and computer simulations is carried out in three spatial dimensions. Anisotropic finite-size scaling with field-theoretic values of critical exponents are confirmed for the first time, thus decisively putting a long-standing controversy to rest.

VI. Computational Physics

1. Importance-sampling histogram Monte Carlo method and its applications

Based on Hu's histogram Monte Carlo method and Swendsen-Wang algorithm, we calculate the geometrical factor of the q-state bond-correlated percolation model corresponding to the q-state Potts model (QPM). The free energy f, the internal energy U, and the specific heat C_h of the Ising model, i.e. the QPM with q=2, calculated from such geometrical factor agree very well with exact results. This histogram important sampling Monte Carlo method is very simple and is used to calculate the thermodynamic properties of the QPM on a simple cubic lattice.

2. Comparison of different schemes to calculate critical points

We study site percolation on the square lattice and show that, when augmented with histogram Monte Carlo simulations for large lattices, the cell-to-cell renormalization group approach can be used to determine the critical probability accurately. Unlike the cell-to-site method and an alternate renormalization group approach proposed recently by Sahimi and Rassamdana, both of which rely on ab initio numerical inputs, the cell-to-cell scheme is free of prior knowledge and thus can be applied more widely.

3. Numerical Integration of Langevin Equations

This is a useful alternative to perturbation theory in extracting predictions from dynamic continuum field theories. It bridges the gap between analytic treatment and computer simulations, since regimes accessible to neither may be explored. The method is applied to problems of pattern formation and interfacial phenomena in open systems in the low temperature ordered phase.

VII. High Energy Physics Project

1994 is an important year for the High Energy Physics Group of Academia Sinica. CDF announced "vidence of top quark"in March, which attracted a lot of media attention locally and around the world. The proposal to search for CP violation in hyperon decays (P871), which we joined from beginning, was officially approved by Fermilab and became E871. Under the direction of our visitor Z.Q. Yu from IHEP (Beijing), we started the R&D project on microstrip gas chamber (MSGC) and microgap gas chamber (MGC). We formally took the responsibility to produce the "ense Optical Interface Module" (DOIM) for CDF and signed R&D contract with the Telecommunication Laboratory (TL), a research institute under the Ministry of Transportation. With the help of another visitor C.S. Yu, we started to design the front end module (FEM) and the

of another visitor C.S. Yu, we started to design the front end module (FEM) and the corresponding interface module (FEMI) for use in E871. These hardware projects helped us focus our efforts in setting up our laboratory, temporarily at Room 405 of the Institute.

CDF was taking data during most part of 1994. Simultaneously, there was an intense effort in analyzing the data for top candidate events. Our group members M.J. Wang and H.Y. Chao worked very hard in trying to understand the discrepancy between Monte Carlo and data for SVX' . In particular, H.Y. Chao discovered a correlation between cluster charge and cluster length. Their efforts resulted in an improved SVX' simulation program. C.H. Wang played a major role in SVX' software alignment job. He was responsible for producing the alignment constants of SVX'. He also developed the wedge-to-wedge alignment code. The success of alignment job was esssential for SVX' to achieve a better than 10 μm resolution. C.N. Chiou was responsible for upgrading the SVX' display package. His efforts made interactive track fitting possible which helped the development of better btagging algorithms.

On the SVX II upgrade project, thanks to the efforts of J. Antos, H.Y. Chao and Paul Chang, who joined later of the year we were able to take sole responsibility for SVX II simulation. Our group produced the whole SVX II simulation package and our simulation results influenced the decision on several details of the SVX II upgrade project.

M.T. Cheng, M.L. Chu and P.K. Teng worked hard on the DOIM project. The first prototypes of laser-diode and photo-diode arrays had been produced. Radiation-hardness test was tried at TRIUMF with the help of R.S. Guo. We had been collaborating with the analog IC laboratorv of Chiao-Tung University and the Chip Implementation Center (CIC) to design the driver and receiver IC. M.L. Chu also needed to design circuit boards for the DOIM test before the relevant IC's become available.

R.S. Guo had been playing an increasingly important role in the mechanical subgroup of the SVX II group. He helped the calculation of the radiation length budget of the baseline design, studied the noise issue due to epoxy and was the main organizer of the TRIUMF beam test. Paoti Chang had also worked with the mechanical group since he joined near the end of the year.

P. Yeh had played an important role in the data production. He is solely responsible for the IBM farm and contributed greatly to the operation of SGI farm also. Paoti Chang had been helping him since he joined. The efforts of the Taiwan group were well recognized by the SVX II and the CDF group. The participation of Taiwan was explicitly mentioned in the press conference presenting the "evidence of the top quark". J. Antos, M.T. Cheng, M.J. Wang and P. Yeh appeared in the author list of the "vidence of the top quark" paper. P.K. Teng, C.H. Wang, C.N. Chiou and H.Y. Chao were allowed on the author list by the end of the year.

P.K. Teng, Y.C. Chen, C. Ho, C.S. Yu and K.C. Cheng were the main participants of our group in E871. C. Ho had visited LBL since September and had helped on the

design of the wire chamber. A11 group members were actively involved in the design of the DAQ for E871.

The two visitors Z.Q. Yu and C.S. Yu from IHEP (Beijing) had been very helpful to our group. Z.Q. Yu had given a series of lectures on "Introduction to Experimental Particle Physics". Both of them participated in Taiwan's first detector school. C.S. Yu had undertaken the job of designing the various modules for DAQ of E871 while Z.Q. Yu, with help from P.K. Teng and M.L. Chu, led students H.J. Wai and S.S. Wang in developing the high rate chambers MSGC and MGC.

Research assistant K.S. Lu had done a great job in keeping our computing system functioning and our CDF and other HEP related software updated. He is also responsible for establishing and maintaining "Taiwan High Engergy Physics Network" (twhepnet) as well as similar networks for other fields.

In the coming year, we expect more intense efforts will be focused on data analysis for interesting physics at CDF. The R&D mode for optical readout system for SVX II is fast approaching the concluding phase. We need to work; harder on the chip design for DOIM. E871 is expected to start taking data in April 1996. We need to enter production mode for wire chambers and DAQ in mid-1995. The R&D on MSGC and MGC is expected to lead to definite conclusion by the summer of 1995. We are looking forward to another busy and fruitful year.

III

List of Ongoing Research Projects

List of Ongoing Research Projects

中央研究院物理所八十五年度計畫清單一覽表

(1995年7月~1996年6月)

主持人	計畫名稱	執行期間	計畫編號
杜其永	二元混合液中鏈狀聚合物之研究	08/01/95-07/31/96	NSC 85-2112-M-001-033
黃榮鑑	海岸空間利用-海岸污染 (III) 總計畫	08/01/95-07/31/96	NSC 85-2611-E-001-001
黃榮鑑	電廠熱排水之混合擴散與模擬研究	08/01/95-07/31/96	NSC 85-2611-E-001-002
黃榮鑑	複雜紊流場流況之數值研究	08/01/95-07/31/96	NCA 85-2611-E-001-003
陳志強	複合液體皂膜物性之研究	08/01/95-07/31/96	NSC 85-2112-M-001-038
曾忠一	應用AVHRR資料在SPOT影像之大氣糾正及估算值被指數	07/01/95-06/30/96	85-RS-04-03
曾忠一	輻射傳遞模式在大氣輻射遙測問題上的應用(II)	08/01/95-07/31/96	NSC 85-2111-M-001-004
簡來成	震動與游離耦合模式在極超速流之應用	08/01/95-07/31/96	NSC 85-2212-E-001-001
王建萬	以鋰七誘發庫倫激發探討原子核低激發能態(續)	08/01/95-07/31/96	NSC 85-2112-M-001-006
江紀成	pf-層原子核受激態之生命期(V)52: V 核構造之研究	08/01/95-07/31/96	NSC 85-2112-M-001-008
余岳仲	原子內層游離截面積與重離子荷電態的關係研究(I)	08/01/95-07/31/96	NSC 85-2112-M-001-012Y
林爾康	離子射束分析及高速輕離子激發原子游離(II)	08/01/95-07/31/96	NSC 85-2112-M-001-005
曾詣涵	原子核多體問題中之△自由度	08/01/95-07/31/96	NSC 85-2112-M-001-009
鄧炳坤	重夸克及強作用物理之實驗探討(子計畫四): 奇異重子衰變中CP不守恆現象之探討 (II)	08/01/95-07/31/96	NSC 85-2112-M-001-027

主持人	計畫名稱	執行期間	計畫編號
鄧炳坤	重夸克及強作用物理之實驗探討(子計畫二):CDF及相關實驗粒子偵測器之研製 (II)	08/01/95-07/31/96	NSC 85-2112-M-001-043
顏迪佑	以準實驗法決定原子核物質之能量密度及其於天文物理之應用	08/01/95-07/31/96	NSC 85-2112-M-001-015
王唯工	以雷射都卜勒法來研究共振理論在腎臟之表現	08/01/95-07/31/96	NSC 85-2331-B-001-018-M0
王唯工	針刺太谿及陷谷對脈波頻譜之影響	07/01/95-06/30/96	NRICM-85105
王唯工	血液波前進方程式邊界條件之建立及其在偵測心臟血管疾病之應用	08/01/95-07/31/96	NSC 85-2213-E-001-008
王唯工	以脈診分析原理研究六味地黃丸之作用	11/01/95-06/30/96	
任盛源	非晶形磁性材料之磁阻抗效應	08/01/95-07/31/96	NSC 85-2112-M-001-018
何侗民	矽中二價受者雜質基態結構之研究	08/01/95-07/31/96	NSC 85-2112-M-001-034
胡宇光	顯像式光電子能譜顯微術	08/01/95-07/31/96	NSC 85-2613-M-001-002
姚永德	鈷／鉻超晶格之電磁特性研究	08/01/95-07/31/96	NSC 85-2112-M-001-020
陳洋元	超微粒金屬比熱之量子效應	08/01/95-07/31/96	NSC 85-2112-M-001-037
黃英碩	掃瞄穿隧顯微儀對磊晶成長及結構變化的研究(2/2)	08/01/95-07/31/96	NSC 85-2112-M-001-002
鄭天佐	晶體表面原子動力學與量子物理性質之研究	08/01/95-07/31/96	NSC 85-2112-M-001-039
劉鏞	高度方向性紋理鑽石薄膜的生長研究及其應用	08/01/95-07/31/96	NSC 85-2216-E-001-001
劉鏞	磊晶成長鈷／鉻超晶格,磁性改變的因素研究	08/01/95-07/31/96	NSC 85-2112-M-001-019
謝雲生	三硼酸鋰單晶之拉曼光譜與長晶研究	08/01/95-07/31/96	NSC 85-2112-M-001-035

主持人	計畫名稱	執行期間	計畫編號
魏金明	利用分子動力學方法研究金屬表面原子的擴散及移動行為(II)	08/01/95-07/31/96	NSC 85-2112-M-001-036
王明哲	重夸克及強作用物理之實驗探討(子計畫三)CDF實驗之電腦模擬與數據分析	08/01/94-07/31/95	NSC 85-2112-M-001-028
余海禮	規範場論、強作用及其相關物理之研究(子計劃二):小x重強子物理(II)	08/01/95-07/31/96	NSC 85-2112-M-001-021
吳建宏	宇宙微波背景輻射之各向不同性及偏極性(II)	08/01/95-07/31/96	NSC 85-2112-M-001-014
李世昌	重夸克及強作用物理之實驗探討(子計畫一):頂夸克搜尋及強作用之非微擾現象及其相關物究理理之研究(II)	08/01/95-07/31/96	NSC 85-2112-M-001-026
李世昌	重夸克及強作用物理之實驗探討(國外差旅費)	08/01/95-07/31/96	NSC 85-2112-M-001-044
李世昌	沙堆模型及其它非線性系統之研究(II)	08/01/95/-07/31/9	NSC 85-2112-M-001-004
李世炳	規範場論;強作用及其相關物理之研究(子計畫三):尺度不變與標準模型中一些基本問題的探討	08/01/95-07/31/96	NSC 85-2112-M-001-022
胡進錕	臨界現象的普適及非普適量	08/01/95-07/31/96	NSC 85-2112-M-001-007Y
胡進錕	統計物理與數值模擬(II)	02/01/96-07/31/96	NSC 85-2112-M-001-045
張志義	規範場論;強作用及其相關物理之研究(子計畫四):重夸克對稱與手徵動力學(II)	08/01/95-07/31/96	NSC 85-2111-M-001-023
林誠謙	最佳化問題混合演算法之系統性推展	08/01/95-07/31/96	NSC 85-2112-M-001-011
梁鈞泰	非線性系統之相變(II)	08/01/95-07/31/96	NSC 85-2112-M-001-013
鄭海揚	物理學門規劃資料修訂	09/01/95-12/31/96	NSC 85-3011-M-001-002
鄭海揚	粒子現象學之研究(IV)	08/01/95-07/31/96	NSC 85-2112-M-001-010

IV

Publication List of 1995/1996

Bai, Shr-Nan (白世南)

1. S. N. Bai, Y. Y. Chen, Y. D. Yao, L. H. Chen, S. H. Lin, S. Y. Liao, and Y. Liou, "Specific Heat Study of $La_{2/3}Ca_{1/3}$ MnO_3", Annual Meeting of the Physical Society of the Republic of China, January (1996).
2. S. N. Bai, Y. Y. Chen, Y. D. Yao. S. Y. Liao, L. H. Chen, S. H. Lin, and Y. Liou, "Transport Properties of $La_{0.67}$ $Ca_{0.33}$ MnD3" accepted for publication, *Chin. J. Phys.* (1996).

Chan, Chi-Keung (陳志強)

1. C.K. Chan,"Dynamics of slip-and-stick fluctuations in a random growing interface," Proceedings of STATPHYS 19, World Scientific (in press).
2. K.W. To, H.J. Choi and C.K. Chan,"Phase Equilibrium and Conformation of a Polymer in a Binary Solvent," *Physica A*, **221**, 223 (1995).
3. N.Y. Liang and C.K. Chan,"Depinning Dynamics of an Air-Water Interface moving in a Random medium," (Preprint 1996).

Chang, Chia-Seng (張嘉升)

1. H.N. Lin, C.S. Chang, and T.T. Tsong, "Generation of nanometer scale holes on Pt in air with the scanning tunneling microscope," *J. Appl. Phys.* 77, 2825 (1995).
2. C.S. Chang, W.B. Su, and T.T. Tsong, "Observation of new two dimensional periodic structures in the confined regions of the reconstructed Pt(100) surface," *Surf. Sci. Lett.* **330,** L686 (1995).
3. C.S. Chang, W.B. Su, and T.T. Tsong, "New charge density modulations in the confined regions of the reconstructed Pt(100) surface," *Jpn. J. Appl. Phys.* **34**, 3329 (1995).
4. T.T. Tsong and C.S. Chang, "High field effects and methods useful for transferring atoms in scanning tunneling microscope," *Jpn. J. Appl. Phys.* **34**, 3309 (1995).
5. T.C. Chang, C.S. Chang, H.N. Lin, and T.T. Tsong, "Generation of nano-structures on gold surfaces in nonconducting liquid," *Appl. Phys. Lett.* **67**, 903 (1995).

Chen, Chin-Ning (陳企寧)

1. C.-K. Hu, C.-N. Chen and F.Y. Wu, "Histogram Monte Carlo Position-Space Renormalization Group: application to the site percolation," *J. Stat. Phys.*,**82**, 1199 (1996).

2. C.-N. Chen, C.-K. Hu and F.Y. Wu, "Partition Function Zeroes of the Square Lattice Potts Model," *Phys. Rve. Lett.*,**76**, 169 (1996).
3. F.Y. Wu, G. Rollet, H.Y. Huang, J.M. Maillard, C.-K. Hu and C.-N. Chen, "An Exact Solution of the Infinite-State Potts Model in Two and Three Dimensions, *Phys. Rev. Lett.*, **76**, 173 (1996).

Chen, Jau-Ann (陳昭安)

1. C.-K. Hu and J.-A. Chen, "Lattice Shapes and Scaling Functions for Bond Random Percolation Model on Honeycomb Lattices," *J. Phys. A: Math. Gen.* 28, L73-L78 (1995).
2. C.-K. Hu and J.-A. Chen, "Histogram Monte Carlo Calculations of Thermodynamic Quantities for the Potts Model on the Planar Lattices," *Physica* **A215**, 518-531 (1995).
3. P.-Y. Lai and J.-A. Chen, "Stretch Transition in a Ploymer Brush," *Phys. Rev.* **E51**, 2272-2276 (1995).
4. C.-K. Hu, C.-Y. Lin, and J.-A. Chen, "Universal scaling functions in critical phenomena," *Phys. Rev. Lett.*, **57**, 193-196 (1995).
5. C.-K. Hu, C.-Y. Lin, and J.-A. Chen , "Universal scaling functions for site and bond percolations on planar lattices," *Physica* **A221**, 80-88 (1995).
6. J.-A. Chen and C.-K. Hu, "Histogram-importance-sampling Monte Carlo approach to the q-state Potts model on simple cubic lattices," in *Proceedings of HPC'ASIA* (1995).
7. C.-K. Hu, C.-Y. Lin, and J.-A. Chen, "Universal scaling functions for per-colation on planar lattices," in *Proceedings of The 1st Tohwa University Statistical Physics Meeting*, 7-10 November, Fukuoka, Japan (1995).
8. C.-K. Hu, J.-A. Chen, and C.-Y. Lin, "Boundary conditions, lattice shapes, and the scaling functions of phase transition models," *Chin. J. Phys. (Taipei)*, **34**, in press (1996).

Chen, Yang-Yuan (陳洋元)

1. Y.D. Yao, J.K. Wu, K.T. Wu, Y.Y. Chen, C. Tien and D.S. Hung "Aqueous Coprecipitation Synthesis of $Nd_{1.85}Ce_{0.15}CuO_4$ Superconductors," *Physica C* **235-240**, 553-4 (1995).
2. Y.Y. Chen, Y.D. Yao, B.T. Lin, C.T. Suo, S.G. Shyu and H.M. Lin "Specific Heat of Fine Copper Particles," *NanoStructured Materials*, **6**, 597-600 (1995).
3. Y.D. Yao, Y.Y. Chen, C.M. Hsu, H.M. Lin, C.Y. Tung, M.F. Tai, D.H. Wang, K.T. Wu and C.T. Suo. "Thermal and Magnetic Studies of Nanocrystalline Ni," *NanoStructured Materials*, **6**, 933-936 (1995).

4. Y.Y. Chen, Y.D. Yao, S.U. Jen, B.T. Lin, H.M. Lin, C.Y. Tung and S.S. Hsiao. "Magnetic Susceptibility and Low Temperature Specific Heat of Palladium Nanocrystals," *NanoStructured Materials*, **6**, 605-8.(1995).
5. H.M. Lin, C.M. Hsu, Y.D. Yao, Y.Y. Chen, T.T. Kuan, F.A. Yang and C.Y. Tung "Magnetic Study of Both Nitrified and Oxidized Co Particles," *NanoStructured Materials*, **6**, 977-80 (1995).
6. M.S. Lin, J.H. Shieh, Y.B. You, Y.Y. Hsu, J.W. Chen, S.H. Lin, Y.D. Yao, Y.Y. Chen, J.C. Ho and H.C. Ku "Coexistence of Antiferromagnetic Order and Superconductivity with T_N higher than T_c in $D_yNi_2B_2C$," *Physica C* **249**, 403-8 (1995).
7. Y.Y. Chen, Y.D. Yao, S.U. Jen, B.T. Lin, H.M. Lin, C.Y. Tung and S.S. Hsiao "Specific Heat Study of Nanocrystalline Palladium," *Phys. Rev. B*, **52**, 9364-9 (1995).
8. J.C. Ho, H.H. Hamdeh, Y.Y. Chen, S.H. Lin, Y.D. Yao, R.J. Willey and S.A. Oliver "Low Temperature Calorimetric Properties of Zinc Ferrite Nanoparticles," *Physical Review B*, **52**, 10122-6 (1995).
9. J.C. Ho, H. Hamdeh, S.H. Lin, Y.Y. Chen, Y.D. Yao, R.J. Willey "A comparative Study of Low Temperature Heat Capacities between Zinc Ferrite and Magnesium Ferrite Nanoparticles," *Chinese Journal of Physics* **33**, 707 (1995).
10. Y.D. Yao, Y.Y. Chen, M.F. Tai, D.H. Wang and H.M. Lin "Magnetic Anisotropy Effects in Nano-Cluster Nickle Particles," *Accepted for Publication in Materials Science and Eng. A* (1995).

Cheng, Hai-Yang (鄭海揚)

1. H.Y. Cheng, C.Y. Cheung, G.L. Lin, Y.C. Lin, T.M. Yan and H.L. Yu, 1995 "Effective Lagrangian Approach to Weak Radiative Decays of Heavy Hadrons" *Phys. Rev.* **D51**, 1199 (1995).
2. H.Y. Cheng and B. Tseng, 1995 "Extraction of a_1 and a_2 from $B\to \psi K(K^*)$, $D(D^*)\pi(\rho)$ Decays" *Phys. Rev.* **D51**, 6259 (1995).
3. H.Y. Cheng, 1995 "Vector Dominance Effects in Weak Radiative Decays of B Mesons" *Phys. Rev.* **D51**, 6228 (1995).
4. H.Y. Cheng, 1995 "Nonfactorizable Corrections to Hadronic Weak Decays of Heavy Mesons" To appear in the proceedings of The International Symposium on Particle and Phenomenology, Iowa State University, May 22-24, 1995.
5. H.Y. Cheng and B. Tseng, 1995 "1/M Corrections to Baryonic Form Factors in the Quark Model" *Phys. Rev.* **D53**, 1457 (1996).

6. H.Y. Cheng, H.H. Liu and C.Y. Wu, 1995 "Polarized Parton Distribution Functions Reexamined" *Phys. Rev.* **D53**, 2380 (1996).
7. H.Y. Cheng, 1995 "Hadronic Weak Decays of Heavy Mesons and Nonfactorization" to appear in *Z. Phys.* (1996).
8. L.L. Chau, H.Y. Cheng and B. Tseng, 1995 "Analysis of Two-body Decays of Charmed Baryons Using the Quark-diagram Scheme" to appear in *Phys. Rev.* **D** (1996).
9. H.Y. Cheng, 1995 "U(1) Goldberger-Treiman Relation and Its Connection to the Proton Spin" to appear in *Chinese J. Phys.* (1996).
10. H.Y. Cheng, 1995 "Sea Quark or Anomalous Gluon Interpretation for $g_1^p(x)$?" IP-ASTP-25-95 (1995).
11. T.M. Yan, H.Y. Cheng, and H.L. Yu, 1996 "CKM Favored Semileptonic Decays of Heavy Hadrons at Zero Recoil" IP-ASTP-01-96 (1996).

Cheung, Chi-Yee (張志義)

1. H.Y. Cheng, C.Y. Cheung, G.L. Lin, Y.C. Lin, T.M. Yan, and H.L. Yu, "Effective Lagrangian Approach to Weak Radiative Decays of Bottom Hadrons" *Physical Review* **D51**, 1199-1214 (1995).
2. C.Y. Cheung, W.M. Zhang, and G.L. Lin, "Light-Front Heavy Quark Effective Theory and Heavy Meson Structure" *Physical Review* **D52**, 2915-2925 (1995).
3. W.M. Zhang, G.L. Lin, and C.Y. Cheung, "Heavy Quark Effective Theory on the Light-Front" *International Journal of Modern Physics*, (1996 to appear).
4. C.Y. Cheung, "Symmetry Breaking Effects in Heavy Hadron Chiral Dynamics" *Chinese Journal of physics*, (1996 to appear).
5. C.Y. Cheung, C.W. Hwang, and W.M. Zhang, "$B \to \pi \ell \nu$ Form Factors Calculated on the Light-Front" *Physical Review* **D**, (1996 to appear).

Chien, Lai-Chen (簡來成)

1. L.C. Chien, Y.K. Fuh, "Pressure Based Navien Stoke Calculation for all speed flows," *Numerical Methods in Thermal Problems*, **Vol. 9**, pp.1270-1282, (1995).
2. Lai-Chen Chien, T.K. Yeh, "Three Dimensiand Grid Generation using poissins equations," *Numerical Methods in Laminer/Turbulent Flows*, **Vol. 9**, pp.1688-1697.
3. J.J. Wu and L.C. Chien, "Solutions to a General Forced Nonlinear Oscillations Problem," *J. Sound Vibration* **Vol. 185**, pp.247-264, (1995).
4. L.C. Chien, "Application of Flux-Vector-Splitting Scheme to a Dilute Gas-Particle JPL Nozzle Flow," to be published in *Numerical Methods in Fluids*, **Vol. 22**, (1996).

Dai, Gui-liang (戴貴亮)

1. "Neural Network Classifier Based on Genetic Algorithm" Proceeding of the 8th National Conference of Computer Application in Science & Technology, pp. 203-206, 1995 第八屆全國計算機在科學技術領域應用學術會談專輯。
2. "A Benchmark and its Rules for Neural Network Classifier" Proceedings of the 8th National Conference of Computer Application in Science & Technology, pp. 207-210, 1995 第八屆全國計算機在科學技術領域應用學術會談專輯。
3. "Evolutionary Neural Network: Review and Prospect" ACTA ELECTRONICA SINICA, Vo1.23, No.10, pp.197 - 203, 1995 中文刊物 (電子學校)。
4. "Combining Genetic Algorithm and Cascade-Correlation," Accepted by IEEE International Conference on Neural Networks and Signal Processing, Nanjing, China, pp.56 - 59, 1995。
5. "Error Estimation and Error Bounds for Neural Networks," Appear in Artificial Neural Networks and Expert Systems, 2, IEEE Computer Society Press, Los Alamitos, CA, pp.42-44, 1995 (Refer to The Second New Zealand International Conference on Artificial Neural Networks (ANNES'95), Dunedin, New Zealand, November 20-23, 1995)。
6. "Comparison Between the Evolutionary Approach and the Backpropagation Training Algorithm," Proceedings of The First International Conference on Computational Intelligence & Neurosciences, North Carolina, USA, pp.591-592, 1995。
7. "Neural Network Classifier Based on Genetic Algorithm," accepted by Nuclear Electronics & Detection Technology. 已被中文刊物 (核電子學與核探測技術) 接受。
8. "Classification of the Primary Cosmic Ray Composition with Neural Networks," Submitted to High Energy Physics and Nuclear Physics. 已發往中文刊物 (高能物理與核物理)。

Ho, L. T. (何侗民)

1. L.T. Ho, F.Y. Lin, M.J. Wu, and W.J. Lin, "Excitation Spectrum of Beryllium Impurities in Silicon," *Physics* **17**, 47 (1995).
2. L.T. Ho, F.Y. Lin, M.J. Wu, and W.J. Lin, "Spectroscopic Study of Beryllium Related Acceptors in Silicon," *Solid State Commun.* **93**, 455 (1995).
3. L.T. Ho, F.Y. Lin, and W.J. Lin, "Infrared Absorption Spectrum of Beryllium Acceptors in Silicon," *International Journal of IR & MM Waves* **16**, 339 (1995).

Hsu, Tse-Lin (徐則林)

1. W.K. Wang, T.L. Hsu, Z.Y. Huang, Y.Y.Lin Wang, "Collective effect of a Chinese Formular-A Study of Xiao-Jian-Zhong-Tang," *Am. J. Chin. Med.* **XXIII** (paper accepted)(1995).
2. W.K. Wang, T.L. Hsu, H.C. Chang, Y.Y.Lin Wang, "Effect of acupuncture at Tsu San Li (St-36) on the pulse spectrum," *Am. J. Chin. Med.* **XXIII(2)** : 121-130 (1995).
3. W.K. Wang, J. Tsuei, H.C. Chang, T.L. Hsu, Y.Y.Lin Wang," A pulse spectrum analysis of a chemical factory works with abnormal blood tests," *Am. J. Chin. Med.* (paper accepted)(1996).
4. W.K. Wang, T.L. Hsu, Y. Chiang, Y.Y.Lin Wang, "The prandial effect on the pulse spectrum," *Am. J. Chin. Med.* **XXIV(1)** 已接受(1996).

Hu, Chin-Kun (胡進錕)

1. C.-K. Hu and J.-A. Chen, "Lattice shapes and scaling functions for bond random percolation model on honeycomb lattices," *J. Phys. A: Math. Gen.* **28**, L73-L78 (1995).
2. C.-K. Hu, "Large cell renormalization group and order parameter for site percolation problems," *Phys. Rev. B*, **51**, 3922-3925 (1995).
3. C.-K. Hu and J.-A. Chen, "Histogram Monte Carlo calculations of thermodynamic quantities for the Potts model on the planar lattices," *Physica A*, **215**, 518-531 (1995).
4. C.-K. Hu, "Monte Carlo approach to critical phenomena (in Chinese), *The World of High-performance Computing*, **4**, 26-39 (1995).
5. C.-K. Hu, "Percolation and Critical Phenomena (in Chinese), *Newsletters in Natural Sciences*, **7**, pp. 87-97 (1995).
6. C.-K. Hu, C.-Y. Lin and J.-A. Chen, "Universal scaling functions in critical phenomena," *Phys. Rev. Lett.*, **75**, pp.193-196 (1995).
7. C.-K. Hu, C.-Y. Lin, and J.-A. Chen, "Universal scaling functions for site and bond percolations on planar lattices," *Physica A*, **221**, 80-88 (1995).
8. J.-A. Chen and C.-K. Hu, "Histogram-importance-sampling Monte Carlo approach to the q-state Potts model on simple cubic lattices," in Proceedings of HPC'ASIA 1995 (1995).
9. C.-Y. Lin and C.-K. Hu, "Histogram Monte Carlo approach to site percolation on planar lattices," in Proceedings of HPC'ASIA 1995 (1995).
10. C.-K. Hu, C.-Y. Lin, and J.-A. Chen, "Universal scaling functions for percolation on planar lattices, in *Proceedings of The 1st Tohwa University Statistical Physics Meeting*, 7-10 November 1995, Fukuoka, Japan (1995).

11. C.-K. Hu, "Scaling functions for numbers of percolating clusters on lattices and quantum Hall effects, in *Pacific Conference on Condensed Matter Theory*, 2-5 December 1995, Seoul, Korea (1995).
12. C.-K. Hu and K.T. Leung (eds.), "Nonlinear and Random Processes, Proceedings of the Second IUPAP Topical Conference and the Third Taipei International Symposium on Statistical Physics," *Physica A*, **221**, 1-388 (1995).
13. F.Y. Wu, G. Rollet, H.Y. Huang, J.M. Maillard, C.-K. Hu, C.-N. Chen, "Directed compact lattice animals, restricted partitions of an integer, and the infinite-state Potts model," *Phys. Rev. Lett.*, **76**, 173-176 (1995).
14. C.-N. Chen, C.-K. Hu, and F.Y. Wu, "Partition function zeroes of the square lattice Potts model," *Phys. Rev. Lett.*, **76**, 169-172 (1996).
15. C.-K. Hu, C.-N. Chen and F.Y. Wu, "Histogram Monte Carlo Position Space Renormalization Group: Application to the Site Percolation," *J. Stat. Phys.*, **82**, 1199-1206 (1996).
16. C.-K. Hu, Replies to "Comment on universal scaling functions in critical phenomena", *Phys. Rev. Lett.*, **76**, 3875 (1996).
17. C.-K. Hu, J.-A. Chen, and C.-Y. Lin, "Boundary conditions, lattice shapes, and the scaling functions of phase transition models, *Chin. J. Phys. (Taipei)*, **34**, in press (1996).
18. C.-K. Hu and C.-Y. Lin, "Universal scaling functions for numbers of percolating clusters on planar lattices", *Phys. Rev. Lett.*, July (1996).
19. F.-G. Wang and C.-K. Hu, "Universality in dynamic critical phenomena".
20 C.-K. Hu and F.-G. Wang, "Continuum percolation and critical behavior of soft disks and hard disks".

Huang, Mei-Jiau (黃美嬌)

1. Mei-Jiau Huang, "Studies of Flows between Eccentric Rotating Cylinders in Use of Isoparametric Spectral Element Method", submitted to *Theoretical and Computational Fluid Dynamics* (revised); also presented at the Third National Conference on Computational Fluid Dynamics, Taiwan, R.O.C., proceedings 307, Aug. 1995.
2. Mei-Jiau Huang, "Correlations of Vorticity and Material Line Elements with Strain in a Decaying Turbulence", accepted by *Phys. Fluids*, to appear; also presented at APS Meeting of the Division of Fluid Dynamics, Irvine, CA, Nov. 1995.
3. Mei-Jiau Huang and Anthony Leonard, "Velocity Autocorrelations of Decaying Isotropic Homogeneous Turbulence", *Phys. Fluids* **7**, 2455, Oct. 1995.

Hwang, Ing-Shouh (黃英碩)

1. I.-S. Hwang, R. Martinez, C. Liu and J.A. Golovchenko, "A soft incommensurate reconstruction on Pb/Si(111): structure, stress modulation and phase transition," *Phys. Rev.* **B51**, 10193 (1995).
2. I.-S. Hwang, R. Martinez, C. Liu and J.A. Golovchenko, "High coverage phases of Pb on the Si(111) surface: structures and phase transitions," *Surf. Sci.* **323**, 241 (1995).

Hwang, Robert R. (黃榮鑑)

1. Kong, C.H. and Hwang, R.R., Steady stratified circulation induced by constant coastal wind, *Intern. J. of Computational Fluid Dynamics*, **Vol. 3**, (1995).
2. Chiang, T.P., Sheu, W.H. and Hwang, R.R., Numerical investigation of vortex interactions in a lid-driven cubical cavity, *Numerical Methods in Laminar and Turbulent Flows*, **Vol. 9**, Part I, 296-305 (1995).
3. Hwang, R.R. and Chiang T.P., Effect of ambient stratification on buoyant jets in cross-flow, *J. of Engineering Mechanics, ASCE*, **Vol. 121** No. 8, 865-872 (1995).
4. Hwang, R.R. and Chern, M.J., Vortex shedding of a square cylinder in shear and wall effect, *Numerical Methods in Laminar and Turbulent Flows*, **Vol. 9**, Part II, 1503-1513 (1995).
5. Hwang, R.R. and Peng, Y.F., Computation of backward facing step flows by a second-order Reynolds stress closure model, *Intern. J. for Numerical Methods in Fluids*, **Vol. 21**, 223-235 (1995).
6. Hwang, R.R. and Yao, C.C., Visualization of wind induced mixing in stably stratified fluid, *the Chinese Journal of Mechanics*, **Vol. 11**, No. 3, 243-252 (1995).
7. Hwang, R.R. and Chiang, T.P., Numerical simulation of vertical forced plume in a cross flow of stably stratifed fluid, Transactions of ASME, *J. of Fluids Engieering*, **Vol. 117**, No. 4, 696-705 (1995).
8. Hwang, R.R. and Yang, W.C., Effects of surface waves on buoyant jet flows, *J. of Marine Environmental Engineering*, -- Accepted (1995)
9. Chiang, T.P., Hwang, R.R. and Sheu, W.H., Finite volume analysis of spiral motion in a rectangular Iid-driven cavity, Intern. *J. for Numerical Methods in Fluids.*-- Accepted. (1995).

Hwu, Yeu-Kuang (胡宇光)

1. Y. Hwu, C.Y. Tung, J.Y. Pieh and S.D. Lee, P. Almeras, F. Gozzo, H. Berger, G. argaritondo, Gelsominca De Stasio, Delio Mercanti and M. Teresa Ciotti, "First Spectromicroscopy Tests at the Taiwan Synchrotron Radiation Research Center (SRRC): Chemical and Topological Microimaging of Layered Systems", *Nucl. Instrum. Meth. A* **361**, 349 (1995).
2. D.Y. Noh, K.S. Liang, Y. Hwu, and S. Chandavarkar, "Thermal Roughening of a Si(331) Surface", *Surf. Sci.* **326** L455 (1995).
3. D.Y. Noh, Y. Hwu, and M. Hong, "X-ray scattering studies of the interfacial structure of Au/GaAs", *Phys. Rev.* **B 51**, 4441 (1995).
4. G. Faraci, S.La Rosa, A.R. Pennisi, Y. Hwu, G. Margaritondo, "Al intermediate oxidation states observed by core level photoemission spectroscopy", *J. Appl. Phys.* **78**, 4091 (1995).
5. Y. Hwu, C.Y. Tung, C.Y. Pieh, S.D. Lee, N.F. Cheng, P. Alméras, F. Gozzo, H. Berger, T. Dell'Orto, C. Coluzza, J. Almeida and G. Margaritondo, Y.Y. Xue, R.L. Meng and C.W. Chu, "Chemical Inhomogeneity of High-Temperature Superconductor Surfaces", *J. Apply. Phys.* (Submitted).
6. Y. Hwu, N.-F. Cheng, Y.D. Yao, C.-Y. Tung and H.-M. Lin, "High Resolution Soft-X-Ray Absorption Spectra of Nanocrystal Titanium Oxides", *Appl. Phys. Lett.* (submitted).
7. Y. Hwu, N.-F. Cheng, S.-D. Lee, C.-Y. Tung, P. Alméras and H. Berger, "Chemical Inhomogeneity and reactions of BiCaSrCuO surface detected by synchrotron imaging spectromicroscopy", *Appl. Phys. Lett.* (submitted).
8. Y. Hwu, D.Y. Noh, S. Chandravakar, Z. Fu, and K.S. Liang, "Multistage Faceting on a Pt(115) Surface", *Phys. Rev. Lett.* (submitted).
9. D.Y. Noh, S. Chandavarkar, Z. Fu, Y. Hwu, and K.S. Liang, "Real Time X-ray Scattering Study of Si-on-Si growth", *Phys. Rev.* **B** (submitted).
10. D.Y. Noh, M. Hong, Y. Hwu, J.H. Je and J.P. Mannaerts, "Strain Relaxation in Fe_3(Al, Si)/GaAs: An X-ray Scattering Study", *Apply Phys. Lett.* **68**, 1528 (1996).

Jen, Shien-Uang (任盛源)

1. S.U. Jen and S.S. Liou, "High-field Forced Magnetoresistance of Co-Pd Alloys," *J. Magn. Magn. Mater.* **139**, 77 (1995).
2. S.U. Jen, S.P. Shieh and S.S. Liou, "Neel, Cross-tie, and Bloch Walls in Fe_{100-x} Ni_x Films," *J. Magn. Magn. Mater.* **147**, 49 (1995).
3. Y.Y. Chen, Y.D. Yao, S.S. Hsiao, S.U. Jen, B.T. Lin, H.M. Lin, and C.Y. Tung, "Specific-heat study of Nanocrystalline Pd," *Phys. Rev.* **B52**, 9364 (1995).
4. S.U. Jen, "Effect of Atomic Order on Some Physical Properties of $Co_{25}Pt_{75}$", *J. Alloys & Compounds.* **234**, 231 (1996).

5. S.U. Jen, L.H. Ray and Y.D. Chao, "Thermoelectric Power and Electrical Resistirity of Co-Pd Alloys," *J. Mater. Sci. Lett.*, **15**, 792 (1996).
6. S.U. Jen and Y.D. Chao, "Magneto-impedance of Some Non-zero Magneto-strictive Amorphous Ribbons," *J. Non-crystalline Solids*, accepted (1996).
7. S.U. Jen and Y.D. Chao, "The Field-annealing Effect on Magnetoimpedance of A Zero Magnetostrictive Matallic Glass," *J. Appl. Phys.*, **79**, 6552 (1996).
8. S.U. Jen, C.T. Wei and J.Y. Huang, "The Thickness Dependance of Anisotropic Magnetoresistance in The Co35Pd65 Films," *J. Magn. Mater.*, accepted (1996)

Jon, Guo-Ching (仲國慶)

1. M. Oura, H. Orihara, M. Hosaka, G.C. Jon, A. Terakawa, K. Ishii, A. Narita, K. Hosomi, T. Nakagawa, K. Miura, H. Ohnuma, T. Niizeki, D. Dehnhard. The ^{17,18}O (p,n) ^{17,18}F reaction at Ep=35 MeV. *Nuclear Physics* **A586**, 20-34 (1995).

Kiang, Ge-Cheng (江紀成)

1. L.L. Kiang, G.C. Kiang, W.F. Niu, P.K. Teng, Huang and C.H. Chen, "A Normalization Procedure for the Four-Detector System in $\gamma-\gamma$ Angular Correlation Studies, " *Appl. Radiat. Isot.* **6/7**, 503 (1995).
2. L.L. Kiang, R.H. Tsou, G.C. Kiang, W.S. Lin, J.Y. Li, S.C. Lin, C.-Y. Lo and P.K. Teng and "A Study of an Asymmetric Compton Suppression Spectrometer by Monte Carlo Simulation," *Nucl. Instr. & Meth.*, **A355,** 434 (1995).
3. M.H. Schub, D.M. Jansen, C.S. Mishra, P.M. Ho, C.N. Brown, T.A. Carey, Y.C. Chen, R. Childers, W.E. Cooper, C.W. Darden, G. Gidal, K.N. Gounder, L.D. Isehower, R.G. Jeppesen, D.M. Kaplan, J.S. Kapustinsky, M. G.C. Kiang, M. Kowitt, D.W. Lane, L.M. Lederman, M.J. Leitch, J.W. Lillberg, W.R. Luebke, K.B. Luk, P.L. McGaughey, J.M. Moss, J.C. Peng, R.S. Preston, D. Pripstein, J Sa, M.E. Sadler, R. Schnatorst, V. Tanikella, P.K. Teng and J.R. Wilson and "Measurement of J/Ψ and Ψ' Production in 800 GeV/c Proton-Gold Collision," *Phys. Rev.* **D 52** (1995).

Klik, Ivo (柯松仁)

1. I. Klik, Y. D. Yao and C. R. Chang, "Multilevel master equation for bicrystal clusters", to appear in *J. Appl. Phys.*
2. I. Klik, Y. D. Yao and C. R. Chang, "Non-Markovian thermal relaxation at elevated temperatures," *Phys. Rev. E* **52** 6892 (1995).

3. Y. D. Yao, Y. Liou, J. C. A. Huang, S. Y. Liao, I. Klik, W. T. Yang, C. P. Chang and C. K. Lo, "Enhancement of magnetoresistance in Co(1$\bar{1}$00)/Cr(211) bilayer films on MgO(110)," *J. Appl. Phys.* **79** (15 April 1996).
4. I. Klik, C. K. Lo, U. M. Chen, Y. D. Yao and Y. Liou, "Magnetic and surface properties of Co/Cr/MgO(100) epitaxial films," to appear in *IEEE Trans. Magn.*
5. I. J. Jang, Y. D. Yao, I. Klik, H. E. Horng and H. C. Yang, "Low temperature magnetization of a ferrofluid of magnetite coated with polysterene," to appear in *Phys. Stat. Sol. (a)* (February 1996).
6. C. K. Lo, Y. Liou, C. P. Chang, I. Klik, Y. D. Yao and J. C. A. Huang, "Structure and magnetic anisotropy of epitaxial fcc-Co(110) and hcp-Co(1$\bar{1}$00) films," *Appl. Phys. Lett.* **68** (8 April 1996).
7. I. Klik, C. R. Chang and Y. D. Yao, "Relaxation effects in magnetic recording," to appear in *IEEE Trans. Magn.*
8. C. R. Chang, U. M. Chen, S. Y. Liao, J. S. Yang, Y. Liou, I. Klik and Y. D. Yao, "Surface topology and anisotropy in Co(1$\bar{1}$00)/Cr(211) bilayers," to appear in *IEEE Trans. Magn.*
9. Y. D. Yao, Y. Liou, J. C. A. Huang, S. Y. Liao, I. Klik, C. P. Chang and C. K. Lo, "Fabrication and characterization of Co(1100)/Mo(211) and Co(1120)/Mo(100) bilayered films on MgO," to appear in *IEEE Trans. Magn.*
10. I. Klik, Y. D. Yao, S. Y. Liao, C. P. Chang, Y. Liou and S. U. Jen,"Magnetoresistance of epitaxial cobalt films," to appear in *Czech. J. Phys.*
11. C. K. Lo, C. P. Chang, I. Klik, Y. Liou and Y. D. Yao, "Magnetization reversal in Cr(211)/Co(1$\bar{1}$00)/Cr(211) sandwich films on MgO(110)," to appear in *IEEE Trans. Magn.*
12. I. J. Jang, Y. D. Yao, I. Klik, H. E. Horng and H. C. Yang, "Thermomagnetic effect in ferrofluids with weakly coupled particles," to appear in *Czech.* J. Phys.
13. I. Klik, U. M. Chen, Y. D. Yao, C. K. Lo, C. P. Chang and Y. Liou, "Properties of Co(11$\bar{2}$0)/Mo(100)/MgO(100) bilayers," to appear in *Appl. Surface Science.*
14. I. Klik, Y. D. Yao and J. lee, "Spectrum of the Fokker-Planck operator for a double well," submitted to *Phys. Rev E.*

Lee, Shih-Chang (李世昌)

1. Darwin Chang, S.-C. Lee and Wen-Jer Tzeng, "Exact Solution of a One-Dimensional Deterministic Sandpile Model," *Phys. Rev.* **E51**, 5515 (1995).
2. J.W. Bos, D.W. Chang, S.-C. Lee, Y.C. Lin and H.H. Shih, "Baryon Chiral Perturbation Theory in Next-to-Leading Order," *Phys. Rev.* **D51**, 6308 (1995).

3. S.-C. Lee and A. Sumarokov, "Determining the Top Mass from $t\bar{t}$ Dilepton Decay Events," *Chin. J. Phys.* **33**, 221 (1995).

Leung, Kwan-Tai (梁鈞泰)

1. K.T. Leung, "Generalization of a two-dimensional Burridge-Knopoff model of earthquakes," *J. Müller and J.V. Andersen*, preprint (1995).
2. C.-K. Hu and K.T. Leung (eds.), "Nonlinear and Random Processes, Proceedings of the Second IUPAP Topical Conference and the Third Taipei International Symposium on Statistical Physics," *Physica A*, **221**, 1-388 (1995).
3. K.T. Leung, "Phase Transitions in Two-Species Asymmetric Diffusive Lattice Gases," Butsusei Kenkyu (Material Research) (to appear, 1996).
4. K.T. Leung and R.K.P. Zia, "Subtleties in Data Analysis Related to the Size of Critical Region," *J. Stat. Phys.* 83 (1996).

Li, Sai-Ping (李世炳)

1. S.P. Li and Hung Cheng, "The Radiative Corrections of The Triangular Anomaly," (submitted for publication).
2. S.P. Li and Hung Cheng, "Physical Masses and The Vacuum Expectation Value of The Higgs Field," (submitted for publication).

Lin, Li-Te Steven (林立德)

1. L.-T. S. Lin, G. Popovici, Y. Mori, A. Hiraki, M. A. Prelas, B. V. Spytsyn, S. Khasawinah and T. Sung, "Study of Color Centers in Hot-filament CVD Diamond Films by Cathodo-and Photoluminescence and Their Correlations with Films Quality," accepted by *Diamond and Related Materials* (1996).
2. L.-T. S. Lin, M. A. Prelas and G. Popovici, "Photochemical Processes in Diamond Chemical Vapor Deposition," *1996 APS March Meeting, 18-22 March 1996, St. Louis, MO, USA.*

Lin, Erh-Kang (林爾康)

1. E.K. Lin, C. W. Wang, Y. C. Yu, W. C. Cheng, C. H. Chang, Y. C. Yang, and C. Y. Chang,"Application of PIXE for Elemental Analysis of Ancient Chinese Artifacts", *Nucl. Instru. and Meth.* **B99**, 394 (1995).
2. J.G. Lin, C.Y. Huang, L.M. Wang, H.C. Yang, C.W. Wang, E.K. Lin, and Y.C. Yu, "Effect of the Irradiation of O-Ions on the Resistivity for the Y Ba_2 Cu_3 O*y* Films", Proceedings of IUMRS-ICEM'94, 1995.

3. H. Y. Yao, E. K. Lin, C. W. Wang, Y. C. Yu, C. H. Chang, Y. C. Yang, and C. Y. Chang, "A PIXE Study of Vitrification of Carnation in Vitro Culture", *Ncul. Instru. and Meth.* **B109**, 32 (1996).
4. H.S. Cheng, Y.C. Yu, C.W. Wang, E.K. Lin, T.Y. Liu, M.S. Chen and M.S. Chang, "Backscattering Studies of ^{7}Li, ^{12}C and ^{16}O Ions at Energies 3-15 MeV", *Nucl. Instru. and Meth.* (1996).
5. H.L. Sun, Y.C. Yu, E. K. Lin, C. W. Wang, J.L. Duggan, A. Azordegan and G. Lapicki, "Charge-State Depandence of K-Shell X-Ray Production in Aluminum for 2-12 MeV Carbon Ion Bombardment", *Phys. Rev.* (1996).
6. C.C. Chin, Y.J. Lin, Y.C. Yu, C.W. Wang, E.K. Lin, W.C. Tsai and T.Y. Tseng, "Of and Off Stoichometry of Cerium Oxide Thin Films Deposited by RF Sputtering,", *Physica* **C260**, 86 (1996).
7. C.W. Wang, E.K. Lin and Y.C. Yu, "Determination of Nuclear Reduced Transition Probabilities by ^{7}Lin-Ion Induced Coulomb Excitation," to be published.
8. C.W. Wang, Y. C. Yu, E.K. Lin, and G.C. Jon, "Reaction Channels of ^{51}V+^{7}Li System Below Coulomb Barrier", to be published.

Lin, Simon-C. (林誠謙)

1. L.L. Kiang, R.H. Tsou, J.H. Li, S.C. Lin, C.-Y. Lo, G.C. Kiang, P.K. Teng, "A study of an asymmetric Compton Suppression spectrometer by Monte Carlo Simulation," *Nucl. Instr. and Math. in Phys. Res.* **A355**, p434-438 (1995).

Liou, Yung (劉 鏞)

1. C.C. Chiu, Y. Liou, "Low-velocity impact damage in brittle coatings", *J. Mater. Sci.* **30**, 1018 (1995).
2. C.C. Chiu, Y. Liou and Y-D Juang, "Elastic modulus af and residual stresses in diamond films", *Thin Solid Films* **260**, 118 (1995).
3. Y. Liou, J.C.A. Huang, Y.D. Yao, S.F. Lee, W.T. Yang, S.Y. Liao, and C.P. Chang, "Fabrication and characterization of magnetic superlattices-epitaxial Co/Cr(100) and Co/Cr(211) superlattices", *IEEE transactions on magnetics*, **31**, 3927 (1995).
4. C.C. Chiu, Y. Liou, "Residual stresses and stress-induced cracks in coated components", *Thin Solid Films* **268**, 91 (1995).
5. J.C.A. Huang, Y. Liou, Y.D. Yao, W.T. Yang, C.P. Chang, S.Y. Liao, Y.M. Hu, "Large crystalline-induced magnetic anisotrophy and field-direction-dependent magnetoresistance in Co($1\bar{1}00$) /Cr(211) superlattices", *Physics Rev. B*, **52**, R13110 (1995).

6. Y. Liou, "Textured diamond growth study by microwave plasma chemical vapor deposition", *Appl. Surf. Sci.* (in press) (1995).
7. J.C.A. Hung, Y.D. Yao, Y. Liou, S.F. Lee, W.T. Yang, S.Y. Liao, and C.P. Chang, "Novel epitaxial growth and magnetotransport characterization og single crystal Co(11$\bar{2}$0) /Cr(100) superlattices on Mo buffer layers," *Appl. Surf. Sci.* (in press) (1995).
8. Y.D. Yao, Y. Liou, J.C.A. Huang, S.Y. Liao, I. Klik, W.T. Yang, C.P. Chang and C.K. Lo, "Enhancement of Magnetoresistance in Co(1$\bar{1}$00) /Cr(211) Bilayered Films on MgO(110), *J. Appl. Phys.*, accepted (1996).
9. Y. Liou, J.C.A. Hung, Y.D. Yao, W.T. Yang, S.Y. Liao, and C.P. Chang, "Influence of the crystal structure on the magnetic ptoperty of Co/Cr superlattices", *J. Appl. Phys.*, accepted (1996).
10. J.C.A. Huang, F.C. Tang, W.W. Fang, R.L. Liu, Y.M. Hu, C.K. Lo, Y. Liou, Y.D. Yao, W.T. Yang, C.P. Chang and S.Y. Liao,"Studies of the magnetic anisotropies of Co(1$\bar{1}$00) /Cr(211) and Co(11$\bar{2}$0) /Cr(100) multilayers", *J. Appl. Phys.*, accepted (1996).
11. C.K. Lo, Y. Liou, C.P. Chang, I. Klik, Y.D. Yao and J.C.A. Huang, "Structure and magnetic anisotropy of epitaxial fcc-Co(110) and hcp-Co(1$\bar{1}$00) films", *Appl. Phys. Lett.*, accepted (1996).
12. I. Klik, S.Y. Liao, C.K. Lo, Y.D. Yao, Y. Liou, C.R. Chang, J.C.A. Huang, "Evidence for in-plane columnar structure in epitaxial Co(1$\bar{1}$00) /Cr(211) / MgO (110) bilayers," *Phys. Rev.* **B**, submitted (1996).

Liu, Hung Hsiang（劉鴻祥）

1. Hai-Yang Cheng, Hung Hsiang Liu and Chung-Yi Wu "Polarized Parton Distribut-ion Function Reexamined," *Phys. Rev.* **D53**, 1 (1996).
2. Hung Hsiang Liu "Light-front heavy quarkonium bound-state equation in the Leibbrandt-Mandelstam gauge prescription," to be published.
3. Hung Hsiang Liu "Double parton interaction and its gluonic contribution," to be published.

Lo, Chi-Kuen（盧志權）

1. C.K. Lo, Y.Liou, C.P. Chang, Klik and Y.D. Yao, "Structure and Magnetic Anisotropy of Epitaxial fcc-Co(110) and hcp-Co(1$\bar{1}$00) Films",Appl. Phys Lett. **68**(15), 8 April 1996.
2. Y.D. Yao, Y.Liou, J.C.A. Huang, S.Y. Liao, I. Klik, W.T. Yang, C.P. Chang, and C.K. Lo,"Enhancement of Magnetoresistance in Co(1$\bar{1}$00)/Cr(211) Bilayered Films on MgO(110)", J. Appl. Phys. **79** (8) 15 April, 1995.

3. C.K. Lo, "SMOKE Studies of Switching Anisotropy of Ultra Thin Fe Films on Si(110)" 1996 Annual Meeting of the Chinese Physical Science.
4. C.K. Lo, C.P. Chang, I. Klik, Y. Liou, and Y.D. Yao,"Magnetisation Reversal in Cr(211)/Co(1$\bar{1}$00)/Cr(211) Sandwich Films on MgO(110), INTERMAG 96, Seattle, USA.
5. I. Klik, C.K. Lo,U.M. Chang, Y.D. Yao, and Y. Liou, "Magnetisation and Surface Properties of Co/Cr/MgO(100) Epitaxial Films", INTERMAG 96, Seattle, USA.
6. C.K. Lo, C.P. Chang, Y. Liou, I.Klik, Y.D. Yao, "Unusual Magnetisc Behaviour of hcp-Co Films on bcc-V, Cr, and Mo", ISSFS-8th,Japan, July, 1996.
7. C.P. Chang, U.M. Chang, S.Y. Liao, C.K. Lo,J. Yang, Y. Liou, I. Klik, and Y.D. Yao, "Surface Topology and Anisotropy in Co(1$\bar{1}$00)/Cr(211)"INTERMAG 96, Seattle, USA.
8. Y.D. Yao, Y. Liou, J.C.A. Huang, S.Y. Liao, I. Klik, C.P. Chang, and C.K. Lo," Fabrication and Characterization of Co(1$\bar{1}$00)/Cr(211)and Co(1120)/Mo(100) Bilayered Films on MgO",INTERMAG 96, Seattle, USA.

Ng, Kin-Wang（吳建宏）

1. K.L. Ng and K.-W. Ng, "Large-scale polarization of the cosmic microwave background radiation," *Phys. Rev.* D **51**, 364 (1995).
2. K.-W. Ng and A.D. Speliotopoulos, "Random and correlated phases of primordial gravitational waves," *Phys. Rev.* D **51**. 5636 (1995).
3. K.L. Ng and K.-W. Ng, "Gravity wave-induced polarization of the cosmic microwave background radiation," *Astrophys. J.* **445**, 521 (1995).
4. K.-W. Ng and A.D. Speliotopoulos, "Cosmological evolution of scale-invariant gravity waves," *Phys. Rev.* D **52**, 2112 (1995).
5. K.L. Ng and K.-W. Ng, "Large-angle polarization of the cosmic microwave background radiation and reionization," *Astrophys. J.* **456**, 413 (1996).
6. K.-W. Ng, "Graviton mode function in inflationary cosmology," *Int. J. Mod. Phys.* **A** (in press).
7. K.-W. Ng, "Large-angle CMB polarization in reionized ACDM models," *Proc. of the Symposium on the Cosmological Constant and the Evolution of the Universe, Tokyo, Japan, Nov.*, 1995 (Universal Academy Press, Japan, 1996).

Mao, Zepu（毛澤普）

1. Zepu Mao "Study of the Decay $\tau^{\pm}\to\pi^{+}\pi^{-}\pi^{\pm}\nu_{\tau}$ *at* $\sqrt{s}$=4.30 GeV," *High Energy Physics & Nuclear Physics* **Vol. 19**, No.7 (1995).

2. Zepu Mao "Study of ψ (2s) Decay to τ Lepton Pairs," *High Energy Physics & Nuclear Physics*, **Vol. 19**, No.8 (1995).
3. Zepu Mao "Study of Energy Response Nonlinearity of BSC at BES," *High Energy Physics & Nuclear Physics*, **Vol. 20**, No.1 (1996).

Shiau, Bao-Shi (蕭葆義)

1. B.S. Shiau, "The Structure of the Reyholds Stress in a Turbulent Flow over Windbreaks of Half Circular Section," *Journal of the Chinese Institute of Engineers*, **Vol. 18**, No.2, 265-271 (1995).
2. B.S. Shiau, "Measurement of the Reynolds Stress Structure Behind the Multiple Windbreaks Across-Wind," *Journal of Wind Engineering and Industrial Aerodynamics*, **Vol. 54/55**, 561-571 (1995).
3. B.S. Shiau, "Oil Spill Spreading Simulation in Sen-Au Port," *Proceedings of 4-th International Conference on Coastal and Port Engineering*, 2153-2159 (1995).
4. B.S. Shiau, "Experimental Study on Turbulence Characteristics of Flow Past Windbreak," *Proceedings of Ninth International Conference on Wind Engineering*, 1766-1775 (1995).
5. B.S. Shiau, "Numerical Study on the Simulation of Bubble Plume in Stratified Fluids," *Proceedings of First International Conference on Engineering Computation and Computer Simulation* (1995).
6. B.S Shiau and Ying-Chang Chang, "Measurement of Turbulence Effects on the Flow Past a Two-Dimensional Circular Cylinder," *Proceedings of ninth National Conference on Theoretical and Applied Mechanics*, 215-222 (1995).
7. B.S. Shiau, "Hydrodynamics of Offshore Gas Well Blowouts," The sixth International Conference on Offshore and Polar Engineering, (1996).
8. B.S. Shiau, "Experimental Study of Turbulence Intensity Effect on the Mean Flow Behind Two Cylinders in Side By Side Arrangement," The Sixth International Symposium on Flow Modeling and Turbulence Measurement, (1996).

Shiau, Yuo-Hsien (蕭又新)

1. Yuo-Hsien Shiau and Yi-Chen Cheng, "Nonlinear response and clriven chaos in n-type GaAs Compensated with Ni impurities", *Phys. Rev.* **B52**, 1698 (1995).
2. Yuo-Hsien Shiau and Yi-Chen Cheng, "Various routes to chaos in n-GaAs compensated with Ni impurities", *Physica* **A221**, 348 (1995).
3. Yuo-Hsien Shiau and Yi-Chen Cheng, "Static and dynamic hysteresis in cleep-impurity doped n-GaAs under d.c. bias voltage", *Solid State Electron.* **39**, 205 (1996).

Soumarokov, Alexei (薩馬羅克夫)

1. S.-C. Lee, A. Soumarokov "Determination the top mass from $t\bar{t}$ dilepton decay events," *Chineese Journal of Physics*, **Vol. 33**, 3, p. 221 (1995).
2. The CDF Collaboration (F.Abe et al.), "Observation of top quark production in $P\overline{P}$ collisions," *Phys. Rev. Lett.* **74**, 2626 (1995).
3. The CDF Collaboration (F.Abe et al.), "identification of top quarks using kinematic varilables," *Phys. Rev.* **D52**, R2605 (1995).
4. D. Chang, S.-C. Lee, A. Soumarokov, "On the observation of top spin correlation effect at tevatron," Submitted to *Phys. Rev.Lett.* January (1996).
5. The CDF Collaboration (F.Abe et al.), "measurement of the B^- and B^0 meson lifetimes using semileptonic decays," Fermilab-PUB-96/041-E, Submitted to *Phys.Rev.Lett.* February 16 (1996).
6. The CDF Collaboration (F.Abe et al.), "forward-backward charge asymmetry of electron pairs above the Z^0 pole," Fermilab-PUB-96/071-E, Submitted to *Phys.Rev.Lett.* March 21 (1996).
7. The CDF Collaboration (F.Abe et al.), "inclusive jet cross section in $P\overline{P}$ collisions at ✓ S = 1.8 TeV," Fermilab-PUB-96/020-E, Submitted to *Phys.Rev.Lett.* January 24 (1996).
8. The CDF Collaboration (F.Abe et al.), "Search for gluino and quark cascade decays at the fermilab tevatron collider," *Phys.Rev.Lett.* **76**,2006 (1996).

Teng, Ping-Kun (鄧炳坤)

1. F. Abe and P.K. Teng et al., "Observation of Top Quark Production in $\bar{p}p$ Collisions with the Collider Detector at Fermilab", *Phys. Rev. Lett.* **74**, 2626 (1995).
2. D.M. Jansen and P.K. Teng et al., "Measurement of the Bottom-Quark Production Cross Section in 800 GeV/c Proton-Gold Collisions", *Phys. Rev. Lett.* **74**, 3118 (1995).
3. F. Abe and P.K. Teng et al., "Kinematic evidence for top quark production in W+multijet events in $p\bar{p}$ collisions at $\sqrt{s}$=1.8TeV", *Phys. Rev. D* **51**, 4623 (1995).
4. M.H. Schub and P.K. Teng et al., "Measurement of J/Ψ and Ψ' production in 800 GeV/c proton-gold collisions", *Phys. Rev. D* **52**, 1307 (1995).
5. M.J. Leitch and P.K. Teng et al., "Nuclear dependence of J/Ψ production production by 800 GeV/c protons near x_F=0", *Phys. Rev. D* **52**, 4251 (1995).

To, Ki-Wing (杜其永)

1. Kiwing To, "Measurement of flow speed from video images of demixing liquid-liquid system using spatial-temporal Fourier spectral method", *Rev. Sci. Instru*, **66**, 2935 (1995).
2. Kiwing To, C.K. Chan and H.J. Choi, "Phase equilibrium and conformation of a polymer in a binary solvent", *Physica* **A 221**, 223 (1995).
3. Kiwing To, "Morphological Transitions of Diffusion Limited Aggregate under Outward Radial Drift", to be published in *Chin. J. Phys.* (1996).

Tse, Wan-Sun (謝雲生)

1. W.S. Tse, et al., "Raman Scattering of $YBa_2Cu_3O_{7.8}$ Thin Films with Different Surface Morphology." *Chin. J. Phys.*, **33**, 33 (1995).
2. W.S. Tse et al., "Photoreflectance and Raman Analysis of Composition in In Al As Layer on InP Substrate by MBE," *Chin J. Phys*, **33**, 57 (1995).
3. P.T. Leung and W.S. Tse, "Nonlocal Electrodynamic Effect on the Enhancement Factor for Surface Enhanced Raman Scattering," *Sol. State. Phys.*, **95**, 39 (1995).
4. W.S. Tse et al., "Vibration Quantum Beats Observed by Raman-Induced Optical Kerr Effect in Liquids," *Submitted to Chemical Physics* (1995)
5. W.S. Tse et al., "The Coherent Transient Optical Kerr Effect of CS_2 and $CHBr_3$ Liquids," *Submitted to Journal of Chemical Physics* (1996).

Tseng, Chung-Yi (曾忠一)

1. 曾忠一, 郭廷新, 1995: 半拉格朗日法的數值試驗. 大氣科學, 23, 19-33, 民國84年3月。
2. 曾忠一, 1995: 衛星遙測頻道之大氣訂正(二). 農委會84年度試驗研究計劃研究報告, 47頁, 民國84年6月。
3. 曾忠一, 1995: 輻射傳遞模式在大氣輻射遙測問題上的應用(一). 國科會專題計劃成果報告, 46頁, 民國84年9月。
4. 曾忠一, 李衍民, 1995: 二氧化碳4.3微米吸收帶的反射陽光及其訂正. 大氣科學, 23, 3, 民國84年9月。
5. 曾忠一, 張博雄, 1995: 準單調半拉格朗日法在雲模式中的應用. 國科會結餘款再運用計劃研究報告, 31頁, 民國84年12月。
6. Onn, S.C., K.H. Wang, T.H. Hor, and C.Y. Tseng, 1995: The initial field construction for numerical weather predicion in the low latitudinal region by a new mixed type autocorrelation function. Accepted by Terrestrial, Atmospheric and Oceanic Sciences.

Tsong, Tien-Tzou (鄭天佐)

1. K.D. Shiang and T.T. Tsong, "Energetics and atomic steps in the reconstruction of the Pt (110) plane" *Phys. Rev.* **B51**, 5522-5525 (1995).
2. J.M. Yuan, C.M. Wei and T.T. Tsong, "Dissociation Dynamics of a Field Evaporated Diatomic Ion: Rovibrational Coupling, Isotope Effects, and Fractal Field Thresholds", *J. Chem. Phys.* **102**, 170-179 (1995).
3. H.N. Lin, C.S. Chang and T.T. Tsong, "Generation of holes on Pt surfaces in air with the scanning tunneling microscope", *J. Appl. Phys.* **77**, 2825-2827 (1995).
4. T.C. Chang, C.S. Chang, H.N. Lin and T.T. Tsong, "Creation of nanostructures on gold surfaces in nonconducting liquid", *Appl. Phys. Lett.* **67**, 903-905 (1995).
5. C.S. Chang, W.B. Su and T.T. Tsong, "An STM observation of strong-coupling charge density waves on the reconstructed Pt (100) surface", *Surface Sci.* **330**, L686-L690 (1995).
6. C.S. Chang, W.B. Su and T.T. Tsong, "New Structures Formed in the Confined Regions of the Reconstructed Pt (100) Surface", *Jpn J. Appl. Phys.* **34**, 3329-3335 (1995).
7. C.L. Chen, T.T. Tsong, S.D. Liang and L.H. Zhang, "Dynamic Behaviour of a Small Atomic Cluster on an Ir (001) Surface", *Phil. Mag. Letters* **71**, 357-365 (1995).
8. C.L. Chen and T.T. Tsong, "Atomic Roughness of the Steps of the Ir (001) Layers", *Surface Sci.* **336**, L735-L740 (1995).
9. J.P. Wang and T.T. Tsong, "A Study of Local Density of States of Atom-Clusters on the W (110) Surface", *Surface Sci. Letters.* **341**, L1048-L1054 (1995).
10. Y.L. Kuang, Y.F. Wang, N. Lee, A. Badzian, T. Badzian and T.T. Tsong, "Surface Structure of Homoepitaxial Diamond Films, a Scanning Tunneling Microscope Study", *Appl. Phys. Lett.* **67**, 3721-3723 (1995).
11. Y.L. Kuang, N. Lee, A Badzian, T.T. Tsong, T. Badzian and C.L. Cnen, "Study of antiphase boundaries and local 3×1 configuration on the (001) surface of homoepitaxial diamond films by scanning tunneling microscopy," Diamond & Related Materials **4**, 1371-1374 (1995).
12. C.L. Chen and T.T. Tsong, "Atomic Structure of Re Monolayer on the W (112) Surface, *Phil. Mag. Letters*, **72**, 285-290 (1995).
13. C.L. Chen, S.G. Song, G.T. Gray III and T.T. Tsong, "Field Ion Microscopy Observation of Mechanism Twinning in Pure Iridium", *Materials Sci. & Eng. A.* **203**, 415-419 (1995).
14. T.T. Tsong and C.S. Chang, "High Field Effects and Methods Useful for Transferring Atoms in STM", *Jpn J. Appl. Phys.* **34**, 3309-3318 (1995).

15. T.T. Tsong, "Seeing and Moving Atoms", Bulletin of AAPPS (Association of Asia Pacific Physical Society), **5**, 15-24 (December, 1995).
16. T.T. Tsong, "Random Walk of Single Atoms and Small Atom Clusters on Solid Surfaces", *Physica A* **221**, 291-296 (1995).
17. C.M. Wei, J.M. Yuan and T.T. Tsong, "Fractal Dissociation Dynamics of Diatomic Ions in a DC Field", *Physica A* **221**, 297-313 (1995).
18. T-Y Fu, Y-R Tzeng and T.T. Tsong, "Atomic View of the Upward Movement of Stepedge and In-layer Atoms of Ir Surfaces", *Phys. Rev. Lett.* (accepted).
19. J. Florencio, D.M. Ren and T.T. Tsong, "Surface Segregation of Pt-Rh Alloys: An Experimental and Theoretical Study", *Surface Sci.*, **345**, L29-L33 (1996).
20. Y.F. Wang and T.T. Tsong, "Structures of the Atomic Steps of the Si (111) 7×7 Reconstructed Surfaces". *Phys. Rev.* **B** (accepted).
21. T.T. Tsong, "Observing and Manipulating Single Atoms on Solid Surfaces", *Science Monthly* (Taipei, Taiwan), **27**, 112-121 (1996), in Chinese.
22. T.T. Tsong, C.L. Chen, T.Y. Fu and Y.R. Tzeng, "Atom Dynamics on Pt, Ir, and Cu Surfaces, An Experimental Study Using Various Techniques", to be published in *Surface Review and Letters.*

Tzeng, Wen-Jer (曾文哲)

1. D. Chang, S.-C. Lee, and W. -J. Tzeng, "Exact Solution of a Deterministic One Dimensional Sandpile Model", *Phys. Rev.* **E51**, 5515-5519 (1995).

Tzeng, Yi-Harn (曾詣涵)

1. T.T.S. Kuo and Yiharn Tzeng, Long-range correlations in nuclear matter, A review article in the book "Nuclear Method and Nuclear Equation of State", a monograph edited by M. Baldo of Catania, published by World Scientific Singapore (1995).
2. H.G. Miller, Yiharn Tzeng, G.D. Yen, N. Canosa, R. Rossignoli, and A. Plastino, 1995, The Minimum Norm Method for the Determination of the Charge Density from Elastic Electron Scatering Data, Submitted to Z. Phys. (Germany).
3. Y. Tzeng, T.T.S. Kuo, T.-S.H. Lee, 1996, The effect of the △ excitation on the nucleon-nucleon effective interactions in the nuclear shell model, *Physica Scripta* **53** (1996) 300.
4. S.Y.Tsay Tzeng, T.T.S. Kuo, Yiharn Tzeng, H.B. Geyer, and P. Navratil, 1995, On a Green's function method with energy-independent vertex functions, to appear in *Phys. Rev.* **C** (accepted).

5. Y. Tzeng, T.T.S. Kuo, T.-S.H. Lee, 1996, The Delta excitation on the shell-model effective nucleon-nucleon interactions, to appear in *Chinese Journal of Physics.* (accepted).

Wang, Chang-Wan (王建萬)

1. J.G. Lin, C.Y. Huang, L.M. Wang, H.M. Cho, H.C. Yang, H.E. Horng, C.W. Wang, E.K. Lin, Y.C. Yu, "Effect of the irradiation of Au ions on the negative Hall resistivity for YBCO films," *Physica* **C243**, 177 (1995).
2. C.C. Wei and C.W. Wang, "An Atomic Basis of Cancer(V):A New Marker in Animal Tumors," *Suppl. Nutrition* **Vol. 11,** 601 (1995).
3. E.K. Lin, C.W. Wang, Y.C. Yu, W.C. Cheng, C.H. Chang, Y.C. Yang, C.Y. Chang, "Application of PIXE for elemental analysis of ancient Chinese artifacts," *NIM* **B99,** 394(1995).

Wang, Ming-Jer (王明哲)

1. CDF Collaboration, F. Abe,... M.J. Wang et al., "SEARCH FOR NEW GAUGE BOSONS DECAYING INTO DIELECTRONS IN ANTI-P P COLLISIONS AT $S^{1/2}$=1.8-TEV." *Phys. Rev.* **D51**, 949-953 (1995).
2. CDF Collaboration, F. Abe,... M.J. Wang et al., "MEASUREMENT OF W-PHOTON COUPLINGS WITH CDF IN P - ANTI-P COLLISIONS AT $S^{1/2}$=1.8-TEV." *Phys. Rev. Lett.* **74**, 1936-1940 (1995).
3. CDF Collaboration, F. Abe,... M.J. Wang et al., "A DIRECT MEASUREMENT OF THE W BOSON WIDTH GAMMA (W)." *Phys. Rev. Lett.* **74**, 341-345 (1995).
4. CDF Collaboration, F. Abe,... M.J. Wang et al., "THE CHARGE ASYMMETRY IN W BOSON DECAYS PRODUCED IN P ANTI-P COLLISIONS AT $S^{1/2}$=1.8-TEV." *Phys. Rev. Lett.* **74**, 850-854 (1995).
5. CDF Collaboration, F. Abe,... M.J. Wang et al., "LIMITS ON Z - PHOTON COUPLINGS FROM P - ANTI-P INTERACTIONS AT $S^{1/2}$=1.8-TEV." *Phys. Rev. Lett.* **74**, 1941-1945 (1995).
6. CDF Collaboration, F. Abe,... M.J. Wang et al., "SEARCH FOR NEW PARTICLES DECAYING TO DIJETS IN P ANTI-P COLLISIONS AT $S^{1/2}$=1.8-TEV." *Phys. Rev. Lett.*, pp.20 (1995).
7. CDF Collaboration, F. Abe,... M.J. Wang et al., "MEASUREMENT OF THE B(S) MESON LIFETIME." Jan pp.18 (1995).
8. CDF Collaboration, F. Abe,... M.J. Wang et al., "OBSERVATION OF TOP QUARK PRODUCTION IN ANTI-P P COLLISIONS." *Phys. Rev. Lett.* **74**, 2626-2631 (1995).

9. CDF Collaboration, F. Abe,... M.J. Wang et al., "LIMITS ON W W Z AND W W GAMMA COUPLINGS FROM W W AND W Z PRODUCTION IN P ANTI-P COLLISIONS AT $S^{1/2}$=1.8-TEV." *Phys. Rev. Lett.*, pp.16 (1995).
10. CDF Collaboration, F. Abe,... M.J. Wang et al., "MEASUREMENT OF THE W BOSON MASS." *Phys. Rev.* **D**, pp.153 (1995).
11. CDF Collaboration, F. Abe,... M.J. Wang et al., "MEASUREMENT OF THE W BOSON MASS." *Phys. Rev. Lett.*, pp.13 (1995).
12. CDF Collaboration, F. Abe,... M.J. Wang et al., "PROPERTIES OF HIGH MASS MULTI - JET EVENTS AT THE FERMILAB PROTON - ANTI-PROTON COLLIDER." *Phys. Rev. Lett.*, pp.16 (1995).
13. CDF Collaboration, F. Abe,... M.J. Wang et al., "MEASUREMENT OF THE B MESON DIFFERENTIAL CROSS-SECTION, D SIGMA / D P(T), IN P ANTI-P COLLISIONS AT $S^{1/2}$=1.8-TEV." *Phys. Rev. Lett.*, pp.14 (1995).
14. CDF Collaboration, F. Abe,... M.J. Wang et al., "UPSILON PRODUCTION IN P ANTI-P COLLISIONS AT $S^{1/2}$=1.8-TEV." *Phys. Rev. Lett.*, pp.16 (1995).
15. CDF Collaboration, F. Abe,... M.J. Wang et al., "A SEARCH FOR SECOND GENERATION LEPTOQUARKS IN P ANTI-P COLLISIONS AT $S^{1/2}$=1.8-TEV." *Phys. Rev. Lett.*, pp.17 (1995).
16. CDF Collaboration, F. Abe,... M.J. Wang et al., "IDENTIFICATION OF TOP QUARKS AT CDF USING KINEMATIC VARIABLES." *Phys. Rev. Lett.*, pp.14 (1995).
17. CDF Collaboration, F. Abe,... M.J. Wang et al., "A MEASUREMENT OF THE RATIO SIGMA X B (P ANTI-P→W→E NEUTRINO) / SIGMA X B (P ANTI-P →Z0→E E) IN P ANTI-P COLLISIONS AT $S^{1/2}$=1800-GEV." *Phys. Rev.* **D**, pp.102 (1995).
18. CDF Collaboration, F. Abe,... M.J. Wang et al., "STUDY OF T ANTI-T PRODUCTION P ANTI-P COLLISIONS USING TOTAL TRANSVERSE ENERGY." *Phys. Rev. Lett.*, pp.5 (1995).
19. CDF Collaboration, F. Abe,... M.J. Wang et al., "MEASUREMENT OF THE POLARIZATION IN THE DECAYS B(D) → J / PSI K*0 AND B(S) → J / PSI PHI." *Phys. Rev. Lett.*, pp.13 (1995).
20. CDF Collaboration, F. Abe,... M.J. Wang et al., "MEASUREMENT OF CORRELATED MU - ANTI-B JET CROSS-SECTIONS IN P ANTI-P COLLISIONS AT S**(1/2)=1.8-TEV." *Phys. Rev.* **D**, pp.37 (1995).
21. CDF Collaboration, F. Abe,... M.J. Wang et al., "MEASUREMENT OF SIGMA B (W→E NEUTRINO) AND SIGMA B (Z0→E+ E-) IN P ANTI-P COLLISIONS AT S**(1/2)=1.8-TEV." *Phys. Rev.* **D**, pp.10 (1995).

22. CDF Collaboration, F. Abe,... M.J. Wang et al., "MEASUREMENT OF THE MASS OF THE B(S)0 MESON." *Phys. Rev.* **D**, pp.20 (1995).
23. CDF Collaboration, F. Abe,... M.J. Wang et al., "RECONSTRUCTION OF B0→J / PSI K(S)0 AND MEASUREMENT OF RATIOS OF BRANCHING RATIOS INVOLVING B→J / PSI K*." *Phys. Rev. Lett.*, pp.16 (1995).
24. CDF Collaboration, F. Abe,... M.J. Wang et al., "SEARCH FOR GLUINO AND SQUARK CASCADE DECAYS AT THE FERMILAB TEVATRON COLLIDER." *Phys. Rev. Lett.*, pp.11 (1995).

Wang, Wei-Kung (王唯工)

1. W.K. Wang, T.L. Hsu, Z.Y. Huang, Y.Y.Lin Wang, "Collective effect of a Chinese Formular-A Study of Xiao-Jian-Zhong-Tang," *Am. J. Chin. Med.* **XXIII** (paper accepted)(1995).
2. W.K. Wang, T.L. Hsu, H.C. Chang, Y.Y.Lin Wang, "Effect of acupuncture at Tsu San Li (St-36) on the pulse spectrum," *Am. J. Chin. Med.* **XXIII(2)** : 121-130 (1995).
3. W.K. Wang, J. Tsuei, H.C. Chang, T.L. Hsu, Y.Y.Lin Wang," A pulse spectrum analysis of a chemical factory works with abnormal blood tests," *Am. J. Chin. Med.* (paper accepted)(1996).
4. W.K. Wang, T.L. Hsu, Y. Chiang, Y.Y.Lin Wang, "The prandial effect on the pulse spectrum," *Am. J. Chin. Med.* **XXIV(1)** 已接受(1996).
5. Y.Y.Lin Wang, C.C. Chang, J.C. Chen, H. Hsiu, W.K. Wang, "Pressure wave propagation in a distensible tube arterial model with radial dilatation," *IEEE Engineering in Med. & Biol. Magzine* (paper accepted)(1996).

Wei, Ching-Ming (魏金明)

1. Jian-Min Yuan, C.M. Wei and Tien T. Tsong, "Dissociation Dynamics of a Field-Evaporated Diatomic Ion: Rovibrational Coupling, Isotope Effects, and Fractal Field Thresholds." *J. Chem. Phys.* **102(1)**, 170 (1995).
2. P.R. Jeng, I.H. Hong, Y.C. Chou and C.M. Wei, "Direct Atomic Imaging of Ag(100) and Ag(111) by Inverting Quasi-Elastically Scattered Electrons," *Phys. Rev.* **B51**, 13645 (1995).
3. I.H. Hong, S.C. Shyu, Y.C. Chou and C.M. Wei, "Surface Dimer and Bulk Atoms Imaging of Si(001) (2 × 1) Surface by Kikuchi Electron Holography," *Phys. Rev.* **B52**, 16884 (1995).
4. C.M. Wei, J.M. Yuan and T.T. Tsong, "Fractal dissociation dynamics of diatomic ions in a DC field." *Physica* **A221**, 297 (1995).

5. I.H. Hong, D.K. Liao, Y.C. Chou, C.M. Wei and S.Y. Tong, "Direct Observation of Ordered Trimers on Si(111) $\sqrt{3}\times\sqrt{3}$ R30°-Au by Scanned-Energy Glancing-Angle Kikuchi Electron Wavefront Reconstruction," accepted by *Phys. Rev.* **B** (1996, June).

Yao, Yeong-Der (姚永德)

1. W.C. Chang, C.S. Chen and Y.D. Yao, "Magnetic Studies of $(Y_{1-x}Nd_x)(Fe_{1-y}Co_y)_{11.5}Mo_{0.5}N$ Alloy Powders," *J. Alloys & Compounds*, **222**, 87 (1995).
2. Y.Y. Chen, Y.D. Yao, B.T. Lin, C.T. Suo, S.G. Shyu, and H.M. Lin, "Specific Heat of Fine Copper Particles," *NanoStru. Mater.* **6**, 597 (1995).
3. Y.D. Yao, Y.Y. Chen, C.M. Hsu, H.M. Lin, C.Y. Tung, M.F. Tai, D.H. Wang, K.T. Wu, and C.T. Suo, "Thermal and Magnetic Studies of Nanocrystalline Ni," *NanoStru.*, **6**, 933 (1995).
4. D.R. Huang, Y.D. Yao, S.M. Lin, and S.J. Wang, "The Radial Magnetic Coupling Studies between Magnetic Gears," *IEEE Trans. Magn.*, **31**, 3752 (1995).
5. Y.Y. Chen, Y.D. Yao, S.U. Jen, B.T. Lin, H.M. Lin, C.Y. Tung, and S.S. Hsiao, "Magnetic Susceptibility and Low Temperature Specific Heat of Palladium Nanocrystals," *NanoStru. Mater.* **6**, 605 (1995).
6. H.M. Lin, C.M. Hsu, Y.D. Yao, Y.Y. Chen, T.T. Kuan, F.A. Yang, and C.Y. Tung, "Magnetic Study of Both Nitrified and Oxidized Co Particles," *NanoStru. Mater.* **6**, 977 (1995).
7. C.H. Lee, H.J. Lin, K.L. Tsang, J.C.A. Huang, W.T. Yang, Y. Liou, and Y.D. Yao, "X-ray study the Structure of Co/Cr Epitaxial Multilayer," The Third ROC-Japan Joint Seminar on Crystallography, (1995).
8. J.C. Ho, H.H. Hamdeh, Y.Y. Chen, S.H. Lin, Y.D. Yao, R.J. Willey, and S.A. Oliver, "Low Temperature Calorimetric Properties of Zinc Ferrite Nanoparticles," *Phys. Rev. B*, **52**,10122 (1995).
9. Y.Y. Chen, Y.D. Yao, S.S. Hsiao, S.U. Jen, B.T. Lin, H.M. Lin, and C.Y. Tung, "Specific Heat Study of Nanocrystalline Palladium," *Phys. Rev. B*, **52**, 9364 (1995).
10. H.H. Hamdeh, J.C. Ho, S.A. Oliver, R.J. Willey, J. Kramer, Y.Y. Chen, S.H. Lin, Y.D. Yao, M. Daturi, and G. Busca, "Ferrimagnetic Zinc Ferrite Fine Powders," *IEEE Trans. Magn.* **31**, 3808 (1995).
11. J.C.A. Huang, Y.D. Yao, Y. Lieu, S.F. Lee, W.T. Yang, C.P. Chang, S.Y. Liao, and C.H. Lee, "Novel Epitaxial Growth and Magnetotransport Characterization of Single Crystal Co/Cr Superlattices on Mo Buffer layers," *Appl. Surf Sci.*, in press (1995).

12. Y. Liou, J.C.A. Huang, Y.D. Yao, S.F. Lee, W.T. Yang, S.Y. Liao, and C.P. Chang, "Fabrication and Characterization of Magnetic Superlattices- Epitaxial Co/Cr(100) and Co/Cr(211) Superlattices," *IEEE Trans. Magn.*, **31**, 3927 (1995).
13. J.C.A. Huang, Y. Liou, Y.D. Yao, W.T. Yang, C.P. Chang, and S.Y. Liao, and Y.M. Hu, "Large Crystalline-induced Magnetic Anisotropy and Field- direction-dependent Magnetoresistance in Co(1100)/Cr(211) Superlattices," *Phys. Rev. B*, **52**, R13110 (1995).
14. M.S. Lin, J.H. Shieh, Y.B. You, Y.Y. Hsu, C.W. Chen, S.H. Lin, Y.D. Yao, Y.Y. Chen, J.C. Ho and H.C. Ku, "Coexistence of Superconductivity with High T_N Antiferromagnetic Order in $D_yNi_2B_2C$," *Physica C*, **249**, 403 (1995).
15. I. Klik, Y.D. Yao, and C.R. Chang, "Non-Markovian Thermal Relaxation at Elevated Temperatures," *Phys. Rev. E*, **52**, 6892 (1995).
16. J.C. Ho, H.H. Hamdeh, S.H. Lin, Y.Y. Chen, Y.D. Yao, and R.J. Willey, "A Comparative Study of Low Temperature Heat Capacities between Zinc Ferrite and magnesium Ferrite Nanoparticles," *Chin. J. Phys.*, **33**, 707 (1995).
17. H.Y. Chen, Y.D. Yao, H.W. Yu, L.M. Wang, H.C. Yang, and H.E. Horng, "Effect of Transport Current Density on the Longitudinal and Hall Resistivities in the Mixed State of YBCO Films," *Chin. J. Phys.*, in press (1996).
18. I. Klik, Y.D. Yao, and C.R. Chang, "Multilevel Master Equation for Bicrystal Clusters," *J. Appl. Phys.*, in press (1996).
19. L.H. Chen, S. Jin, T.H. Tiefel, S.Y. Liao, and Y.D. Yao, "Giant Magneto-esistance in Melt-Spun $Cu_{80}Ni_{10}Fe_{10}$ Ribbons," *J. Appl. Phys.*, in press (1996).
20. Y.D. Yao, Y. Liou, J.C.A. Huang, S.Y. Liao, I. Klik, W.T. Yang, C.P. Chang, and C.K. Lo, "Enhancement of Magnetoresistance in Co(1100)/Cr(211) Bilayered Films on MgO(110)," *J. Appl. Phys.*, in press (1996).
21. Y. Liou, J.C.A. Huang, Y.D. Yao, W.T. Yang, S.Y. Liao, and C.P. Chang, "Influence of the Crystal Structure on the Magnetic Property of Co/Cr Superlattices," *J. Appl. Phys.*, in press (1996).
22. Y.D. Yao, Y.Y. Chen, M.F. Tai, D.H. Wang, and H.M. Lin, "Magnetic Anisotropy Effect in Nano-Cluster Nickel Particles," *Mat. Sci. Eng. A*, in press (1996).
23. Y.D. Yao, D.R. Huang, S.M. Lin, and S.J. Wang, "Theoretical Computations of the Magnetic Coupling between Magnetic Gears," *IEEE Trans. Magn.*, in press, May (1996).
24. J.C.A. Huang, F.C. Tang, W.W. Fang, R.L. Liu, Y.M. Hu, C.K. Lo, Y. Liou, Y.D. Yao, W.T. Yang, C.P. Chang and S.Y. Liao, "Studies of Magnetic Anisotropies of Co(1100)/Cr(211) and Co(1120)/Cr(100) Multilayers," *J. Appl. Phys.*, accepted (1996).

25. I.J. Jang, Y.D. Yao, I. Klik, H.E. Horng, and H.C. Yang, "Low Temperature Magnetization of a Ferrofluid of Magnetite Coated with Polystyrene," *Phys. Stat. Sol. (a)*, **Vol. 153**, No. 2, in press (1996).
26. C.K. Lo, Y. Liou, C.P. Chang, I. Klik, Y.D. Yao, and J.C.A. Huang, "Structure and Magnetic Anisotropy of Epitaxial fcc-Co(110) and hcp-Co (1100) Films," *Appl. Phys. Lett.*, in press, April (1996).
27. S.N. Bai, Y.Y. Chen, Y.D. Yao, S.Y. Liao, L.H. Chen, S.H. Lin, and Y. Liou, "Transport Properties of $La_{0.67}Ca_{0.33}MnO_3$," *Chin. J. Phys.*, in press (1996).
28. L. S. Hsu, C.K. Lo, Y.D. Yao,and C.S. Yang, "SIMS and MOKE Studies of Fe/Gd multilayers on Si," *Proc. MRS 1996 Spring Meeting* in press (1996).

Yen, Granddon Dee-Yo (顏迪佑)

1. R.M. Adam, A.J.O. Gavin, H.G. Miller, K.V. Shitikova and G.D. Yen, "An estimate of center of mass effects in quark potential models", *Int. J. Mod. Phys.* **E4**, 145-152 (1995).
2. B. Harvey, K. Shitikova and G.D. Yen, "The effect of projectile shape on cross sections and momentum distribution of fragments from heavy-ion reactions", Proceedings of the 11th Winter Workshop on Nuclear Dynamics, Key West, Florida, January, (1995).
3. H.G. Miller, Y. Tzeng, G.D. Yen, N. Canosa, R. Rossignoli and A. Plastino, "The minimum norm method for the determination of the charge density from elastic electron scattering data", *Z. Phys.* **A**, (accepted, 1996).
4. G.D. Yen, H.G. Miller, N.J. Davidson, "The liquid-to-gas transition of nuclear matter in a semi-empirical approach", (submitted).
5. G.D. Yen, T. Gutsche, A. Fäßler, S.-N. Yang, "Nucleonic strangeness and $p\bar{p}$ annihilation branching ratio", (submitted).

Yeh, Ping (葉 平)

1. F. Abe, ...P. Yeh et al. (CDF collaboration), "The Charge Asymmetry in W Boson Decays Produced in $p\bar{p}$ Collisions at $\sqrt{s}$=1.8 TeV," *Phys. Rev. Lett.* **74**, 850-854 (1995).
2. F. Abe, ...P. Yeh et al. (CDF collaboration), "Measurement of W-Photon Couplings in $p-\bar{p}$ Collisions at $\sqrt{s}$=1.8 TeV," *Phys. Rev. Lett.* **74**, 1936-1940 (1995).
3. F. Abe, ...P. Yeh et al. (CDF collaboration), "Limits on Z-Photon Couplings from P-$\bar{p}$ Interactions at $\sqrt{s}$=1.8 TeV," *Phys. Rev. Lett.* **74**, 1941-1945 (1995).
4. F. Abe, ...P. Yeh et al. (CDF collaboration), "Observation of Top Quark Production in $\bar{p}p$ Collisions with the Collider Detector at Fermilab," *Phys. Rev. Lett.* **74**, 2626-2631 (1995).

5. F. Abe, ...P. Yeh et al. (CDF collaboration), "Search for Charged Bosons Heavier than the W in $p\bar{p}$ Collisions at $\sqrt{s}$=1800 GeV," *Phys. Rev. Lett.* **74**, 2900-2904 (1995).
6. F. Abe, ...P. Yeh et al. (CDF collaboration), "Search for New Particles Decaying to Dijets in $p\bar{p}$ Collisions at $\sqrt{s}$=1.8 TeV," *Phys. Rev. Lett.* **74**, 3538-3543 (1995).
7. F. Abe, ...P. Yeh et al. (CDF collaboration), "Measurement of the B_s Meson Life-time," *Phys. Rev. Lett.* **74**, 4988-4992 (1995).
8. F. Abe, ...P. Yeh et al. (CDF collaboration), "Measurement of the W Boson Mass," *Phys. Rev. Lett.* **75**, 11-16 (1995).
9. F. Abe, ...P. Yeh et al. (CDF collaboration), "Properties of High Mass Multijet Events at the Fermilab Proton-Antiproton Collider," *Phys. Rev. Lett.* **75**, 608-612 (1995).
10. F. Abe, ...P. Yeh et al. (CDF collaboration), "Search for Second Generation Lepto-quarks in $p\bar{p}$ Collisions at $\sqrt{s}$=1.8 TeV," *Phys. Rev. Lett.* **75**, 1012-1016 (1995).
11. F. Abe, ...P. Yeh et al. (CDF collaboration), "Limits on WWZ and WWγ Couplings from WW and WZ Production in $p\bar{p}$ Collisions at $\sqrt{s}$=1.8 TeV," *Phys. Rev. Lett.* **75**, 1017-1022 (1995).
12. F. Abe, ...P. Yeh et al. (CDF collaboration), "Measurement of the B Meson Differential Cross Section $d\sigma/dp_T$ in $p\bar{p}$ Collisions at $\sqrt{s}$=1.8 TeV," *Phys. Rev. Lett.* **75**, 1451-1455 (1995).
13. F. Abe, ...P. Yeh et al. (CDF collaboration), "Measurement of the Polarization in the Decays $B_D \to J/\psi K^{*0}$ and $B_S \to J/\psi\phi$," *Phys. Rev. Lett.* **75**, 3068 (1995).
14. F. Abe, ...P. Yeh et al. (CDF collaboration), "Study of $t\bar{t}$ Production $p\bar{p}$ Collisions Using Total Transverse Energy," *Phys. Rev. Lett.* **75**, 3997 (1995).
15. F. Abe, ...P. Yeh et al. (CDF collaboration), "Upsilon Production in $p\bar{p}$ Collisions at $\sqrt{s}$=1.8 TeV," *Phys. Rev. Lett.* **75**, 4358 (1995).
16. F. Abe, ...P. Yeh et al. (CDF collaboration), "Search for New Gauge Bosons Decaying into Dielectrons in $\bar{p}p$ Collisions at $\sqrt{s}$=1.8 TeV," *Phys. Rev.* D **51**, 949-953 (1995).
17. F. Abe, ...P. Yeh et al. (CDF collaboration), "Kinematic Evidence for Top Quark Pair Production in W + Multijet Events in $p\bar{p}$ Collisions at $\sqrt{s}$=1.8 TeV," *Phys. Rev.* D **51**, 4623-4637 (1995).
18. F. Abe, ...P. Yeh et al. (CDF collaboration), "Identification of Top Quarks Using Kinematic Variables," *Phys. Rev.* D **52**, 2605-2609 (1995).
19. F. Abe, ...P. Yeh et al. (CDF collaboration), "Measurement of the Ratio $\sigma B(p\bar{p} \to W \to e\nu)/\sigma B(p\bar{p} \to Z^0 \to ee)$in $p\bar{p}$ collisions at $\sqrt{s}$=1800 GeV," *Phys. Rev.* D **52**, 2624-2655 (1995).

20. F. Abe, ...P. Yeh et al. (CDF collaboration), "Measurement of the W Boson Mass," *Phys. Rev.* D **52**, 4784-4827 (1995).

Yu, Hoi-Lai (余海禮)

1. Hsiang-nan Li, Hoi-Lai Yu "Extraction of V_{ub} from Decay $B \to \pi l \nu$," *Phys. Rev. Lett.* **74**, 4388-4391 (1995).
2. H.N. Li and Hoi-Lai Yu "PQCD Analysis of Exclusive Charmless B Decay Spectra," *Phys. Lett.* **B353**, 301-305 (1995).
3. Hsiang-nan Li, Hoi-Lai Yu "Perturbative QCD analysis of B Meson Decays," to appear in *Phys. Rev.* **D** (1996).
4. H.N. Li and Hoi-Lai Yu "PQCD Analysis of Inclusive Semileptonic Decays of B Mesons," to appear in *Phys. Rev.* **D**.
5. T.M. Yan, H.Y. Cheng and Hoi-Lai Yu "CKM Favored Semileptonic Decays of Heavy Hadrons at Zero Recoil" submitted to *Phys. Rev.* **D**.

Yu, Yueh-Chung (余岳仲)

1. J.G. Lin, C.Y. Huang, L.M. Wang, H.M. Cho, H.C. Yang, H.E. Horng, C.W. Wang, E.K. Lin, and Y.C. Yu, "Effect of the Irradiation of Au Ions on the Negative Hall Resistivity for YBCO Films," *Physica* **C243**, 177 (1995).
2. E.K. Lin, C.W. Wang, Y.C. Yu, W.C. Cheng, C.H. Chang, Y.C. Yang, and C.Y. Chang, "Application of PIXE for Elemental Analysis of Ancient Chinese Artifacts", *Nucl. Instr. Methods* **B99**, 394 (1995).
3. Y.C. Yu, H.L. Sun, J.L. Duggan, F.D. McDaniel, J.Y. Jin, and G. Lapicki, "Charge-state Dependence of M-shell X-ray Production in $_{67}$Ho by 2-12 MeV Carbon Ions", *Phys. Rev.* **A52**, 3836 (1995).
4. H.L. Sun, Y.C. Yu, E.K. Lin, C.W. Wang, J.L. Duggan, A. Azordegan, and G. Lapicki, "Charge-state Dependence of K-shell X-ray Production in Aluminum by 1-12 MeV Carbon Ions", to be published in *Phys. Rev.* **A** (1996).
5. H.Y. Yao, E.K. Lin, C.W. Wang, Y.C. Yu, C.H. Chang, Y.C. Yang and C.Y. Chang, "A PIXE of Vitrification of Carnation in Vitro Culture", to be published in *Nucl. Instr. Methods* (1996).

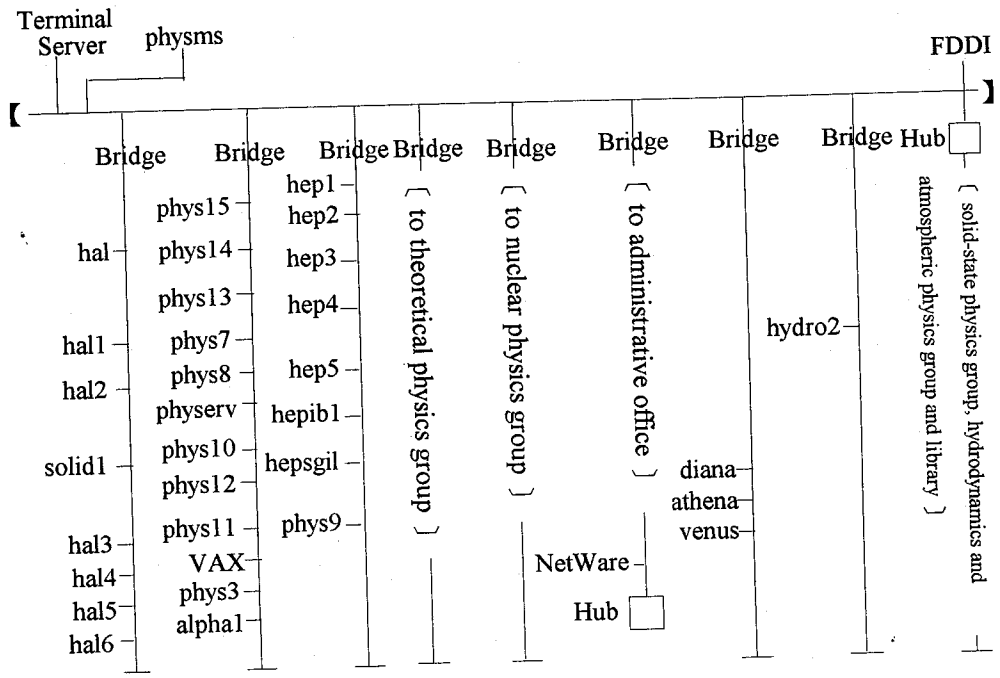
V

Supporting Facilities

Computing Facilities

After years of development and devotion by a few colleagues, starting wit a few desktop computers, our institute now enjoys the services of a well equipped computer room with knowledgeable staff. The primary tasks of th computer room are four-fold: first, to provide and upgrade our high-speed wor stations to meet our researchers' computational needs, such as compute simulations, numerical analysis and symbolic manipulations; second, to strive t maintain the connectivity and conductivity of our local Ethernet network, so tha speedy access to the outside world through the Internet and e-mailing are possibl third, to build and maintain automation in the administrative office and th library; and fourth, to provide general hardware and software consultations to ou colleagues as well as technical assistances in network-related porblem Currently, the computer room hosts a high-speed 3-cpu AlphaServer (model 210 4/275), a VAX 3100, and two clusters of work stations: one for the seven IB RISC-6000 (three 3CT's, one 550, 370, 350 and 320), and another for the twelv SUN Sparc stations. Several Pentium-class and MacIntosh personal computer are also provided. Hubs and bridges connect all these machines as well as eac office and laboratory to the backbone of our network, which in turn is linked t Computer Center of the Academia Sinica by optical cables, thus enabling fas access to other institutes and institutions. The computer room also has a wid range of peripheral devices, such as laser printers, scanner, tape and optical dis drives, and an adequate selections of original softwares.

Ethernet Configuration 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 1997, the library has a total budget of NT8.5million; 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 years, 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 the 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 the 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 information systems around the world.

(b) PINET (The Physics Information Network 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.

(c) ITIS Information System

This information system is developed by the Industrial Technology Research Institute of the R.O.C.. It is free at the present moment.

(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 Abstract, 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.

Technical Workshops

A technical group has been established since 1993 to manage the technical personnel and facilities for supporting the research activities in our institute. The works of the technical group includes:1. fabrication and repairing of electronic equipment, 2. fabrication and assembly of mechanical parts, 3.making sample cells and testing tools, 4. support of vacuum facilities, 5. management and supplies of gases and liquids, 6. operation and maintenance of complex and specialized research facilities, 7. management and handling of radioactive materials and 8. technical support of power supplies and communication facilities. The technical group consists of three workshops: electronics workshop, mechanical workshop and electrical power workshop.

1. *Electronics Workshop:*

The electronic workshop provides services for the whole institute on design, fabrication and repairing works related to electronic parts and equipment. We experience difficulties in maintaining and repairing because of incomplete documentation and supplies of rare parts. To improve the situation, we are going to collect and to categorize related documentation and data books. From these materials we plan to build a database and to stock rare but important parts and devices. If necessary we may ask our colleague to buy these parts and devices from abroad directly. We hope that we can maintain an adequate supply of parts and that an up-to-date inventory will be available for our colleagues. In 1995, we purchased a precision LCR meter and more equipment will be purchased next year. Table 1 is a list of our equipment. Table 2 lists the research facilities that has been repaired and maintained. Table 3 shows the equipments that have been designed in the workshop.

2. *Mechanical Workshop:*

It has been five years since the mechanical workshop was established. To meet the increasing need of our institute, we expanded the number of technical staff in the workshop by hiring a work-student. We also installed several new equipment: a line saw, a milling machine and a cutting machine. Next year we hope to purchase a lathe and a folding machine. In the past five years,we designed and made numerous parts and assemblies for our research staffs. We also helped to solve problems in various laboratories in our institute. At present, we are upgrading our technical support for vacuum systems. These include design, fabrication and assembly of vacuum chamber, maintenance and repair works of vacuum pumps. We also make some effort to stock commonly used vacuum parts and materials. To meet the need of our research staff, we make

available various materials such as Ta, Ti, Al_2O_3 for used in UHF systems. The staff in the mechanical workshop are always service-oriented and work under safety-first guidelines. We hope that we can suppont our research staff and improve ourselves towards the goal of high precision and high efficiency.

3. *Electrical Workshop:*

Our duties include regular maintenance of our electrical power system, fire facilities, central air conditioning, communication systems (including telephone network, fax, short wave and radio wave systems), illuminating system, audio-visual equipment. In conferences and seminars, it is our job to make audio and video tapes records if needed. We also help our colleagues to improve the quality of the electrical power, grounding facilities and peripherals in their laboratories. Besides, we are also responsible for the detection and safety precaution of radioactive materials. We also keep track of dosage badges and handling of radioactive waste.

In summary, the work of the technical group is heavy and high-tech related. We are still evolving towards maturity and the main hurdle is lack of man power. 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 staffs. In the meantime, we are trying to train our technical personnel by giving them chances to practice in famous laboratories abroad.

Table 1

Electronic Equipment：

Equipment	Model
Curve tracer	Tektronix 571
Multimeter	HP 3458A
LCR Meter	HP 4284A
Waveform Analyzer	SENCORE SC61
Power Supply	GW 3615 GW 1830 GW 3030

Table 2

Maintenance and Repaired Works：

Equipment	User
1.Feedback Circuit	Ing-Shouh Hwang
2.High Voltage Supply	Ing-Shouh Hwang
3.Photon Counter	Wei-Kung Wang
4.SPM Signal Connector	Yeong-Der Yao
5.SPM Caser Pre-amplifier	Yeong-Der Yao
6.DC Power Supply for Accelerator	Chang-Wan Wang

Table 3

Designed and Fabrication：

Equipment	User
High Speed Power Supply	Tien-Tzou Tsong
Precision AC Power Supply	Tien-Tzou Tsong
High Voltage Power Supply	Ing-Shouh Hwang
Optical Control Switching Circuit	Ki-Wing To
Coil Power Supply	Chi-Keung Chan
Lemo Signal Line	Ge-Cheng Kiang
120 Channel Laser Diode Testing Device	Ming-Lee Chu
Signal Cables	Chang-Wan Wang
Printed Circuit Board	Ping-Kun Teng

Table 4：

Machinery：

Equipment	Quantity	Equipment	Quantity
Lathe Machine	2	Portable Grinding Machine	2
Wire Sawing Machine	1	Portable Electrial Drilling Machine	1
Vertical Wire Sawing Machine	1	Portable Electrical Sawing Machine	1
Drilling Machine	1	Delicate Platform	1
Drilling and Milling Machine	1	Height Gauge	1
Electric Welding Machine	1	Highly Delicate Measuring Table	1
Abrasive Machine	1	Computer 586	1
Abrasive Cut-off Machine	1	Milling Machine	1
Electric arc Welding Machine	1	High Speed Drilling Machine	1
Ion Cutter	1	Wood Sawing Machine	1
Lathe Machine	1	Vertical Drilling Machine	1
Surface Grinding Machine	1	Shearing Machine	1
Slant Machine	1		

Table 5

Vacuum Parts：

Gasket	Blank		Bellow	Oring	Vent Valve	Four way	Three way	90 ELBOW
16CF	NW16	16CF	NW25	U.S.A.	NW-16	NW-50	35CF	NW25
35CF	NW25	35CF	NW50	Parker	NW-40	35CF	NW25	
63CF	NW40	63CF		Viton				
100CF	NW50	100CF						
160CF		160CF						

VI

Academic Activities

Attendance in International Conferences

中研院物理所八十五年度出席國際會議表

(1995年7月~1996年6月)

會議名稱	會期	舉辦地點	出席人員	經費來源
第六屆國際重子會議	07/03/95-07/15/95	英國曼徹斯特	王正祥	物理所
凝態物理高登會議-Type II 和相關系統之非平衡觀念	07/07/95-07/31/95	美國新罕布夏州	施霧克	自理
第九屆層流/紊流數值方法國際會議	07/09/95-07/20/95	美國亞特蘭大	簡來成	本所補助部份經費
第十屆電磁場理論計算研討會	07/10/95-07/17/95	德國柏林市	姚永德	國科會
第九屆國際血液流變學及第二屆國際血液臨床流變學	07/10/95-08/10/95	美國 Big Sky	王唯工	物理所
第十六屆國際在固體中的原子碰撞會議	07/15/95-07/23/95	奧地利林茲市	余岳仲	國科會、物理所
第八屆國際掃描穿隧顯微術會議	07/22/95-07/29/95	美國科羅拉多州市	張嘉升	國科會
國際複合液體與蒙地卡羅法會議及第十九屆國際統計物理會議	07/22/95-08/05/95	香港及廈門	陳志強	物理所
第十九屆IUPAP國際統計物理會議及複雜流體蒙地卡羅法	07/24/95-08/05/95	中國大陸廈門及香港	梁鈞泰	國科會、物理所
非穩態、機械合成合金及微晶材料之國際會議	07/24/95-07/30/95	加拿大魁北克	任盛源	物理所
第十九屆統計物理會議-複雜流體與蒙地卡羅方法	07/25/95-07/29/95	中國大陸香港	曾龍	物理所

會議名稱	會期	舉辦地點	出席人員	經費來源
第十九屆國際統計物理會議及國際複合液體及蒙地卡羅法會議	07/25/95-08/06/95	中國大陸廈門及香港	杜其永	本所補助部份經費
第一屆國際華人物理學大會	07/25/95-08/10/95	大陸汕頭	楊維邦	物理所
第十屆國際傅立葉轉換光譜會議	08/03/95-09/03/95	匈牙利布達佩斯市	何侗民	國科會
第十七屆國際輕光子會議	08/04/95-08/16/95	中國大陸北京	李世昌 余海禮 鄭海揚	本所補助部份經費
第一屆國際華人物理學大會及國際場發射研討會	08/04/95-08/19/95	大陸及美國汕頭及Madision	鄭天佐	主題計劃
第一屆國際華人物理學大會	08/04/95-08/09/95	大陸汕頭	李世昌	本所補助部份經費
第一屆國際華人物理學大會	08/05/95-08/12/95	中國大陸汕頭	謝雲生	物理所
一九九五年臺灣國際超導會議	08/07/95-08/11/95	中華民國花蓮	姚永德 朱經武	物理所
第十七屆輕子-光子國際會議	08/09/95-08/21/95	中國大陸北京	鄧炳坤	本所補助部份經費
國際原子核物理會議	08/20/95-08/31/95	中國大陸北平	王建萬	國科會
國際原子核物理會議	08/20/95-09/10/95	中國大陸北京	林爾康	本所補助部份經費
國際原子核物理會議	08/21/95-08/30/95	中國大陸北京	曾詣涵	本所補助部份經費
反粒子質譜儀國際合作計劃組織會議	09/10/95-09/13/95	日內瓦CERN	李世昌	物理所
反物質搜尋實驗之工程研討會	08/22/95-08/06/95	瑞士日內瓦	朱明禮	物理所

會議名稱	會期	舉辦地點	出席人員	經費來源
反物質搜尋實驗之工程研討會	08/22/95-08/06/95	瑞士日內瓦	朱明禮	物理所
第九屆液態及非晶態金屬國際會議	08/27/95-09/30/95	美國芝加哥市	任盛源	國科會
亞太理論物中心成立籌備會議	08/27/95-08/29/95	韓國漢城	鄭天佐	物理所
國際超微粒粒狀物質特性研討會	09/17/95-09/24/95	日本仙台	姚永德	國科會
第十屆高能物理及量子場論國際會議	09/17/95-09/28/95	蘇俄莫斯科	撒馬羅克夫	物理所
第十三回PIXE研討會	09/19/95-09/27/95	日本東京	仲國慶	物理所、自理
第十三屆國際眞空大會暨第九屆國際固體表會單一表面原子的隧道效應	09/23/95-10/05/95	日本橫濱及Kanazawa	胡宇光	國科會、自理
第四屆國際海岸及港口工程研討會	09/23/95-10/04/95	巴西里約熱內盧	蕭葆義	物理所
第九屆固體表面會議	09/24/95-09/29/95	日本橫濱	鄭天佐	主題計劃
第十三屆國際眞空大會暨第九屆國際固體表面單一表面原子的隧道效應	09/24/95-10/05/95	日本橫濱	魏金明	國科會、自理
第九屆固體表面會議衛星會議-單原子穿隧特性研討會	10/01/95-10/04/95	日本金澤	鄭天佐	主題計劃
美國眞空學會年會	10/16/95-10/21/95	美國明尼蘇達州聖保羅市	鄭天佐	應用科學及工程中心
標準模型之尖端物理	10/22/95-10/24/95	越南胡志明市	李世昌	主題計劃

會議名稱	會期	舉辦地點	出席人員	經費來源
第四十屆磁性及磁性材料研討會	11/04/95-11/14/95	美國費城	姚永德	主題計劃
第四十屆磁性與磁材料年會	11/05/95-11/10/95	美國費城	劉　鏞	物理所
第一屆東和大學統計物理會議	11/06/95-11/11/95	日本九州福岡	陳昭安	國科會
第一屆東和大學統計物理會議	11/06/95-11/12/95	日本福岡	梁鈞泰	物理所
第一屆東和大學統計物理會議	11/06/95-11/11/95	日本九州福岡	胡進錕	國科會
宇宙常數與宇宙的演化國際會議	11/06/95-11/11/95	日本東京	吳建宏	國科會
第一屆東和大學統計物理會議	11/06/95-11/11/95	日本九州福岡	陳志強	國科會
第四十八屆美國物理學會流體力學年會	11/18/95-11/23/95	美國加州	黃美嬌	物理所
材料研究學會一九九五年秋際年會	11/25/95-12/03/95	美國麻州波士頓市	黃英碩	國科會
太平洋凝體物質會議	12/01/95-12/05/95	韓國漢城	胡進錕	自　理
反物質質譜儀技術協調會議	12/05/95-12/07/95	美國休斯頓太空總署	李世昌	國科會
第二十屆國際紅外線及毫波會議	12/09/95-12/17/95	美國佛州奧蘭多市	何侗民	物理所
電子繞射與表面目睹的研究講習會	01/02/96-01/10/96	美國亞利桑那州	魏金明	本所補助部份經費
新超導微粒穿越輻射偵測影像器之研究會議	02/08/96-01/12/96	法國巴黎	李世昌	主題計劃

會議名稱	會期	舉辦地點	出席人員	經費來源
第七屆電磁場計算工程研討會	03/16/96-03/22/96	日本Okayama	姚永德	物理所、主題計劃
一九九六年國際磁學研討會	04/07/96-04/15/96	美國西雅圖	姚永德	物理所、主題計劃
一九九六年國際磁學研討會	04/08/96-04/13/96	美國西雅圖	Ivo Klik	主題計劃
一九九六年國際磁學研討會	04/08/96-04/13/96	美國西雅圖	盧志權	主題計劃
反物質質譜儀國際合作組織會議	02/29/96-03/04/96	美國甘迺迪太空中心	李世昌	物理所
第一屆亞洲未來加速器委員會	04/08/96-04/09/96	韓國浦頭	李世昌	本院
反物質質譜儀(AMS)實驗組會議	05/14/96-05/21/96	瑞士CERN	李世昌	本院
第十四屆粒子與原子核物理國際會議	05/22/96-05/30/96	美國Virginia	曾詣涵	物理所
第六屆國際海域與極地工程研討會	05/26/96-05/31/96	美國加州洛杉磯	鄭天佐	主題計劃

Institute Sponsored Meetings

中央研究院統計物理與數值模擬第三次研討會

非線性動力學與理論生物物理

時間：1995年7月15日

地點：中央研究院物理所一樓演講室

09:00 - 09:30	報到及登記中午便當
09:30 - 10:30	袁建民博士(Drexel大學) *Dissociation Dynamics of a Field-Evaporated Diatomic Ion：Isotope Effects, Rotational-Vibrational Coupling, and fractal Behavior.*
10:30 - 10:50	休 息
10:50 - 11:50	彭仲康博士(哈佛大學) *Application of Statistical Physics in Molecular Biology.*
11:50 - 13:00	午 餐
13:30 - 14:30	袁建民博士(哈佛大學) *Chemical Bonding, Non-adiabaticity, and Periodic Orbits of Hydrogen Molecular Ion.*
14:30 - 14:50	休 息
14:50 - 15:50	彭仲康博士(哈佛大學) *Application of Statistical Physics in Physiological Control.*
15:50 - 16:10	休 息
16:10 - 17:10	蕭又新博士(台大物理系) *Nonlinear Transport Properties of n-type GaAs at Room Temperatures.*

Program for StatPhys-Taipei-1995

Nonlinear and Random Processes

18 - 24 July 1995, Academia Sinica, Taipei, Taiwan

7/19/95 (Wednesday)

08:00 - 09:00		Registration
09:00 - 09:45		Opening and Welcome Addresses *C.-K. Hu (Symposium Chairman)* *Y.-T. Lee (President, Academia Sinica)* *G. Marx (Vice President, IUPAP)* *E. Brezin (Chairman, IUPAP Commision on Stat. Phys.)* *M. K. Wu (President, Physical Society Located in Taipei)*
09:45 - 10:30	**A1**	Intramolecular Energy Transfer and the Statistical Theory of Unimolecular Dissociation *Y.-T. Lee (Academia Sinica)*
10:30 - 11:00		Coffee break and Taking group pictures
11:00 - 11:40	**A2**	Complex Dynamics in Chemical Reactions *S. Havlin (Bar-Ilan Univ.)*
11:40 - 12:20	**A3**	Femtosecond Processes and Ultrafast Biological Electron Transfer *Sheng-Hsien Lin (Academia Sinica)*
12:20 - 14:00		Lunch break
14:00 - 14:45	**B1**	The Emergence of Free Energy *George Marx (Eotvos Univ.)*
14:45 - 15:30	**B2**	Correlations in DisorderedSystems *Edouard Brezin (Ecole Normale Superieure)*
15:30 - 16:00		Coffee break
16:00 - 16:30	**B3**	Conformal Invariance in Two-Dimensional Percolation *Yvan Saint-Aubin (Univ. of Montreal)*
16:30 - 17:00	**B4**	Crossover from Isotropic to Directed Percolation *Erwin A. Frey (TU Munich)*

17:00 - 17:15		Coffee break
17:15 - 18:45	**C1-C6**	Short Talks
19:00 - 20:30		Dinner

7/20/95 (Thursday)

09:00 - 09:50	**D1**	Modelization of Fracture *H. J. Herrmann (Ecole Superieure de Phys.et Chimie)*
09:50 - 10:20	**D2**	Models of Fracture Propagation *E. S. C. Ching (Chinese Univ. of Hong Kong)*
10:20 - 10:50		Coffee break
10:50 - 11:35	**D3**	Dynamical models of Earthquakes *Hiizu Nakanishi (Keio Univ.)*
11:35 - 12:20	**D4**	Phase Transformation and Deep Focus Earthquakes *Lin-Gun Liu (Academia Sinica)*
12:20 - 14:00	**P1**	Lunch break and Poster Section
14:00 - 14:45	**E1**	Statistical Models for Studying DNA Sequence Evolution *Wen-Hsiung Li (Univ. of Texas)*
14:45 - 15:30	**E2**	The Origin of Biological Order: Genes, Epigenetic Self Organization and Natural Selection *Ming-Ta Hsu (Academia Sinica)*
15:30 - 16:00		Coffee break
16:00 - 16:30	**E3**	Evolution as a Self-Organized Critical Phenomenon *Kim Sneppen (Niels Bohr Inst.)*
16:30 - 17:00	**E4**	Statistical Properties of DNA Sequences *C.-K. Peng (Harvard Univ.)*
17:00 - 17:15		Coffee break
17:15 - 18:45	**F1-F6**	Short Talks
19:00 - 20:30		Dinner

7/21/95 (Friday)

09:00 - 09:50	**G1**	Statistical Mechanics of Protein Folding and Evolution *E. I. Shakhnovich (Harvard Univ.)*
09:50 - 10:20	**G2**	Simulated Annealing as a Tool for Ab Initio Phasing in X-Ray Crystallography *Wu-Pei Su (Univ. of Houston)*
10:20 - 10:50		Coffee break
10:50 - 12:20	**H1-H6**	Short Talks
12:20 - 13:00		Lunch break
13:00 - 19:30		Visit Taipei City & National Palace Museum

7/22/95 (Saturday)

09:00 - 09:40	**I1**	Anomalous Diffusion: Its Statistical-Mechanical Foundation *C. Tsallis (Centro Brasileiro de Pesquisas Fisicas)*
09:40 - 10:20	**I2**	Random Walk of Single Atoms and Small Atom-Clusters on Solid Surfaces *T.-T. Tsong (Academia Sinica)*
10:20 - 10:50		Coffee break
10:50 - 12:20	**J1-J6**	Short Talks
12:20 - 14:00	**P2**	Lunch break and Poster Section
14:00 - 14:30	**K1**	Control Patterns and Chaos in Spatio-Temporal Systems *G. Hu (Beijing Normal Univ.)*
14:30 - 15:00	**K2**	Fractals and Chaos in Atoms and Molecules *J.-M. Yuan (Drexel Univ.)*
15:00 - 15:30	**K3**	Time Evolution of Three-Dimensional Cellular Systems: Computer Modelling Based on Vertex-type Models *K. Fuchizaki (Kyashu Univ.)*
15:30 - 16:00		Coffee break

16:00 - 18:00	**L1-L8**	Short Talks
18:15 - 19:30		Dinner

7/23/95 (Sunday)

		Tours and Free Discussion

7/24/95 (Monday)

08:20 - 09:30		Bus takes participants from Academia Sinica to National Taiwan Normal Univ.
09:30 - 10:00		Opening Section for Teaching Statistical Physics
10:00 - 10:50	**M1**	Disorder in the School *George Marx (Eotvos Univ.)*
10:50 - 11:20		Coffee break
11:20 - 12:10	**M2**	A Multimedia Introduction to Chaos *Yih-Yuh Chen (Taiwan Univ.)*
12:10 - 13:30		Lunch break
13:30 -		Bus takes some foreign participants from National Taiwan Normal Univ. to CKS International Airport

The 4th. Academia Sinica Workshop on Statistical Physics and Numerical Simulations: Numerical Approach to Critical Phenomena

中央研究院統計物理與數值模擬第四次研討會

以數值方法研究臨屆現像

December 12~14, 1995, Taipei, Taiwan

12/12/95(Tuesday)

09:00 - 09:30	Registration
09:30 - 10:30	F. Y. Wu (Northeastern University): *One-dimensional quantum spin chains: Exact and numerical solutions*
10:30 - 10:50	Break
10:50 - 11:50	Naoki Kawashima (Toho University, Japan) *Cluster Algorithm for quantum systems (1)*
11:50 - 13:30	Lunch Break
13:30 - 14:30	Naoki Kawashima (Toho University, Japan) *Cluster Algorithm for quantum systems (2)*
14:30 - 14:50	Break
14:50 - 15:50	Chin-Kun Hu (Academia Sinica, Taipei) *Histogram Monte Carlo simulation methods*
15:50 - 16:10	Break
16:10 - 17:10	Naoki Kawashima (Toho University, Japan) *Cluster Algorithm for quantum systems (3)*
18:00 - 19:00	Dinner

12/13/95(Wednesday)

09:30 - 10:30	Y. C. Tsai (Academia Sinica, Taipei) *Crystalline Surface Growing in Random Systems*
10:30 - 10:50	Break
11:10 - 12:00	C.-M. Chen (Physics Department, The University of Michigan) *Equilibrium and Non-equilibrium Statistical Mechanics of Membrens, Liquid Crystal Films, and Other Layered Structures*

11:50 - 13:30	Lunch Break
13:30 - 14:30	Sergey Buldyrev (Boston University) : *Bak-Sneppen models of biological evolution and related problems (1)*
14:30 - 14:50	Break
14:50 - 15:50	Hsen-Che Tseg (National Chung-Hsing University) *On Statistical properties of chaos*

12/14/95(Thursday)

09:30 - 10:30	Sergey Buldyrev (Boston University): *Bak-Sneppen Models of biological evolution and related problems (2)*
10:30 - 10:50	Break
10:50 - 11:50	Ning-Ning Pan (National Taiwan University) *Self-organized criticality in Bak-Sneppen model*
11:50 - 13:30	Lunch Break
13:30 - 14:30	Sergey Buldyrev (Boston University): *Bak-Sneppen models of biological evolution and related problems (3)*

Pre-Spring-School Lectures(II)

Jan. 5,1996, Taipei, Taiwan

09:30 - 10:30	Chia-Hung Chang (NTHU) *Principles of continuum effective field theory---Matching & Running and Effective hamiltonians for $\triangle S = 1$ and $\triangle B=1$ weak decays*
11:00 - 12:00	Chia-Hung Chang (NTHU) *Topics in heavy quark effective fied thery* *(a). Basics* *(b). Radiative corrections* *(c). Inclusive semileptonic B meson decay*
13:00 - 14:30	Chia-Hung Chang (NTHU) *Nonperturbative matching calculation* *(a). Instanton and matching* *(b). Composite Higgs model*
14:30 - 14:45	Break
14:45 - 16:15	Prof. Chung Ngoc Leung (University of Delaware) *Do Neutrinos Obey the Priciple of Equivalence?*

1996年流體及非線性物理研討會

Feb. 26~28, 1996, Taipei, Taiwan

2/26/96 (February)

13:10 - 14:00	報 到
14:10 - 15:00	郭義雄 *混沌的回顧及趣談*
15:20 - 16:10	郭義雄 *非線性振子的性質及自相似性*
16:20 - 17:10	陳志隆 *混沌與噪音的區別*
17:00 -	晚 餐

2/27/96 (February)

09:10 - 10:00	伊 林 *Stochastic resonance (1)*
10:10 - 11:00	伊 林 *Stochastic resonance (2)*
11:10 - 12:00	曾玄哲 *混沌的統計性質及一些定義*
12:00 - 13:00	午 餐
13:10 - 14:00	陳志隆 *混沌的實驗確認(1)*
14:10 - 15:00	陳志隆 *混沌的實驗確認(2)*
15:20 - 16:10	曾玄哲 *5-1 涵數的循環展開(1)*
16:20 - 17:10	曾玄哲 *5-1 涵數的循環展開(2)*
17:00 -	晚 餐

2/28/96 (February)

09:10 - 10:00	曾玄哲 *混沌的情報內涵與記憶流的結構*
10:10 - 11:00	郭義雄 *非線性力學的電子模擬*
11:10 - 12:00	郭義雄 *混沌的控制及應用*
12:00 - 13:00	午 餐
13:10 - 14:00	曾玄哲 *微擾法的應用：決定性擴散*
14:10 - 15:00	討論及建議

1996 Taipei "International Symposium on Surfaces and Thin Films"

March 27-30, 1996, Taipei, Taiwan

3/27/96 (Wednesday)

08:20-09:10	Registration
09:10-09:20	Welcome and Openning Remarks by Director of Institute of Physics, T. T. Tsong (鄭天佐)
Session I	Chairman：T.T. Tsong (鄭天佐)
09:20-10:10	M. Scheffler (Invited) *Bond breaking and bond making at surfaces*
10:10-10:30	**Tea/Coffee break**
10:30-11:20	M.Y. Chou (周美吟) (Invited) *Modern electronic-structure calculations for surfaces*
11:20-12:10	A.F. Naumovets (Invited) *Surface migration induced by electronic transitions*
12:10-13:30	**Lunch**
Session II	Chairman：C.S. Shern (沈青嵩)
13:30-14:20	C.L. Chen (Invited) *Atomic view of dynamic behavior of iridium surface*
14:20-14:40	T.Y. Fu (傅祖怡) and T.T. Tsong *Step edge diffusion and the structure of nanometer size Ir islands on the Ir(111) surface*
14:40-15:00	I.S. Huang (黃英碩), R.L. Lo and T.T. Tsong *Point defects in the Si(111)-7×7 surface*
15:00-15:20	J.S. Tsay (蔡志申) and C.S. Shern *Diffusion and alloy formation of Co ultra-thin film on Pt(111)*
15:20-15:40	**Tea/Coffee break**
15:40-16:30	K. Terakura (Invited), T. Yamasaki, K. Kato and T. Uda *Atomic processes on Si(001) surface*

16:30-16:50	C.S. Chang (張嘉升), Y.M. Huang , C.C. Chen and T.T. Tsong *Anisotropic strain effect on morphology of vicinal Si(100) surface*
16:50-17:10	F.K. Men (門福國), A.R. Smith, K.J. Chao, Z. Zhang and C.K.Shih *Dimer-vacancy −dimer-vacancy interaction on the Si(001) surface: The nature of the 2×n structure*
17:10-17:30	C.N. Wu (吳至寧), K.J. Chao, H.C. Shih, T.G. Tsai and Y.H. Chiou *Preparation and characterization of molecular sieve embrance*
18:00-	**Dinner at the Center of Academic Activities**

3/28/96 (Thursday)

09:00-09:20	Registration
Session III	Chairman：T.J. Chuang (莊東榮)
09:20-10:10	D.P. Woodruff (Invited) *Quantitative structure determination for molecular adsorbates using scanned-energy mode photoelectron diffraction*
10:10-10:30	Tea/Coffee break
10:30-11:20	M. Kiskinova (Invited) *Adsorption and surface reactions on Rh single crystal surfaces*
11:20-12:10	P. Guyot-Sionnest (Invited) *Nonlinear spectroscopy of adsorbate vibrations, structure and dynamics*
12:10-13:30	**Lunch**
Session IV	Chairman：Y.L. Wang (王玉麟)
13:30-14:20	J.W. Coburn (Invited) *Surface science aspects of plasma-assisted etching*

14:20-15:10	B.B. Pate (Invited), C. Bandis and W.-Y. Chang *Charge transport and electron emission physics of negative electron affinity diamond*
15:10-15:30	Tea/Coffee break
15:30-16:20	T. Sakurai (Invited), T. Hashizume, Y. Hasegawa and Qikun Xue *Scanning tunneling microscopy of molecular beam epitaxy GaAs(001) surface*
16:20-17:10	M.H. Tsai (蔡民雄) (Invited), J.C. Jiang and S.H. Lin *Structural properties of the diamond C(111) surface*
17:10-17:30	J.-K. Wang (王俊凱), J.-C. Lin, H.-C. Chang, C.-S. Tsai and K.-H. Chen *Vibrational dephasing and relaxation of CH and CD adsorbates on diamond nanocrystalites*
18:00-	Dinner at the Center of Academic Activities

3/29/96 (Friday)

09:00-09:30	Registration
Session V	Chairman：H.L. Huang (黃惠良)
09:30-10:20	C.R. Abernathy (Invited) and J.D. Mackenzie *Status of III-N material growth in ultra high vacuum*
10:20-11:00	Group Photo and Tea/Coffee break
11:00-11:50	G.C. Chi (紀國鐘) (Invited) *The materials growth and characterization of GaN epitaxial film*
11:50-12:10	K.H. Chen (陳貴賢), C.H. Cao, Y.J. Yang and L.C. Chen *Growth and characterization of GaN using ECR-CVD method*
12:10-13:30	Lunch
Session VI	Chairman：M.K. Wu (吳茂昆)
13:30-14:20	K.D. Tsuei (崔古鼎) (Invited) *Electronic structure of fullerene on metal surfaces*

14:20-14:40	T.W. Pi (皮敦文), I.H. -Hong, C.-P. Cheng and R.-T. Wu *Core-level photoemission study of Ba on W(110): The d-band effect*
14:40-15:00	D.S. Lin (林登松), K. H. Huang, T.W. Pi and R.T. Wu S.H. Chen, C.Y. Huang and C.H. Chen *Applications of scanning near-field optical microscopy at NCCU*
16:50-17:10	W.B. Su (蘇維彬), C.S. Shiu, C.H. Chen, H.N. Lin, D.P. Tsai, C.S. Chang and T.T. Tsong *A study of polystyrene spheres with combined shear force and near field scanning optical microscopy*
17:10-17:30	Y.T. Yang (楊雅堂), D. Heh, P.K. Wei and W.S. Fann *The vibrational motion of a tapered fiber probe in shear force microscopy*
18:00-	Symposium Banquet at Asia World Plaza Hotel (環亞大飯店) [**for invited speakers and chairpersons only**]

3/30/96 (Saturday)

09:00-09:20	Registration
Session VII	Chairman：Y.D. Yao (姚永德)
09:20-10:10	C.M. Wei (魏金明) (Invited), I.H. Hong and Y.C. Chou *New technique for surface crystallography：direct inversion of measured kikuchi electron patterns*
10:10-10:30	**Tea/Coffee break**
10:30-10:50	J.C.A. Huang(黃榮俊),T.E. Wang, Y.M. Hu, C.C. Yu, Y.H. Lee, C.K. Lo, Y. Liou and Y.D. Yao *Structural and magnetic characterizations of permalloy films grown by molecular beam epitaxy*
10:50-11:10	C.K. Lo (盧志權), Y. Liou, Y.D. Yao and J.C.A. Huang *Studies of magnetisation reversal of Co-Films by means of magneto-optical Kerr effect*
11:10-11:30	A.W. Pang (龐文濤), A.berger and H.Hopster *Magnetization reorientation transition of thick epitaxial Gd(0001) films on W(110)*

超晶格物理性質研討會(一九九六)

1996 Symposium on Superlattice Physics

April 26-27,1996, Institute of Physics, Academia Sinica

4/26/96 (Friday)

08:40 - 09:20	Registration
09:20 - 09:30	Welcome and Opening Remarks 鄭天佐所長(中央研究院 物理所)
Session I	Chairman: 姚永德(中研院)
09:30 - 10:20	黃昭淵，陳銘堯(台大) *Study of Ultrathin $Y_3Fe_5O_{12}/Gd_3Ga_5O_{12}$ Superlattices*
10:20 - 10:30	Tea/Coffee break
10:30 - 11:20	ChiiDong Chen (NEC Research Lab., Japan) *Transferring Charges One by One in Single-Electron-Transistors*
11:20 - 12:10	洪雪行 (同步輻射中心) *準週期 AlAs-GaAs 超晶格的結構和測量PR、PZR，以及XRD*
12:10 - 14:00	Lunch
Session II	Chairman: ChiiDong Chen (NEC research Lab.)
14:00 - 14:50	楊鴻昌(台大) *$YBa_2Cu_3Oy/PrBa_2Cu_3Oy$ 超晶格薄膜物理*
14:50 - 15:40	徐力行(彰化師大) *Growth and Characterization of Fe/Gd/Si Superlattice*
15:40 - 16:00	Tea/Coffee break
16:00 - 16:50	陳恭(中正大學) *Heteroepitaxy and Surface Characterizations in Metal Oxides*
16:50 - 17:40	盧志權(中研院) *MOKE Stuy for Magnetic Thin Films*
18:00 -	Dinner

4/27/96 (Saturday)

Session III	Chairman: 張慶瑞(台大)
09:30 - 10:20	黃榮俊(成大) *Crystal Struture and Magnetic Behavior of Permalloy Films and Spin Valve*
10:20 - 10:30	Tea/Coffee break
10:30 - 11:20	許仁華(台大) *The Magnetic Interlayer Coupling via a Non-conducting Intervening Layer*
11:20 - 12:10	劉鏞(中研院) *The Study of Epitaxial Co/Cr,Co/V Superlattices and Their Magnetic Properties.*
12:10 - 13:10	Lunch
Session IV	Chairman: 劉 鏞(中研院)
13:10 - 14:00	Ivo Klik (Academia Sinica) *Correlation of Surface Roughness and Coercivity in Magnetic Films*
14:00 - 14:50	張慶瑞(台大)，楊志信(海洋) *Topographical Effects in Spin Valve Type Multilayers*
14:50 - 15:40	姚永德(中研院) *Magnetoresistance and Superlattice*
15:40 -	姚永德(中研院) *Discussion & Remarks*
17:30 -	Dinner

The 7th Spring School on Nuclear Physics and Few-body Physics

May 7~11, 1996, Hsinchu, Taiwan

5/07/96 (Tuesday)

Arrival

5/08/96

15:00 Registration

17:30 Supper ---- Welcome dinner

Evening Session Chair: E. K. Lin

19:30 I. R. Afnan
Few-body methods and effective field theories of mesons and baryons (1)

20:20 Break

20:25 C. L. Wu
Composite particle representation theory (1)

21:15
Session End

5/09/96 (Wednesday)

07:00 Morning call

07:30 Breakfast

Morning Session Chair: C. Y. Cheung

08:30 Pauchy W. -Y. Hwang
QCD sum rules and chiral symmetry breaking (1)

09:20 I. R. Afnan
Few-body methods and effective field theories of mesons and baryons (2)

10:10 Break

10:40 K. N. Huang
Relativistic equation of motion approach to many-body systems.

11:30 C. L. Wu
Composite particle representation theory (2)

12:20
Session End

12:30 Lunch

17:30 Supper

Evening Session Chair: W. -Y. P. Hwang

19:00 J. L. Friar
Chiral symmetry, nuclear scale and few-nucleon systems (1.5)

20:15 Break

20:20 P. U. Sauer
Microscopic nuclear structure and nuclear reactions at intermediate energies (1.5)

21:35
Session End

5/10/96 (Thursday)

07:00 Morning call

07:30 Breakfast

Morning Session Chair: C. L. Wu

08:30 I. R. Afnan
Few-body methods and effective field theories of mesons and baryons (3)

09:20 Pauchy W. -Y. Hwang
QCD sum rules and chiral symmetry breaking (2)

10:10 Break

10:40 C. D. Lin
Accurate hyperspherical approach to atomic and molecular few-body systems (1,2)

12:20
Session End

12:30 Lunch

17:30 Supper