CFB boiler. Methods to determine the fluidization velocity at the transition from the single to the exploding bubble regime are proposed and discussed. The transition velocity increases with an increase in particle size and bed height.

An experimental study on developing air-water two-phase flow along a large vertical pipe: effect of air injection method
Ohnuki A. & Akimoto H., *International Journal of Multiphase Flow*, 1996, 22/6 (1143-1154). In English.
The flow structure in a developing air-water two-phase flow was investigated experimentally along a large vertical pipe. Two air injection methods (porous sinter injection and nozzle injection) were adopted to realize an extremely different flow structure in the developing region. No air slugs occupying the flow path were recognized in this experiment regardless of the air injection methods even under the condition where slug flow is realized in the small-scale pipe. In the lower half of the test section, the axial distribution of sectional differential pressure and the radial distribution of local void fraction showed peculiar distributions depending on the air injection methods. However, in the upper half of the test section, the effects of the air injection methods are small in respect of the shapes of the differential pressure distribution and the phase distribution.

Measurements of fluid/particle correlated motion in the far field of an axisymmetric jet
Prevost F., Boree J., Nuglisch H.J. & Charnay G., *International Journal of Multiphase Flow*, 1996, 22/4 (685-701). In English.
Typical features of fluid-particle interaction in the far field of an axisymmetric polydispersed particle laden tube jet were measured and analysed in the present study. Measurements up to 45 jet diameters were obtained by using a phase doppler anemometer. The statistical properties of four particle size classes were obtained in order to cover a wide range of particle relaxation times. The downstream evolution of the mean longitudinal particle velocity field and of the particle radial and longitudinal turbulent components is first displayed. A method is proposed and validated to determine the statistics of the velocity of the fluid seen by the particles.

Determination of the interface curvature in stratified two-phase systems by energy considerations
Brauner N., Rovinsky J. & Moalem Maron D., *International Journal of Multiphase Flow*, 1996, 22/6 (1167-1185). In English.
A configuration of a plane interface between two stratified layers is appropriate for two-phase systems which are dominated by gravity, as is the case for large scale air-water systems under earth gravitation. However, for a general two-fluid system, the basic in situ configuration is stratified layers with a curved interface. Energy considerations are employed to predict the interface configuration. The effect of the fluid physical properties, in situ hold up, tube dimension, wall adhesion and gravitation on the characteristic interface curvature are explored. The prediction of interface curvature provides the closure relation required for a complete solution of stratified flows with curved interfaces for a variety of two-fluid systems.

The application of split-coefficient matrix method to transient two phase flows
Lu D.M., Simpson H.C. & Gilchrist A., *International Journal of Numerical Methods for Heat and Fluid Flow*, 1996, 6/3 (63-76). In English.
An easy-to-use numerical model for transient two-phase pipe flow analyses was developed by applying the split-coefficient matrix method (SCMM) to a homogeneous equilibrium two-phase flow model. Te basic idea of the SCMM is to split the Jacobian coefficient matrix into two sub-vectors, each associated with eigenvalues of the same sign. Hence, one-sided finite difference schemes can accordingly be applied to the sub-vectors. The present model was validated against experiments. It is numerically stable provided that a criterion is met due to the use of a time explicit format.

End of the rope for vortex pressure pulsations
Amini F., *International Water Power and Dam Construction*, 1996, 48/11 (26 + 28). In English.
The effects of cavitation on the performance and efficiency of hydraulic turbines are examined. Mathematical models are presented for predicting vortex pressure pulsations. The first is a spiral cone cavity model and the other is a partially rolled up vortex model. The effectiveness of the recovery rotating ring, fabricated in a simple manufacturing process, for controlling unwanted pulsations and swirls in draft tubes in Francis turbines is discussed.

A boundary current induced by diffusion near a motionless horizontal cylinder in a continuously stratified fluid
Baidulov V.G. & Chashechkin Yu.D., *Izvestiya - Atmospheric and Oceanic Physics*, 1996, 32/6 (751-756). In English.
The Cauchy problem of the formation of a diffusion-induced boundary layer near a motionless horizontal cylinder in a continuously stratified fluid at rest is solved in the Boussinesq approximation. Asymptotics of the tangential and radial velocities and of the salinity perturbation for short periods are obtained using the Laplace transformation, and conditions of their applicability are determined. The boundary current under formation splits into two sublayers of considerably different thicknesses. Expressions for the circulation and the dynamic vorticity are also obtained.

Hydrodynamic behavior of a binary solids fluidized bed
Bai D., Madusa Y., Nakagawa N. & Kato K., *Journal of Chemical Engineering of Japan*, 1996, 29/2 (211-216). In English.
This paper presents a study on the hydrodynamic behavior of a fluidized bed containing mixtures of solids of different sizes and densities. The transition velocity from bubbling to turbulent fluidization and solids holdup of the dense bed in different fluidization regimes were experimentally determined. The onset velocity to turbulent fluidization was found to increase with increasing fraction of coarse solids. Solids holdups changed dif-

ferently with gas velocity and fraction of coarse particles in bubbling and turbulent fluidization regimes. As a quantitative measure for describing the complexity or the self-affine property of the time series signals, a fractal analysis was introduced and related to the hydrodynamics of the fluidized beds. A correlation to predict the transition velocity of a binary solids fluidized bed was also developed in this paper.

Effect of packed bed on mass transfer in external-loop airlift bubble column
Okada K., Nagata Y. & Akagi Y., *Journal of Chemical Engineering of Japan*, 1996, 29/4 (582-587). In English.
The influence of packed bed set in the riser section on the liquid-side volumetric mass transfer coefficient (K_La_R) in an external-loop airlift bubble column was examined with water, 20 wt% glycerol, 10 wt% ethanol and 0.3 wt% CMC aqueous solutions. Bubble size, bubble rise velocity and gas holdup in the riser were measured to examine the effect of the packed bed using an optical fiber two-phase flow system. The presence of the packed bed in the riser increased the K_La_R values for the liquids used. This was associated with the increase in the specific gas-liquid interfacial area due to bubble breakage by the packed bed. A correlation equation for K_La_R was proposed for both types of airlift bubble columns with and without the packed bed.

Predictions of gas hold-up and liquid velocity in airlift reactors using two-phase flow friction coefficients
Garcia-Calvo E. & Leton P., *Journal of Chemical Technology and Biotechnology*, 1996, 67/4 (388-396). In English.
The overall friction coefficient of airlift reactors was estimated using equivalent lengths and friction factors. The friction factor was calculated taking into account the riser liquid velocity profile corresponding to the two-phase flow and using classical one-phase equations. A previously described model was used to obtain simultaneously both gas hold-up and liquid circulation velocity. The model simulates experimental data obtained in a wide range of configurations of internal and external airlift reactors with Newtonian and non-Newtonian systems.

Computational methods for multiphase flow and reactive transport problems arising in subsurface contaminant remediation
Arbogast T., Bryant S., Dawson C., Saaf F., Chong Wang & Wheeler M., *Journal of Computational and Applied Mathematics*, 1996, 74/1-2 (19-32). In English.
A mathematical formulation and some numerical approximation techniques are described for a system of coupled partial differential and algebraic equations describing multiphase flow, transport and interactions of chemical species in the subsurface. A parallel simulator PARSIM has been developed based on these approximation techniques and is being used to study contaminant remediation strategies. Numerical results for a highly complex geochemistry problem involving strontium disposal in a pit at Oak Ridge National Laboratory are presented.

Influence of particle size, fluidization velocity and relative humidity on fluidized bed electrostatics
Guardiola J., Rojo V. & Ramos G., *Journal of Electrostatics*, 1996, 37/1-2 (1-20). In English.
The influence of particle size, fluidization velocity, and relative humidity on the degree of electrification reached by a fluidized bed of glass beads has been studied. The static electrification of the bed was measured by means of the potential difference observed between an electric probe and the metallic distributor. The effect of relative humidity appears to be complex and is connected with the quality of fluidization existing in the bed. A characteristic curve for electrification vs. humidity has been proposed that consists of five zones. When the value of the relative humidity is lower than a critical value (RH_c), the static electrification of the bed cannot be measured accurately because the adhesion of particles to the probe leads to irreproducible voltage values. The degree of electrification increases with particle size and air velocity. The relationship between the average solid circulation veocity and electrification is studied.

Interaction of single travelling bubbles with the boundary layer and attached cavitation
Chih-Yang Li & Ceccio S.L., *Journal of Fluid Mechanics*, 1996, 322/- (329-353). In English.
Individual travelling cavitation bubbles were examined as they interacted with the flow over a two-dimensional hydrofoil. Each bubble was produced from a single nucleus created upstream of the hydrofoil, and the flow near the hydrofoil was visualized using particle imaging velocimetry (PIV). Travelling bubbles were observed to generate a local region of turbulence as they passed close to an unstable laminar boundary layer. By producing a locally turbulent region, the bubbles could temporarily sweep away a portion of attached cavitation at the foil midchord. Also, the bubbles were observed to strongly interact with a turbulent boundary layer, producing local regions of patch cavitation.

On general transformations and variational principles for the magnetohydrodynamics of ideal fluids. Part 2. Stability criteria for two-dimensional flows
Vladimirov V.A., Moffatt H.K. & Ilin K.I., *Journal of Fluid Mechanics*, 1996, 329/- (187-205). In English.
The techniques developed in Part 1 of the present series are here applied to two-dimensional solutions of the equations governing the magnetohydrodynamics of ideal incompressible fluids. We first demonstrate an isomorphism between such flows and the flow of a stratified fluid subjected to a field of force that we describe as pseudo-gravitational. We then construct a general Casimir as an integral of an arbitrary function of two conserved fields, namely the vector potential of the magnetic field, and the analogous potential of the modified vorticity field.

Concentration waves and the instability of bubbly flows
Lammers J.H. & Biesheuvel A., *Journal of Fluid Mechanics*, 1996, 328/- (67-93). In English.
This paper examines whether G.K. Batchelor's (1988) theory of the propagation of planar concentration disturbances and the occurrence of instabilities in uniform fluidized beds can be applied to bubbly flows. Experi-