Measurements are presented for the shedding rate of liquid from slugs created by the flow of air and water in a horizontal 0.0953 m pipe at atmospheric conditions. These are used to predict a critical liquid carpet height below which slugs will decay. Of particular interest is the finding that the initiation of the slug flow regime at high gas flows is related to the stability of slugs, rather than the stability of a stratified flow.

**Characterization of two-phase flows using fractal analysis of local temperature fluctuations**
Kozma R., Kok H., Sakuma M., Djainal D.D. & Kitamura M., *International Journal of Multiphase Flow*, 1996, 22/5 (953-968). In English.

This works deals with the characteristics of two-phase flows based on fractal techniques in order to develop objective flow regime indicators. The fractal dimension of measured time series have been evaluated by Higuchi's method. It is shown that the error of the linear fit of the fractal dimension is a sensitive indicator of the changes in the flow regime, while the fractal dimension value itself is less suitable for flow regime identification. The developed method has been applied to the evaluation of two-phase flow experiments at the SIDAS boiling loop.

**Experimental study of a two-phase bubbly flow in a flat duct symmetric sudden expansion - part 1. visualization, pressure and void fraction**
Aloui F. & Souhar M., *International Journal of Multiphase Flow*, 1996, 22/4 (651-665). In English.

The present work involves an experimental study of bubble flow in a flat horizontal sudden expansion. This study consists of two parts which are interdependent and complementary. Here in the first part, the qualitative study by visualization shows that the bubble flow changes from a dissymmetric configuration to a symmetric configuration beyond a certain volumetric quality.

**A first order relaxation model for the prediction of the local interfacial area density in two-phase flows**
Millies M., Drew D.A. & Lahey R.T. Jr, *International Journal of Multiphase Flow*, 1996, 22/6 (1073-1104). In English.

It is the purpose of this paper to present a first order relaxation model which is derived from the Boltzmann transport equation, and which accurately describes the evolution of interfacial area density for bubbly flows. In particular, the local, instantaneous interfacial area densities and volume fractions are predicted for vertical flow of a vapor/liquid bubbly flow involving both bubble clusters and individual bubbles.

**An interfacial friction correlation for shell-side vertical two-phase cross-flow past horizontal in-line and staggered tube bundles**
Rahman F.H., Gebbie J.G. & Jensen M.K., *International Journal of Multiphase Flow*, 1996, 22/4 (753-766). In English.

A correlation is presented for the interfacial friction factor between the gaseous and liquid phases in vertical two-phase flows past horizontal in-line and staggered tube bundles. The interfacial friction data were determined from pressure drop, void fraction, and mass flux data taken by Dowlati et al. (1990, 1992b) and Schrage et al. (1988). These data were correlated using two non-dimensional quantities: a Reynolds number based on the mixture density and relative velocity between the two phases, and the porosity of the tube bundle.

**Two-phase stratified flow splitting at a T-junction with an inclined branch arm**
Penmatcha V.R., Ashton P.J. & Shoham O., *International Journal of Multiphase Flow*, 1996, 22/6 (1105-1122). In English.

The objective of this study is to investigate, experimentally and theoretically, two-phase splitting under stratified wavy flow conditions at a regular horizontal T-junction with an inclined branch arm. Experimental data reveals that gravity forces have a significant effect on the flow splitting. For downward inclination of the side arm more liquid is diverted into the branch arm, as compared to the case in which the side arm was horizontal. A mechanistic model has been developed for the prediction of the splitting phenomenon for both the horizontal and the downward orientations of the side arm. The model is based on the momentum equations applied for the separation streamlines of the gas phase and the liquid phase. Very good agreement is observed between the prediction of the model and the data acquired for all the cases.

**Large eddy simulation of particle deposition in a vertical turbulent channel flow**
Wang Q. & Squires K.D., *International Journal of Multiphase Flow*, 1996, 22/4 (667-683). In English.

The deposition of particles in fully-developed turbulent channel flow has been calculated using large eddy simulation of the incompressible Navier-Stokes equations. Calculations were performed for Reynolds numbers of 11 160 and 79 400 (based on bulk velocity and hydraulic diameter); subgrid-scale stresses were parameterized using the dynamic eddy viscosity model. Particle motion was governed by both drag and lift. The effect of particle-particle interactions as well as modification of the turbulent carrier flow by the particles was neglected.

**Bottom bed regimes in a circulating fluidized bed boiler**
Svensson A., Johnsson F. & Leckner B., *International Journal of Multiphase Flow*, 1996, 22/6 (1187-1204). In English.

This paper extends previous work on the fluidization regimes of the bottom bed of circulating fluidized bed (CFB) boilers. Pressure measurements were performed to obtain the time-averaged bottom bed voidage and to study the bed pressure fluctuations. Two bubbling regimes were identified: a 'single bubble regime' with large single bubbles present at low fluidization velocities, and, at high fluidization velocities, an 'exploding bubble regime' with bubbles often stretching all the way from the air distributor to the surface of the bottom bed. The exploding bubble regime results in a high through-flow of gas, indirectly seen from the low average voidage of the bottom bed, which is similar to that of a stationary fluidized bed boiler, despite the higher gas velocities in the

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-