

INSTITUTE OF FLUID SCIENCE

TOHOKU UNIVERSITY



東北大学
流体科学研究所

2003/2004



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Institute of Fluid Science
Tohoku University

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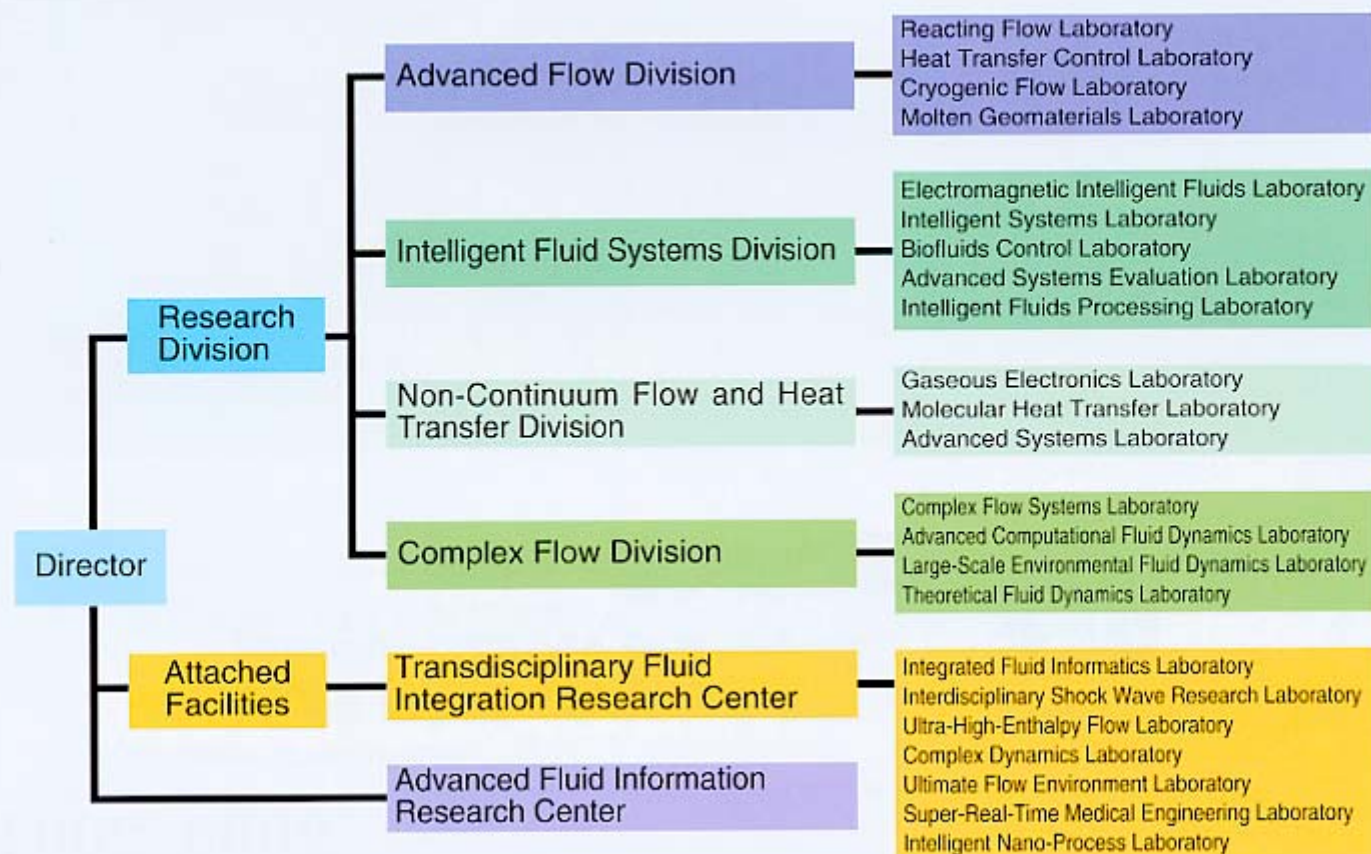
Introduction

Our Institute studies not only flows of substances but also flows of heat, energy and information. Flows of gas, liquid and solid are studied from the continuum approach and also from the microscopic viewpoint by regarding the flows as a set of atoms, molecules and charged particles. The mission of the Institute of Fluid Science is to conduct the researches on flows from the standpoint of basic science, and also to develop their applications to advanced engineering problems. Examples of these activities are optimum design of materials processing plasmas, development of low-intrusive medical treatments using shock waves, measurement-integrated simulation of blood flow, development of high-functionality material/fluid systems, and dynamics of supercooled liquids and glasses.

In order to make great strides in the research areas mentioned above, this Institute was re-inaugurated in 1998 with a new organizational structure consisting of four research divisions (16 laboratories) and a research center (3 laboratories), and the research center was re-established expansively with 7 laboratories in April 2003. The research divisions promote cutting-edge investigations of flow science from both fundamental and applied aspects. They are: "Advanced Flow" division that investigates various thermal/fluid flow phenomena under extreme conditions; "Intelligent Fluid Systems" division that aims at realization of intelligent and functional fluid flow; "Non-continuum Flow and Heat Transfer" division that investigates microscopic, non-continuum heat and flow phenomena; and "Complex Flow" division that extracts universality and regularity from complicated flow phenomena. The "Transdisciplinary Fluid Integration" research center aims at solving transdisciplinary fluid problems in various research fields of recent importance by new research method of integrating experiment and computation. This Institute maintains a high-quality research infrastructure, and large-scale high-performance research facilities that includes a system of supercomputer. All professorial staff engage in teaching and research advising of students at the Graduate Schools of Engineering, Information Sciences and Environmental Studies, and in addition, actively pursue joint research and training activities by hosting Japanese and foreign scholars and research students. In September 2003, the 21st Century COE Program "International COE of Flow Dynamics", in which this Institute plays a core role, was established to produce highly practical and talented researchers who have a good sense of internationality and who can contribute to human society in the field of flow dynamics development.

October, 2003

Organization



Advanced Flow Division

Reacting Flow Laboratory	: Prof. Takashi Nioka
Heat Transfer Control Laboratory	: Prof. Shigenao Maruyama
Cryogenic Flow Laboratory	: Prof. Kenjiro Kamijo
Molten Geomaterials Laboratory	: Prof. Kazuo Hayashi

Researches of flow phenomena under extreme conditions such as extremely high/low temperature, pressure, gravity and velocity are carried out.

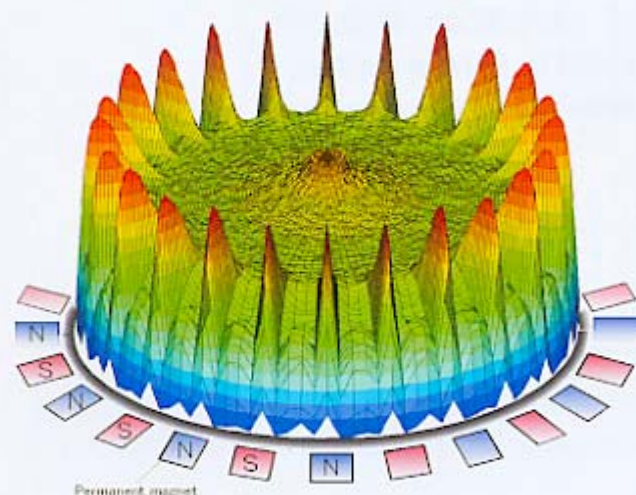


Double diffusion and crystal growth in microgravity and normal gravity environments

Non-Continuum Flow and Heat Transfer Division

Gaseous Electronics Laboratory	: Prof. Kenichi Nanbu
Molecular Heat Transfer Laboratory	: Prof. Michio Tokuyama
Advanced Systems Laboratory	: Prof. Yukihisa Kitamura

Thermofluid phenomena are studied from electronic and molecular levels. The researches make it possible to clarify the mechanisms of such phenomena as production and transport of radicals and ions, nanomachining of solid surfaces and phase change at interfaces.



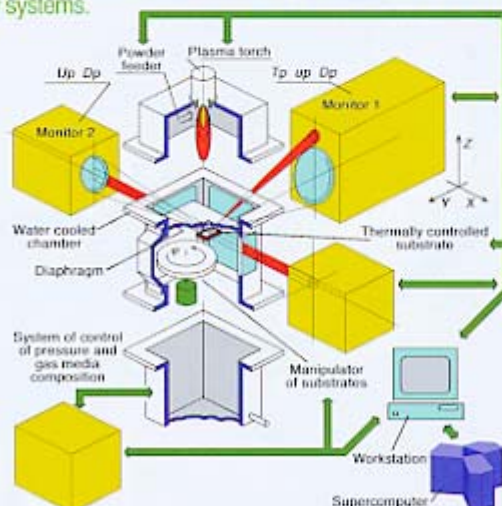
Electron Number Density

Electron confinement by multipolar magnetic fields in a plasma reactor

Intelligent Fluid Systems Division

Electromagnetic Intelligent Fluids Laboratory	: Prof. Hideya Nishiyama
Intelligent Systems Laboratory	: Prof. Junji Tani
Biofluids Control Laboratory	: Prof. Toshiyuki Hayase
Advanced Systems Evaluation Laboratory	: Prof. Toshiyuki Takagi
Intelligent Fluids Processing Laboratory	: Prof. Hiroshi Yamaguchi

Intelligence is the ability to recognize the environment and to make decision for the optimum results. This research division concerns the development of the intelligent fluid systems based on the fundamental research for the recognition, adaptation mechanism and evaluation of the flow systems.

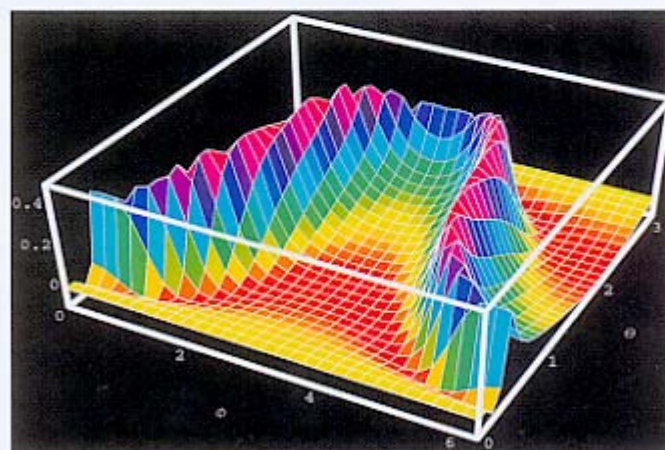


Electromagnetic intelligent fluids system for plasma spray

Complex Flow Division

Complex Flow Systems Laboratory	: Prof. Toshiaki Ikohagi
Advanced Computational	
Fluid Dynamics Laboratory	: Prof. Osamu Inoue
Large-Scale Environmental	
Fluid Dynamics Laboratory	: Prof. Yasuaki Kohama
Theoretical Fluid Dynamics Laboratory	: Prof. Michio Tokuyama

Complex fluid flows are investigated by the analysis of high precision information obtained numerically and experimentally. New theories which explain the flows characterized by a wide range of space and time scales are established.



The angular ($\phi - \theta$) spectrum of vertical heat flux in stratified turbulence



仙台空港より仙台駅までバス45分 仙台駅より徒歩20分
 45 Mins. by bus from Sendai airport to Sendai station.
 20 Mins. on foot from Sendai station to Katahira campus

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