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Research field Topology, Geometry, Dynamical systems
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Present research

(1) For infinite groups such as the group of diffeomorphisms of a compact manifold, I study their invariants for example their cohomology. It is interesting to understand the geometric meaning of the invariants. Recently I am interested in the group of volume preserving diffeomorphisms, that of symplectomorphisms, and that of contactomorphisms. The group of piecewise affine homeomorphisms and the group of real-analytic diffeomorphisms are also of interest.
(2) I also study the topology of the classifying space for foliations. It is closely related to that of the classifying space for the group of diffeomorphisms. I investigate the relationship between the invariants for foliations and the invariants for the group of diffeomorphisms.
(3) I study the contact structures of 3-dimensional manifolds, the symplectic structures of 4-dimensional manifld, several dynamical systems on 3- or 4-dimensional manifolds,several geometric structures on them, the multi-foliations of them, etc., as well as the relationship between these structures.

Notice for the students

For the research in topology, geometry or dynamical systems, the basic knowledge on the following subjests are required.
(1) Manifold theory (definitions of manifolds, vector fields, differential forms, integrals).
(2) Homology theory (definition of homology groups, their properties and calculations), the definition of fundamental groups, their calculations.

The basic knowledge means the ability not only to remember them but to use them when it is necessary. The required level implies that you know a number of examples of mannifolds, you know the de Rham cohomology of them, you know the classification of surfaces, you know the triangulation of manifolds... You learn these things in the under-graduate courses of departments of mathematics of almost all universities in Japan. Now the subject of researchs concerns the structures on the manifolds or the configulation of submanifolds in the manifolds. In order to just describe them, the above basic knowledge is always required.

The theory of dynamical systems I am interested in is the global theory of the integral curves of a vector field on a differentiable manifold, the invariant sets for the action of a group of diffeomorphisms, etc. Hence this needs the foundation of the manifold theory.

Even if you have an intention to study a specific branch of mathematics, you should be interested in the present researchs in the whole mathematics. For example, in the Japanese journal "Sugaku" published by Iwanami Shoten, there are survey articles by the working mathematicians. Some of them are written for specialists, but in general they are written for non-specialists among mathematiciens or graduate students in mathematics major. Hence it is really recommended to force yourself to read this kind of surveys to find the clue to solve your own problems.

The actual research in topology or geometry needs the knowledge on analysis as well as that on algebra. In order to prepare yourself to be able to find various references at the time of necessity, you should be familiar with various branches of mathematics. The study and the research of mathematics often proceeds when you write down or explain to others what you learned from references or from conversation with others. It is important to be accustomed to discussing on mathematics with other people. The years you spend in the graduate school is really a precious time for doing only the mathematics. Spend your time in the graduate school with courage and optimism.