Summary of research

A On the theory of infinite dimensional Lie groups by Hideki Omori. I particiated in Prof. Omori's project on regular Fréchet Lie groups. My main contributions are the concept of preconnections [12] and some results on the enlargeability of Lie algebras with asymptotic growth of Hamiltonian in symplectic geometry [7], [11]

B The equations of Obata type. I took up the equation of perfect fluid of static spacetime in general relativity theory [4], and developed general methods in conformally flat spaces [5]. I gave a complete classification of conformally flat complete Riemannian metrics at which the scalar curvature mapping is singular [6].

C Maximal surfaces in the Minkowski 3-spaces. Weierstrass representation formulas and various examples are shown [10]. A characterization of Lorentzian catenoid is given in terms of a singularity which is particular to maximal surfaces [13].

D An invariant $\nu(M)$ of a smooth manifold M which measures a deviation from conformally-flatness of M is introduced [14]. The aim is to determine the infimum of the L^2 integral of Weyl's conformal curvature tensor on $S^2 \times S^2$. General results of $\nu(M)$ and some partial results on $S^2 \times S^2$ are given. An application to a problem similar to Willmore conjecture is given [15].

E The Yamabe number $\mu(M)$. First appeared in [c1]. The connected sum formula and various related results are shown in [16]. [15], [17], [19], [25] and [c3] are also relevant papers. [b1] is a survey and [b2] is a renewal version. The Yamabe invariant is a synonym with the Yamabe number.

F Riemannian metrics of negative Ricci curvature [18]. Lohkamp (1994) has shown the existense of negative Ricci curvature metric of manifolds of dimension greater than or equal to 3. Lohkamp's proof is difficult. In [18] a simple construction is given which reduces the problem to a local one.

G The smallest number of vertices of closed curves. The classical 4-vertex theorem is generalized to curves with self intersections. A 6-vertex theorem [20] and an 8-vertex theorem [22] are shown.

H The regular homotopy of closed curves. A new regular homotopy invariant $t(\gamma)$ of a closed regular curve γ is introduced [21]. In [31] a differential gemetric interpretation is given.

I The Schwarzian derivative. In the joint work [23] with Masaaki Wada, we obtained a new Schwarzian derivative in Riemannian geometry. [27], [30] are subsequent developments. [28] is also a related paper.

J Differential geometry of affine connections. A characterization of the Levi-Civita connection of an Einstein metric is given in terms of affine connections [26]. Some interesting examples of affine connections are given [29].