

## Summary of research

- A On the theory of infinite dimensional Lie groups by Hideki Omori. I participated 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 existence 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  $\gamma$  is introduced [21]. In [31] a differential geometric 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].