# ON THE TOPOLOGY OF SOME ALMOST CONTACT MANIFOLDS

**Dedicated to Professor A. Komatsu for his 60th birthday**

By

**Haruo SUZUKI and Hiroaki KOSHIKAWA**

## 1. Introduction and results.

We mean by an *almost contact structure* of a real orientable differentiable manifold $M^{2n+1}$ a reduction of the structural group $SO(2n+1)$ of the tangent bundle $\tau(M)$ to $U(n)\times 1$. (Cf. J. W. Gray [2] and S. Sasaki [6].) If $M$ has the almost contact structure, we say also that $M$ is *almost contact.* Gray has proved that a 5-dimensional real orientable manifold is almost contact if and only if its third integral Stiefel-Whitney class is zero. The almost contact structure is a quite analogous to an almost complex structure. Passing to stable class of the tangent bundle both determine a stable complex structure. Recently, the study of stable complex structures of real vector bundles to find almost complex structures of even dimensional orientable differentiable manifolds is advanced by E. Thomas [10] and W. A. Sutherland [8] and others. In this note, we deduce some results on the existence of almost contact structures using their results. Our main theorem is,

**Theorem 1.1.** *Let $M$ be a real orientable differentiable manifold of odd dimension. The tangent bundle $\tau(M)$ has a stable complex structure if and only if $M$ is almost contact.*

This theorem is proved by considering an induced map of Postnikov systems for fibre maps between classifying spaces. Our technique follows D. W. Kahn [4]. Let $w_i$ denote the $i$-th Stiefel-Whitney class and $\delta$ the Bockstein coboundary operator associated with the exact sequence $Z\to Z\to Z_2\to 0$. Let $a$ be a point of $M$. If $M-a$ has an almost contact structure then we say that $M$ has an *almost contact structure except a point.* As applications of Theorem 1.1, we obtain the following:

**Theorem 1.2.** *Let $M$ denote a closed real orientable differentiable manifold of dimension 9 such that $w_4(M)=0$. Then $M$ has an almost contact structure except a point if and only if*