ILLINOIS JOURNAL OF MATHEMATICS
Volume 30, Number 4, Winter 1986

ON REALIZING NAKAOKA'S COINCIDENCE POINT TRANSFER AS AN S-MAP

BY

DANIEL H. GOTTLIEB[1]

1. Introduction

In [6] the existence was asserted of a transfer for fibre bundles whose fibers were compact manifolds. This transfer is a homomorphism in singular homology or cohomology. In [1] this transfer was shown to be induced by an S-map, at least for fibre bundles with compact Lie groups as structure groups and finite complexes as base spaces. When a transfer is induced by an S-map then it exists in every cohomology and homology theory. In the case of the transfer in [1] the S-map led immediately to a simple topological proof of the Adams Conjecture.

The transfer map for finite covering spaces was known to be induced by an S-map. This fact was crucial in the proof of the celebrated Kahn-Priddy theorem [8].

At present there are several different transfers defined in various circumstances. Many are defined only for singular homology groups. Sometimes these are not realized by S-maps. For example the transfer for ramified coverings [10] does not commute with the Steenrod algebra [7] (also attributed to Dold). Hence it cannot be realized by an S-map. Recently, Ralph Cohen [4] has shown that the ramified covering transfer can be realized if the ramified covering is localized at certain primes. This was also known to Larry Smith.

In [9], Nakaoka obtained a transfer in the following situation: *Let*

$$E_1 \xrightarrow{p_1} B \quad and \quad E_2 \xrightarrow{p_2} B$$

be fibre bundles with closed oriented m-dimensional manifolds M_1 *and* M_2 *as fibres. Suppose that* $\pi_1(B)$ *acts trivially on both* $H^m(M_1; \mathbf{Z})$ *and* $H^m(M_2; \mathbf{Z})$. *Let* f *and* g: $E_1 \to E_2$ *be fibre preserving maps covering the identity* $1\colon B \to B$. *Then there is a homomorphism*

$$\tau_{f,g}\colon H^*(E_1; \mathbf{Z}) \to H^*(B; \mathbf{Z})$$

such that $\tau_{f,g} \circ p_1^*$ *is multiplication by* $\lambda(\bar{f}, \bar{g})$ *where* $\bar{f}$ *and* $\bar{g}$ *are the restrictions*

Received November 9, 1984.
[1]Partially supported by a grant from the National Science Foundation.