TRANSACTIONS OF THE
AMERICAN MATHEMATICAL SOCIETY
Volume 243, September 1978

# ERRATUM TO "PERIODIC HOMEOMORPHISMS OF 3-MANIFOLDS FIBERED OVER $S^1$"

BY

JEFFREY L. TOLLEFSON

Theorem 5 in [1] is not true as stated for the case $p = 2$ and should be changed to read as shown below. Since Theorem 4 depends on this result a corresponding change is required here also.

THEOREM 4. *Suppose that $M(\varphi) = F \times R^1/\varphi$, where $F$ is a closed, orientable surface of negative Euler characteristic and $H_1(M(\varphi); Q) \cong Q$. Let $h$: $M(\varphi) \to M(\varphi)$ be a map such that $h^p \simeq 1$ (for some prime $p$). In the case $p = 2$ and $h_*$ is not the identity map on $H_1(M(\varphi); Q)$, assume additionally that $\varphi^k$ is not homotopic to the identity map for any $k \neq 0$. Then there exists a PL homeomorphism $g$ of $M(\varphi)$ such that $g \simeq h$ and $g^p = 1$.*

THEOREM 5. *Let $M(\varphi) = F \times R^1/\varphi$, where $F$ is a closed orientable surface of negative Euler characteristic. Suppose that $h$ is a homeomorphism of $M(\varphi)$ such that $h([F \times 0]) = [F \times 0]$ and $h^p$ is homotopic to the identity for some prime $p$. In the case when $p = 2$ and $h$ interchanges the sides of $[F \times 0]$, assume additionally that $\varphi^k$ is not homotopic to the identity for any $k \neq 0$. Then there exists a homeomorphism $h'$ of $M(\varphi)$ such that $h'$ is homotopic to $h$ and $h'^p = 1$.*

The proof for Theorem 5 in [1] breaks down in the case $p = 2$ and $h$ interchanges the sides of $[F \times 0]$, since composing $h$ with $\lambda_s$ does not effect the degree of $f \circ H|\Sigma$ as asserted. To correct the proof it is sufficient to show that the degree of $f \circ H|\Sigma$ is already zero in this case.

Thus, assume $p = 2$ and $h$ interchanges the sides of $[F \times 0]$. Split $M(\varphi)$ along $[F \times 0]$ to obtain $F \times [0, 1]$ and a homeomorphism $\hat{h}$ on $F \times [0, 1]$ induced by $h$. Then there exist homotopic homeomorphisms $k$ and $k'$ of $F$ such that $\hat{h}(x, 0) = (k(x), 1)$ and $\hat{h}(x, 1) = (k'(x), 0)$. We can view $h|[F \times 0]$ in two ways: $h$: $[x, 0] \mapsto [k(x), 1] = [\varphi^{-1}k(x), 0]$ and $h$: $[x, 0] = [\varphi(x), 1] \mapsto [k'\varphi(x), 0]$. It follows that $\varphi^{-1}k = k'\varphi \simeq k\varphi$. If we let $g = \varphi^{-1}k$ this gives $h([x, 0]) = [g(x), 0]$ and $g \simeq \varphi g \varphi$. Now lift the homotopy $H$: $h^p \simeq 1$ to a homotopy $\tilde{H}$ of the covering space $p$: $F \times R^1 \to M(\varphi)$ defined by $p(x, t) = [x, t]$ such that $\tilde{H}_0(x, 0) = (g^2(x), 0)$. Then $\tilde{H}_1(x, t) = (\varphi^n(x), t + n)$ where

Received by the editors October 27, 1976.

*AMS (MOS) subject classifications* (1970). Primary 57A10, 57E25; Secondary 55C35.

$n = \deg(f \circ H|\Sigma)$. It follows that $g^2 \simeq \varphi^n$ which, when combined with $g \simeq \varphi g \varphi$, yields $\varphi^{2n} \simeq 1$. Thus $n = 0$ as needed.

## References

1. J. Tollefson, *Periodic homeomorphisms of 3-manifolds fibered over* $S^1$, Trans. Amer. Math. Soc. 223 (1976), 223–234.

Department of Mathematics, University of Connecticut, Storrs, Connecticut 06268