depends only on the cohomology class to which α belongs. The map which sends each cohomology class into the corresponding μ-asymptotic cycle is a homomorphism. In particular, if we insist on a single-valued Hamiltonian function, so that $\alpha = dH$, the μ asymptotic cycle is zero. (Received January 12, 1956.)

395. Stephen Smale: *A Vietoris mapping theorem for homotopy.*

Let X and Y be compact metric spaces and $f: X \to Y$ be onto. Vietoris proved (Math. Ann. (1927)) that if for all $r \leqq n-1$ and all $y \in Y$, $H_r(f^{-1}(y)) = 0$ (Vietoris homology mod 2) then $f_*: H_r(X) \to H_r(Y)$ is an isomorphism onto for $r \leqq n-1$ and onto for $r = n$. Begle (Ann. of Math. (1950)) gave generalizations to nonmetric spaces and more general coefficient groups. Examples show that this theorem does not hold directly for homotopy. However, suppose X and Y are LC^n and that for each $y \in Y$, (1) $f^{-1}(y)$ is LC^{n-1} and (2) $\pi_r(f^{-1}(y)) = 0$ for $0 \leqq r \leqq n-1$; then it is proved that $f_\#: \pi_k(X) \to \pi_k(Y)$ is an isomorphism onto for $k \leqq n-1$ and onto for $k = n$. Actually the hypotheses can be weakened in some respects. For example, if instead of assuming $\pi_{n-1}(f^{-1}(y)) = 0$, one only has that $i_\#: \pi_{n-1}(f^{-1}(y)) \to \pi_{n-1}(X)$, the homomorphism induced by inclusion, is zero, then still $f_\#: \pi_{n-1}(X) \to \pi_{n-1}(Y)$ is an isomorphism onto. (Received December 14, 1955.)

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RESEARCH PROBLEM

9. Richard Bellman. *Minimization problem.*

We are given a region R and a random point P within the region. Determine the paths which

(a) Minimize the expected time to reach the boundary, or

(b) Minimize the maximum time required to reach the boundary.

Consider, in particular, the cases

(a) R is the region between two parallel lines at a known distance d apart.

(b) R is the semi-infinite plane and we are given the distance d from the point P to the bounding line. (Received November 18, 1955.)