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Curtis, Edward B. (1-WA); **Mahowald, Mark** (1-NW)
The unstable Adams spectral sequence for S^3.
Algebraic topology (Evanston, IL, 1988), 125–162, *Contemp. Math.*, 96, *Amer. Math. Soc.*, *Providence*, *RI*, 1989.

Systematic calculations of the unstable homotopy groups of spheres using the EHP sequence were begun by Toda and have been continued through the calculation of the 30-stem in the work of Barratt, Mimura, Mori, and Oda. The authors of this paper make use of algebraic EHP sequences to calculate the E_2 terms of the unstable Adams spectral sequence for spheres, with the advantage that the main difficulty in the "geometric computation", the computation of the map P, can be handled by the formula for the differential in the lambda algebra. The paper is concerned mainly with the computation of the higher differentials in the spectral sequence for S^3, which is achieved by means of a stable map $\Omega^2 S^3\langle 3\rangle \to Q\Sigma\mathbf{R}\mathrm{P}^2$. Other considerations (e.g. v_1-periodicity) are sometimes used as well. The first 52 stems of $E_\infty^{*,*}(S^3)$ are given and in many cases the group extension is determined to obtain the actual homotopy group.

{For the collection containing this paper see MR1022668}

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