1072-05-174 **Marcelo Aguiar** and **Aaron Lauve*** (lauve@math.luc.edu). *Lagrange's Theorem for Hopf Monoids in Species.*

Following Radford's proof of Lagrange's theorem for pointed Hopf algebras, we prove Lagrange's theorem for Hopf monoids in the category of connected species. As a corollary, we obtain necessary conditions for a given subspecies $\mathbf{k}$ of a Hopf monoid $\mathbf{h}$ to be a Hopf submonoid: the quotient of any one of the generating series of $\mathbf{h}$ by the corresponding generating series of $\mathbf{k}$ must have nonnegative coefficients. We highlight two further corollaries as time permits, necessary conditions for a sequence of nonnegative integers to be the sequence of dimensions of: (i) a Hopf monoid (these take the form of certain polynomial inequalities); (ii) a set-theoretic Hopf monoid (the binomial transform of the sequence must be nonnegative). (Received June 27, 2011)