Sulfur trioxide is an important participant in reactions in the upper atmosphere and also in a number of industrial processes. It is a D$_{3h}$ planar oblate top whose spectroscopy is incomplete, perhaps in part due to its corrosive properties. We are engaged in a comprehensive investigation of the fundamental and combination-overtone bands of $^{32}S^{16}O_3$ as well as of the $^{34}S^{16}O_3$, $^{32}S^{18}O_3$ and $^{34}S^{18}O_3$ isotopic forms. High resolution (0.001 cm$^{-1}$) coherent anti-Stokes Raman scattering (CARS) was used at Oregon State University to determine for the first time the Q-branch structure of the IR-inactive $\nu_1$ symmetric stretching mode of $^{32}S^{16}O_3$ and its various isotopomers. The $\nu_1$ spectrum of $^{32}S^{16}O_3$ reveals two intense Q-branch regions, with surprisingly complex vibrational-rotational structure. The modeling of this has involved a subtle combination of Fermi resonance and indirect Coriolis interactions with nearby hidden states; $2\nu_4 (\ell = 0, \pm 2), \nu_2 + \nu_4 (\ell = \pm 1), 2\nu_2 (\ell = 0)$. The analysis of the perturbed $\nu_1$ spectrum was made possible by locating some of these states via concurrent infrared hot-band studies at PNNL by T.A. Blake et al. The results of this combined effort will be presented for $\nu_1$ of $^{32}S^{16}O_3$. 