Myxobacteria are Gram-negative, rod-shaped aerobic bacteria which have astonishing life cycles and upon starvation, undergo cellular morphogenesis converting to resistant myxospores that are multicellular fruiting bodies. Over the past two decades, these organisms have gained attention as an excellent source of bioactive compounds with novel structures. We have developed a research program directed towards the total synthesis of myxobacteria metabolites which has resulted in the production of a number of these molecules including apicularen A and 8-deshydroxyajudazol A. Current targets are the anticancer spiroketal spirodienal A and the diolide rhizopodin. In this presentation, details of the synthesis of some of these metabolites will be presented.