Cenote Zacatón
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exploration at sistema Zacatón. kristovich set a women's depth record of 169 meters (554 feet) in Zacatón in 1995, and Bowden made numerous sub-150 meter dives in the years from 1995 to 2000. several leads were explored, but no connecting passages between the cenotes were discovered.

the extreme depth of the cenote el Zacatón makes exploration by traditional scUBa impractical. as a result of this, a series of research proposals to develop a robotic, underwater cave-mapping robot were submitted to the national science foundation and the U.s. national aeronautics and space administration (nasa). the deep phreatic thermal explorer (depthx) was funded by nasa in 2003 in an award to stone aerospace in del Valle, texas. the depthx project included scientists and researchers from nasa, the University of texas at austin, carnegie mellon University, colorado school of mines, the University of arizona, la Universidad autónama de nuevo leon, southwest research institute, and a number of additional contributing institutions. many results from the depthx project are presented within this dissertation, primarily in chapter 3, but also in components of other chapters. after detailed 3-d mapping from the depthx probe revealed no underwater connections between the cenotes, and maps generated from depthx were similar to those published prior to the project (gary, 2000a; gary, 2001; gary, 2002; gary et. al., 2003a), although with much more detail. a great deal of scientific media coverage resulted from the depthx project (krajick, 2007 (Science); kumagai, 2007 (IEEE Spectrum); hansen, 2007; lay, 2007; mcmahon, 2007; connolly, 2007 (Washington Post); patterson, 2007 (Earth and Sky, A Clear Voice for Science); airhart, 2007; and many others).

the geologic study of sistema Zacatón has only occurred in recent years. prior to gary (2000b), no information had been published in any scientific literature, proceedings, or other documents. only information related to the exploration by Bowden and kristovich had been published in scUBa diving or caving magazines and journals. early abstracts and "gray literature" published in 2000–2005 presented the unique and extreme nature of sistema Zacatón. Work presented in this dissertation includes several articles printed in peer-reviewed publications, and unpublished information. the geologic process of volcanogenic karstification at Sistema Zacatón published in gary and sharp (2006) has been cited in several scientific journals (Bayari et al., 2009; Klimchouk, 2009; audra et al., 2009) and textbooks (ford and Williams, 2007; palmer, 2007; klimchouk, 2007).

STRUCTURE OF THE DISSERTATION
there are 6 chapters within this dissertation that document the variety of disciplinary investigations undertaken to understand how the karst of sistema Zacatón developed. chapters 2, 3, 4, 5, and 6 are prepared in the format of individual publications or manuscripts and chapters 2, 3, 4, and 6 have been presented in peer-reviewed publications prior to completion of this dissertation. therefore, some degree of repetition exists in these chapters.