Prospective diving scientists faced with up to a year of training prior to starting on their intended research often pursue less demanding fields. Traditionally, prerequisites of courses in subaquatic research techniques and technology have required that candidates be recreationally trained in basic scuba. Differences in recreational training standards and the quality of individual scuba courses then required that the first quarter of the research course be spent in review. Graduates of such courses were often exposed to discipline-specific techniques resulting in low enrollment and high course expenses.

Florida State University's Department of Anthropology in conjunction with the Academic Diving Program recently taught a relatively inexpensive undergraduate course entitled "Underwater Archaeology Field Techniques: An Application of Diving to Research". This multidisciplinary course was designed to expose students to the basic subaquatic tools and techniques of underwater research. This included, but was not limited to, site selection, survey strategies, data retrieval and data preservation. Additional course objectives were to provide training in basic and advanced scuba and upon completion produce a person capable of pursuing an underwater project under the direction of a graduate committee, principle investigator or employer.

Topics were presented in a modular fashion to encourage review, selected topic training or full training depending on the individuals needs. The lectures were presented in a logical progression to provide the student with a complete understanding of the various aspects of underwater research and how they are related. Materials learned in class were then applied to a real field situation in which class members assisted in the excavation of submerged Mastodon remains from the Ichnetucknee River State Park.

Prospective diving scientist faced with up to a year of training in techniques and technologies of professional scuba, needed to carry out scientific studies, prior to initial field research often pursue less demanding fields of study. Candidates must first take a basic and often advanced recreational scuba class. This is often followed by practice diving to gain additional experience before enrolling in the 100 hour course in basic research diving required by the American Academy of Underwater Sciences. Present day
graduates of such courses are often exposed to very discipline-specific techniques resulting in low class enrollment, high course expenses and irregular course offerings.

As a cost effective way of exposing students to the multi-disciplinary nature of underwater exploration the authors of this paper recently taught a single, relatively inexpensive undergraduate course in underwater research techniques at Florida State University during the Spring of 1986. The course, which was partially supported by the Florida Sea Grant College, trained students, whether recreationally scuba certified or not, in the required professional underwater research skills in one semester. Skills needed to accommodate for the many tasks required of the working diver required this course to produce upon graduation a person capable of pursuing an underwater project under the direction of a graduate committee, principle investigator or employer. It was also designed to serve those professionals already in the field who wanted refresher training in specific areas but could not attend the entire course.

The course entitled Underwater Archaeology Field Techniques: Applications to Diving Research was taught as a field applications lab to the Anthropology Department's Underwater Archaeology Method and Theory class. This was partly due to the fact that the majority of students (past and present) of this course have been Anthropology students trained to incorporate a multi-disciplinary approach to research. The authors have found that a multi-disciplinary approach to underwater research encourages multi-departmental participation involving Biology, Geology, Oceanography and other disciplines which utilize underwater data.

The course was designed to touch on a variety of topics. To increase course efficiency a standard modularized teaching format was used. This encouraged review, allowing selected topic training or full training depending on the individuals needs. Practicals offered in a workshop format provided information and training for faculty and students not registered for the class (i.e. photography, diver rescue and surface supplied air. Exams and open water practicals were offered for those students who were not previously certified to and diving standards. Students passing the test and other required steps were classified as "Restricted" divers, permitting them to dive under the auspices of FSU, with the opportunity to advance to the "Active" diver classification.

The class met twice a week for three hour blocks with single day weekend laboratories. The course format broke the first half of the 16 week semester into various sections. The scuba certification course lasted for an eight week period in which Tuesday sessions consisted of lectures, pool and open water dives devoted to basic underwater research procedures and technologies. Thursday sessions were devoted to professional diving skills development. Students already having certifications were encouraged to attend the lectures as a review. This also enabled the class members to become familiar with standardized information and methodology for research diving procedures. The latter half of the course provided sessions on different topics related to underwater research such as advanced diving physiology, diving procedures and project management. Evening pool sessions served as practical "hands on" experience prior to open field exposure to selected technologies. During weekends, in-water research and practicals exposed students to logistical and technical problems encountered in the field. Technological topics and field projects will vary depending on geographic area and emphasis of the course. Core topics utilized for our particular course included the following:

1) Topic and Site selection
2) Data Retrieval Techniques
Frantz and Stanton: *Training University Students.*

3) Survey Techniques  
4) Excavation and Recovery Techniques  
5) Preservation Techniques

Each topic was presented with a lecture followed by class discussion and participation. The lectures presented followed the National Association of Underwater Instructors standards and used the National Oceanic and Atmospheric Administration diving manual. The lectures flowed synergistically, each part developing from the preceding lecture until a complete understanding of the various aspects of underwater research and how they are related was achieved. Practicals and exposure to the technologies discussed in lecture were presented in a logical progression. This provided the students with the mental processes necessary to follow a project from the conception of the research through the actual field application of the research.

**ICHNETUCKNEE PROJECT**

An initial survey conducted along the Ichnetucknee River in Columbia County, Florida located the partially exposed remains of a prehistoric mastodon (Site 8Co174). Subsequent examinations showed the remains to be a complete six foot isolated tusk with rib and vertebral fragments. The State of Florida Archives Division of Archaeological Research enlisted the assistance of class members from the Underwater Techniques course to assist in the excavation and recovery of the mastodon remains.

A few points of concern must be addressed before using student volunteers in underwater archaeological research. The level of diving skills is critical since students must not only dive safely but they must perform a variety of skilled task such as mapping and photography. They must be familiar with the basic use of archaeological equipment and the proper handling of archaeological remains. The environment itself imposes constraints on field work. These include cold water conditions and the lack of communication. Instructions given on the surface are hard to remember underwater and observations made underwater may be forgotten on arrival at the surface. It was felt, however, that the skills and training received by members of the class were sufficient to conduct the excavation in a professional manner and at the same time provide the students with "hands on" field experience.

**Site Environment**

The Ichnetucknee is a highly erosive river flowing for approximately five miles in length before it empties into the Santa Fe River. The river temperature averages 72 degrees year round with excellent visibility and has an average discharge of 51 cubic feet per second near the head springs. The mastodon remains were located in approximately eight to ten feet of water, in the Simpsons Flat area, one mile south of the head springs. The remains were buried in white water washed sand resting on top of a limestone bed indicating a possible interglacial deposit although much further geologic research needs to be conducted on the area in question.

**Field Methodology**

A total of nine student volunteers and staff with members of Archive's Archæological Research Division excavated and recovered the mastodon remains in a one day period after several initial surveys of the area. A number of class periods were spent in
pre-dive planning and coordination including task description and assignments to prepare the students for the field situation.

The first task performed by the students after arriving on location was to construct a grid for the dual purpose of mapping and for the production of a photomosaic of the site and surrounding terrain. Project documentation was accomplished both by photography and videography.

Mapping of the horizontal dimensions of the site was accomplished by a bearing circle and chain attached to a 50 meter tape. Students were responsible for taking measurements, notes and keeping records of the day's activities.

Excavation of the tusk was accomplished with a four inch coupling jet with all the back dirt being screened at the surface. After removal of the matrix the tusk was reinforced with rebar and fitted with plastic ties. The tusk was then secured onto a piece of plywood and floated to the surface. Today the tusk is in wet storage at Florida Archives awaiting preservation treatment.

The overall success of this archaeological project would have been difficult and expensive without the assistance of the student divers. At the same time each student was encouraged to participate in each phase of the excavation enabling them to apply what they had learned in class to a real field situation.

FINAL REMARKS

Unfortunately, as was to be expected, the course was not trouble free. The course was designed to touch on a variety of topics. Due to time constraints not all aspects of underwater research technologies and techniques could be covered. This meant that some topics relevant to someone's research may have been left out. More flexibility in the topic selection, depending on course emphasis and project planning, may be an appropriate solution.

It was also observed that some of the more experienced divers felt that the class did not challenge them intellectually enough. This was partly due to the fact that the first and second course (a graduate course in advanced diving techniques) have been very inconsistently taught. When this course was finally taught all interested students signed up not realizing that this was basically an undergraduate course. The solution then, would be to consistently teach the first and second course so that those students needing basic underwater research training could attend the first course and those with more advanced skills could attend the second course.

As for time, money and logistical constraints we know of no simple solution when dealing with weather, limited budget and equipment that malfunctions.

In conclusion, the authors feel that the course was well received by the students and faculty of the campus at large. It was a relatively inexpensive way for students to develop the basic skills necessary to conduct underwater research and expose them to the variety of technologies, techniques and options for underwater exploration.