

# The School for Field Studies

1982 Expeditions



TRAINING EXPEDITIONS TO SPECIAL ECOSYSTEMS AROUND THE WORLD

## A Personal Invitation

This catalogue of adventurous training expeditions to remote settings is a special invitation from me to two hundred young people who want to invest themselves in a set of unique opportunities.

Our research expeditions require little experience but do demand the strong curiosity and maturity that are essential to any independent situation. A working field team needs people with various skills: collecting data, keeping journals, taking photographs, keeping spirits up, pitching in whenever the occasion arises. Everyone contributes something different, whatever he or she does best.

Frankly, I wonder how long these opportunities will last. Will the black rhino survive the next decade of poaching in Kenya? Will the harbor seals still be breeding in Glacier Bay? Will Little Cayman's coral reef remain undisturbed? All citizens of the planet and each of us personally need to understand the subtle workings of these complex ecosystems *now*, so informed choices about the future can be made. Before it's too late. Every contribution toward that most important goal helps.

My personal satisfaction from involvement with the School comes from witnessing the transformations that occur in our students from their participation in challenging expeditions to the earth's wild places. They leave no one untouched in one way or another.

For my contribution to these pressing studies, I am headed off to Kenya this January to help Dr. Langman's rhino project. And though I've been there before, I expect close encounters with hulking rhinos and herds of giraffe and wildebeest to alter my perceptions in ways I can't even imagine now. Next June, maybe I can get away to help the Grand Canyon impact study, and then there's the Cayman reef mapping in July, and the...

I look forward to hearing from you soon if you are someone who feels that direct participation in rich learning environments is right for you.

Jim Elder, *Director*



Jim Henderson

## SFS Expeditions: Research, Learning, and Action

**The School for Field Studies** is a nonprofit educational organization. Our field expeditions to special ecosystems around the world focus on a scientific objective while training participants in field methodology, academic material, and teamwork. These projects are real-life problem-solving situations in which we believe comprehensive learning can take place. They also present an opportunity for you to get involved, to turn your concern and interest into action, by helping to further understanding of one of our most important natural resources—our wildlife and wilderness.

**There are many reasons to join an SFS expedition. You might join to:**

- **help a valuable research effort**
- **earn extra or needed credit for college**
- **get first-hand field experience in a science**
- **enhance your background with an unusual experience**
- **test out a discipline which might become your career**
- **explore an exciting environment**
- **learn and use outdoor skills**



*"It appears to me that nothing can be more improving to a young naturalist than a journey in distant countries. . . The excitement from the novelty of objects, and the chance of success, stimulates him to increased activity. . . In a moral point of view, the effect ought to be to teach him good-humoured patience, freedom from selfishness, the habit of acting for himself, and making the best of every occurrence."*

*Charles Darwin  
Journal of Researches  
HMS Beagle*



## 1982 Curriculum

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**The School for Field Studies is different.** Our curriculum, which combines learning with research, is unmatched:

## Research

The focus of each expedition is a research project. The projects are not simulations or demonstrations. They address real scientific problems and concerns. As a field team member, you will share in the responsibilities of the research.

You might help to relocate endangered black rhino in Kenya, record the feeding habits of whales in the North Atlantic, or document the fragile marine life of a coral reef.

*My career goal is veterinary medicine and this was the main reason for my involvement in the research project. The first-hand experience of "doing" and being a participant has been very valuable to me and will help me to achieve my goal. It was hard work, but an exciting and worthwhile experience.*

*Catharine Mannion, Davis, California  
Animal Physiology Expedition, Kenya, 1980  
Zoology Expedition, Galapagos, 1981*

## Unique Challenges

Our expedition teams accompany members of the Kenyan Game Department on game counts, work on giant Galapagos tortoises in their natural habitat, and conduct field observations within the restricted zones of Mount St. Helens. These opportunities are rare, if not unique. They are possible because our students are willing to help while they learn, and we believe that this is in fact the best way to learn—by being involved directly with the subject material.

*I will always remember the time when, hiking out of our glacial valley research area, I stopped at the top of the ridge. I looked back over an endless glacier, then turned and looked out over the open sea. And though I was cold and soaked to the skin and hungry, that moment made it all worthwhile.*

*Robert Becker, Holden, Massachusetts  
Geology Expedition, Iceland, 1981*



Terry Plank

## Special and Remote Ecosystems

Many of our program sites are not directly accessible to other groups, tourists, or outsiders. For example, Little Cayman is one of the few remaining Caribbean islands still preserved from tourism. All of our sites (with the exception of the Gulf of Maine) require special permits to gain access or conduct our work.

*This expedition allowed us to view Kenya's wildlife and game management as a tourist never could. It allowed us to work alongside of the Game Department, not just to watch them in action.*

*Francesca McBride, Wilmington, Delaware  
Zoology Expedition, Kenya, 1981*

## Participants

Our curriculum is designed for and attracts motivated students. Unlike programs that mix widely different age groups, we believe different ages need different types of programs. Our strengths and interests lie in designing projects for young people. The average age of our participants is 20 to 21 and has ranged from 16 to 26. You will live, work, and travel with a team of peers who will share many of your interests.

*I learned a great deal about how islands form and about the ecology of coral reefs. Because of that experience, I plan to continue work in biology and am looking into colleges that offer rugged marine ecology and biology courses. I also went out looking for a job in marine sciences the day after I arrived home and am now doing part-time lab work at Emory University. Thank you for opening a new door in my life.*

*Valleau Hopkins, Atlanta, Georgia  
Marine Science Expedition,  
Little Cayman Island, 1981*



## Training

You do not need previous training or experience. Our purpose is to train you in the skills you will need—in research methodology, teamwork, a scientific discipline, and outdoor skills. No other single program can give you training in all three areas.

## Academic Credit

Many of our students receive academic credit for their work on an SFS expedition. (See p. 27)

## Leadership

Our faculty are generally between 28 and 40 years old. They are chosen not only for their scientific and educational skills, but also for their sensitivity. They have spent years in the field and communicate their enthusiasm for their subject material. They are there to insure that all of our goals are met—both the research objectives and the training goals. Most have worked with us before.

*The leaders were two of the most enthusiastic people I've ever met. Their appreciation for the underwater world quickly spread to the rest of the group. They supplemented the dives with a great deal of added information and anecdotes which made our dives even more meaningful.*

Gay Reidinger, Cincinnati, Ohio  
Marine Science Expedition,  
Little Cayman Island, 1981



Robert Becker

*It was a once-in-a-lifetime opportunity to live with a group of people who were interested in what they were doing and so much fun to work with. The expedition dispelled a lot of misconceptions I'd had about myself and about science. I'm a city person and I never thought I would enjoy living in an isolated wilderness.*

Hillary Kruger, New York, New York  
Zoology Expedition, Galapagos Islands, 1981



## Lower Costs

Our fees are at least 35% to 50% lower than the costs of other programs of comparable length, regardless of the nature or purpose of the program. Financial aid and scholarships are available. (See p. 27)

## Quality not Quantity

Each year we select only the ten or so best projects and then devote the time and attention to the details which are necessary to successfully organize each expedition. We also limit the size of each expedition to 10 to 12 students. The ratio of faculty to students is generally 5 to 1.

**An SFS expedition is not a vacation.** It is hard work. Fieldwork requires long hours, concentration, and patience. Working and traveling with a team require understanding, cooperation, and flexibility. Living conditions in remote wilderness areas can be primitive.

But away from the distractions of modern everyday life, you can become thoroughly *involved*: in the project, in the environment, and in the group. You can experience the rewards of your work and the satisfaction that comes from meeting the challenges, overcoming the hardships, completing the job, and being involved in something bigger than yourself.

Expeditions are graded according to levels of academic background and outdoor experience (see p. 26). We can help you to select an expedition with the right combination of challenge and learning for you.



Jim Elder

# Ecology of Natural Disasters/Mount St. Helens

**Purpose:** To investigate the recolonization process of plants and animals in the devastated area.

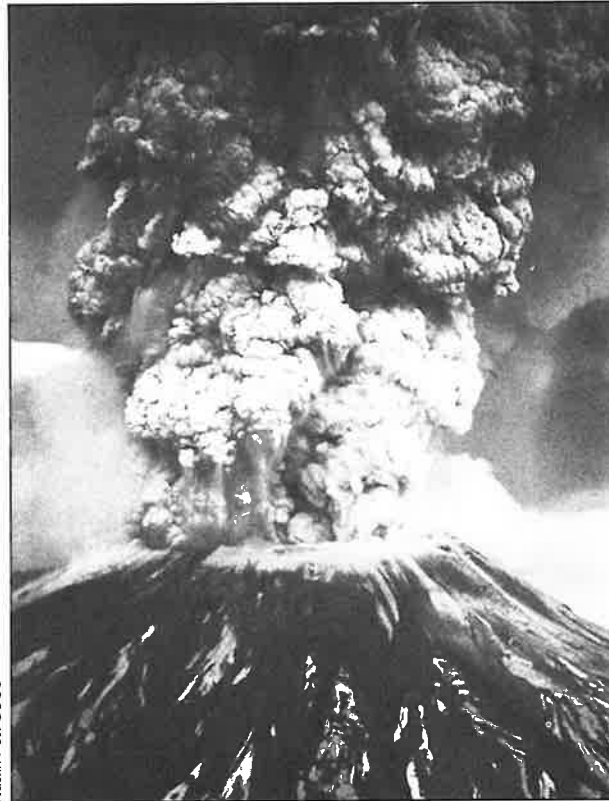
## Site

The "Ring of Fire" is a chain of active, dormant, and recently extinct volcanoes that stretches from British Columbia to California. It includes Mount Garibaldi, Baker, Rainier, Jefferson, Shasta, Lassen Peak... and Mount St. Helens.

Since the end of the Ice Age there has been at least one major eruption in the Cascades every century. Often it was Mount St. Helens, which the Klickitat Indians called Tah-one-lat-clah, "Fire Mountain." We know that Mount St. Helens has seldom lain dormant for more than 150 years; it had erupted in 1857. In 1975, U.S. Geological Survey scientists correctly predicted that the volcano would be heard from again before the end of the century.

It happened in 1980. Following a series of relatively small earthquakes, the mountain first erupted in a cloud of steam and ash on March 27. For seven weeks, periods of quiet alternated with still more bursts of ash and steam. A growing swarm of earthquakes and harmonic tremors indicated an upward movement of lava within the peak. Then, on April 23, an ominous bulge was discovered near the summit. For the next three weeks, the bulge rose by as much as 4 to 5 feet a day. On May 18, at 8:27 a.m. and 8:31 a.m., Mount St. Helens was shaken by a pair of strong earthquakes. The huge bulge began to quiver. At 8:32 a.m. — a cataclysmic explosion. Mount St. Helens blew itself apart in one of the most spectacular eruptions in history. A vast mushroom-shaped cloud soared 12 miles into the stratosphere. The mountain had hurled a huge portion of its mass into the air with a force 500 times more powerful than the Hiroshima bomb.

A pyroclastic flow of hot rocks and searing gas (estimated at 800°C) accompanied an all-destroying shock wave that levelled everything in its path. Torrents of scalding mud followed. Hot ash rained from the sky. A fan-shaped area as great as 30 miles to the north and northwest of the mountain was devastated.



*In a titanic explosion, Mount St. Helens blew itself apart in one of the most spectacular eruptions in history.*

The slopes which had been a botanical and zoological garden were transformed into a desolate moonscape. A countryside of pristine wilderness disappeared. Centuries of forest growth were erased; 156 square miles of forest and trees were flattened or ripped up by their roots.

The Washington State Game Department estimated that 1,500,000 wild animals and birds were killed, and 195 square miles of wildlife habitat destroyed, along with 154 miles of trout streams and 26 lakes. Spirit Lake, one of the most beautiful sites in the Northwest, was turned into a boiling mud pond.

Subsequent blasts occurred on May 25 and June 12. Although another explosive volcanic eruption similar to the one on May 18 is unlikely, geologists believe that Mount St. Helens will be an active volcano for decades. (Lassen Peak, the last Cascade volcano, spewed forth lava, mud and debris 392 times between 1914 and 1917.) There has been some steam venting and lava flow as recently as August 1981. The greatest danger, however, is from flash floods. The lack of ground cover to prevent major water runoff along with the steep, unstable canyon walls created by the explosion, has created a high potential for serious floods.

## Background of the Research

Although there are more than 500 active volcanoes in the world, most of them are in sparsely populated regions. Mount St. Helens is the first volcanic event in the forty-eight contiguous states in sixty-three years. The devastated area presents us with a living laboratory to investigate the ecology of this natural disaster.

The immediate area can be divided into quadrants according to the degree of the blast's impact. The north was devastated and severely burned; the east received the most ash fall and a great amount of mud flow when the snow cap melted; the west includes the Toutle and Cowlitz Rivers which were the hardest hit of the rivers; the southern area suffered the least damage. The difference of the impact in these quadrants will make interesting comparative studies.

In many places, the stream beds are the only habitats with any existing life. Aquatic fly larvae were the first form of insect life to return. (A certain species of caddis fly seems to be using the ash in its larvae cases.)

Of the higher terrestrial plant life, fireweed is recolonizing fairly quickly. The giant Douglas fir, foremost

among the obliterated lifeforms (and one of the most economically important), is beginning to grow through the ash. In some areas, the common lupine (a root stock legume) is the only plant life that has yet reappeared from its tomb of ash.

Some animal life has returned. Small rodents and coyotes that prey on them are being spotted in the devastated areas. South of the volcano, elk and deer survived and are now common in this area.

## The Project and Training

We will investigate some of the plants and animals involved in the recolonization process. Team members will select certain "indicator organisms," or those plants and animals which can show us how nature is recovering from the eruptions. The study organisms will be selected by observations of both the impacted and non-impacted areas. Those which live in both areas will be quantified and comparisons will be drawn. We will select from the available stream insects, land plants and small forest animals.

Based on prior studies, fireweed and lupine will be useful for the study because they grew in the impacted area before the eruption, and they are among the first plants to return. Transects will be drawn and comparisons will be made of the numbers and sizes of these plants in both the impacted and non-impacted areas. Stream insects are ideal for study because they are among the first recolonizers and because they will be the basis for the establishment of the new food webs (as fish begin to appear and to feed on them). The most easily collected and identified groups also happen to be the most common in the two comparison areas. They are the true flies, mayflies, caddis flies and stoneflies. Counts of numbers of each insect group will be made and these counts will be compared between the affected and non-affected areas.

The Douglas fir, easily the most economically important species in the study area, is also an excellent study organism. Counts of young seedlings (less than two years) will be made and their repopulation estimated for the impact zone.

A variety of possible organisms for study exists, and final selection for our work will depend upon the interests of the applicants and the status of the study area immediately prior to departure. As there has been little funding of research in this area, this will be a pioneering effort. We will be collecting some very basic, but original data.

Academic credit may be available through Ohio State University.

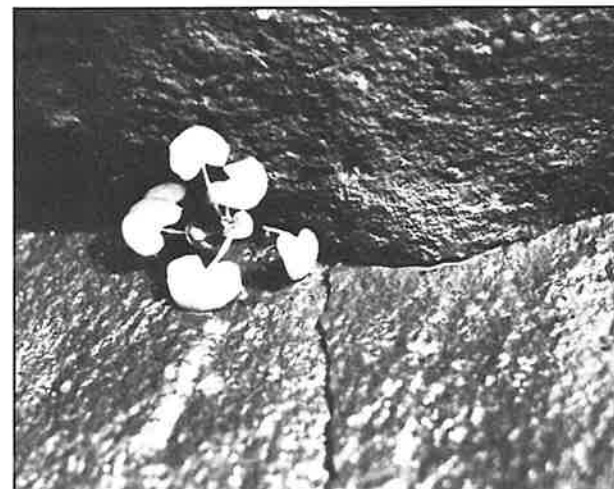
## Field Conditions

Our base camp will be in the nearby town of Cougar, to the south of the volcano. We will make daily trips (only allowed by researchers during daylight) into the "Red Zone" (levelled areas) and "Blue Zone" (ash and mud flow areas). These are areas which have been closed to public access. To monitor any seismic activity, a two-way radio system will be attended at all times, with our base station number on file with the Forest Service Emergency Coordinating Center.

This project is, as always, contingent upon both the safety of the area and the necessary permits.



*A countryside of pristine wilderness was transformed into a desolate moonscape.*



*Life has begun to reappear from a tomb of ash.*

## Highlights

*The first awesome sight of the devastation area. Access to an area not open to the general public. Seeing the first signs of returning life. The sun, storm clouds, and drama of days in the high mountains.*

## Leader

**Bart Baca** currently teaches in the College of Biological Sciences at Ohio State University. He received his Ph.D. in Botany from Texas A&M University. He has conducted studies and taught courses on the impact of the Mt. St. Helens eruption. He led a 1980 pilot expedition to investigate the immediate and long-term effects of the Mexican oil spill.

**When:** Team I: July 6-July 30  
Team II: August 1-August 25

**Level:** Team I: A Team II: B

**Student fees:** \$860

**Departs from** Portland

# Zoology and Evolution/The Galapagos Islands

**Purpose:** To collect data on thermoregulation in giant tortoises.

## Site

The Galapagos Islands are a remarkable chain of islands lying astride the equator, 650 miles west of the coast of Ecuador. The archipelago was formed by the growth and eruptions of submarine volcanoes. Black-ribbed cliffs and rugged shorelines rise up in a vast expanse of sea. They are stark, dramatic, and forbidding. Charles Darwin described them as "a strange Cyclopean scene" and "a little world within itself." The discoveries and observations he made on these islands during his historic voyage on the *HMS Beagle* presented him with some of the vital clues which led him to his Theory of Evolution.

The Galapagos are islands of striking contrasts and startling diversity. Cacti and other arid zone plants blend into moist forests of modified sunflowers. Although plants and animals are clearly related to various species of North and South America, they have evolved into unique, often bizarre forms, well adapted to their unusual surroundings. Birds and reptiles are the dominant vertebrates. Many have hardly changed since prehistoric times. A visitor to this



*This showcase of evolution presents a remarkable aggregation of plants and animals found nowhere else. 75% of the birds are endemic species and easily identified.*

curious world gets the strange and repeated sensation of having slipped back a million years in time.

Although the archipelago straddles the equator, the climate during this season tends to be cool and, at lower levels, dry. The cold waters of the Humboldt Current, originating in Antarctica, upwell off the coast of Peru. This surface water is pushed out to the islands by the southeast tradewinds. The warm air and cold waters create an environment which permits a unique array of plants and animals. It may be the only place in the world which has flamingos and penguins in close proximity.

## Background of the Research

The ecological balance of the Galapagos has been upset and disturbed. The early visitors and settlers killed many of the tame indigenous animals and introduced foreign plants and animals, thus changing the original flora and fauna. Non-native animals introduced by man (dogs, cats, pigs, and goats) have gone wild and pose a serious threat to the indigenous wildlife.

"Galapagos" means "tortoise" in Spanish, and no other animal better characterizes the unique nature of these islands. But this atavistic giant is high on the list of endangered species. Vast numbers were first taken by the buccaneers and pirates of the 17th century and later by the whalers and fur sealers of the 19th century. They were taken as sources of meat, oil, and water. Although man is no longer an enemy, he has exposed them to new threats by introducing non-native animals which dig up nests, attack the young, and compete for available food.

Very little ecological information is available concerning the Galapagos tortoise. Fundamental research is vital to plan and care for them and to help them replace themselves.



*Remnants of the Age of Reptiles, these goliaths seem to have lumbered unwittingly into the modern world.*

## The Project and Training

This is the second year of a research project to study thermoregulation and inertial homeothermy in Galapagos tortoises: *to what extent* and *how* tortoises control their body temperatures relative to that of the environment. Like all reptiles, they are ectothermic animals. They derive the majority of their body heat from external sources; nevertheless, they are able to maintain their body temperature within narrow ranges.

We will examine the relationship between behavior and environmental conditions. We will observe and record the behavior of tortoises (time in the sun, time in the shade, as well as time devoted to various behaviors allowing formulation of a time budget) while monitoring environmental parameters (such as solar radiant intensity and ambient temperature).

The body temperature of tortoises will be monitored, both rectally with a thermometer, and with temperature-sensitive radio transmitters (fed to the subjects). These transmitters emit radio pulses, the frequency of which is temperature dependent. This technique allows body temperature to be monitored without disturbing the behavior of the tortoises.

The heating and cooling rates in tortoises of various body sizes will be measured. Large tortoises should heat and cool more slowly than small ones. The question we will be addressing is: *Do these tortoises attain a large enough body size to become inertial homeotherms?* We will try to determine if the heat stored by their large body mass is sufficient to keep their body temperature from dropping to that of their environment.

Our conclusions may also have broader theoretical implications as inertial homeothermy has been suggested as a possible step in the evolution of endothermy (warm-bloodedness), characteristic of modern birds and mammals and perhaps some ancient dinosaurs.

Introductory presentations and discussions will explain the theoretical and scientific background necessary to understand the project. Students will be trained and assisted in conducting the tests and measurements and in collecting and recording the data. Through daily observations and discussions with the leaders, participants will have an opportunity to learn first-hand about the natural history of the Galapagos, the evolu-



Linda Clegg

A 500-lb tortoise has a giant appetite.

tion of animal groups, and the ecology of plants and animals on the islands.

Academic credit may be available through the University of Florida.

## Field Conditions

This expedition will be an especially rigorous and challenging one. Acceptance to the project will be highly competitive.

Team I: All field work will be conducted on the island of Santa Cruz. We will set up our base camp near the Charles Darwin Research Station. A major part of our work will be done in the highlands where an estimated 1,500 tortoises exist in the wild. Living conditions here will be primitive.

Team II: Approximately half of our work will be at the Research Station. At least 10 days will be spent on Volcan Alcedo on the island of Isabella. This portion of the expedition will be very rugged.

Although there will be little actual rainfall, we can expect cool temperatures and persistent overcast in the form of fog, mist, and drizzle.

The Ecuadorian Park Service and the Darwin Research Station maintain a very strict program of conservation on the islands. Nine-tenths of all the land is National Park and visitor usage is rigorously restricted. Outsiders usually have to stay on chartered cruise boats. Permission for groups to live and work on the islands is a rarely accorded privilege. Because of the serious intent of the research and the quality of work done by the SFS field team of last year, we expect to be granted the necessary permits and permission; however, the project remains tentative until that time.

## Highlights

*The first encounter with a tortoise in the wild. The dragon-like iguanas. Visiting other islands on the "Beagle IV." Swimming with the sea lions. The dramatic life and landscapes of "Darwin's Islands."*



Hillary Kruger

Marble-sized transmitters which are fed to the tortoises register their core temperatures.

## Leader

**Mike Konecny** has lectured in ecology and vertebrate biology at the University of Florida and at the Charles Darwin Research Station on the Galapagos. He has conducted numerous research projects on the islands. He expects to complete his Ph.D. before the project begins.

**When:** Team I: July 5 - July 30  
Team II: August 1 - August 26

**Level:** B

**Student fees:** \$1360

**Departs from Santa Cruz**

# Marine Science/Little Cayman Island

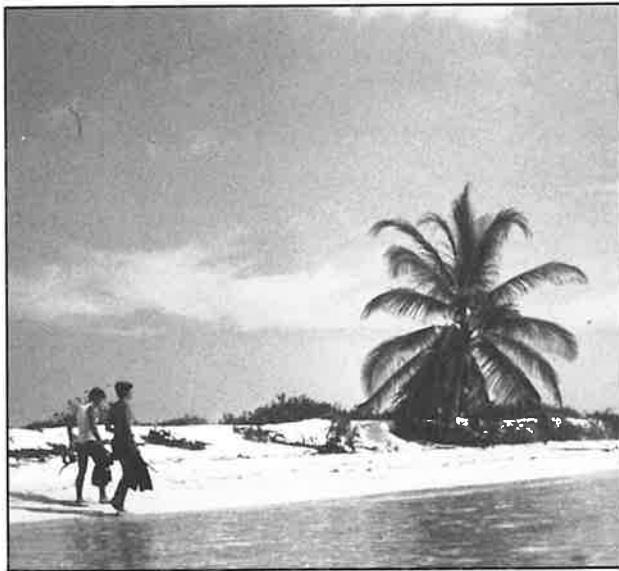
**Purpose:** To provide baseline data on a fragile and complex marine ecosystem.

## Site

The Caymans are three small islands which lie almost dead center in the clear Caribbean Sea and nearly equidistant from the islands of Jamaica and Cuba. Hundreds of miles of open sea separate this little cluster from its closest neighbors.

The islands are the tips of three mountain peaks which have weathered flat and are now filled with sand and coral. Below the surface, the sides of these mountains drop sheer for thousands of feet; a few miles away, the ocean floor itself plunges to a depth of 24,000 feet.

The water surrounding the Cayman Islands flows into the Caribbean from the North and South Equatorial Currents. As the currents cross the Atlantic, silt settles from the water and by the time the water reaches the islands, it is crystal clear. Underwater visibility can be in excess of 200 feet. Because there is no silt to choke and kill coral polyps, the reefs have grown uninhibited for thousands of years, yielding unparalleled underwater scenery.



*Little Cayman is one of the few remaining wilderness islands.*

Cayman reefs vary greatly, from shallow coral gardens to spectacular diving walls dropping straight down for hundreds of feet. These magnificent coral walls which circumscribe the three islands are a unique feature of the underwater world. The north side of Little Cayman Island may present the finest diving wall in the world, and is certainly one of the least explored.

Marine life flourishes on the steep coral walls and in the shallow coral gardens. The reefs are composed of an exceptionally wide variety of stunning species of colored coral (as well as black coral trees), on which grow gigantic sponges of every color, shape, and size. Clouds of colorful fish and all types of marine invertebrates thrive on the reefs amid huge seafans, seawhips, and feathery sea plumes.

Little Cayman Island is one of the few remaining wilderness islands. It is ten miles long, two miles wide, and has a permanent population of about twenty people. It is virtually undeveloped; it has no hotel, no marina and just a landing strip for small cargo planes.

## Background of the Research

The remote and varied oceanic islands of the world have experienced in the last two or three decades an insidious metamorphosis. Both commercial development and tourism have seriously degraded marine environments. For this reason, it is imperative that conservation and protection of the few remaining undisturbed areas in the Caribbean are begun now.

The coral reefs of the Caymans, and Little Cayman in particular, are among the world's most spectacular and pristine. They are also Grand Cayman's prime tourist resource. Yet baseline data on the distribution and abundance of sublittoral biota are lacking. Without baseline data, it will be impossible to assess the potential or real impact of future commercial or industrial developments on the sublittoral coral reef ecosystem of Little Cayman.

Our objective will be to continue to add to baseline studies which we began last summer on the marine subtidal ecosystem of this remote and still relatively undisturbed Caribbean island.

Since most aspects of the research program will involve the use of SCUBA, SCUBA certification is required for participation in this project. This project is divided into three teams according to the level of diving ability and experience as well as to the level of academic interest. Team I & Team II are designed for students who have little diving experience. Team III and Team IV are for more experienced divers. Team V is for experienced divers who also have some training in the methods of marine science research.



*The world below the surface is a kaleidoscope of shapes and colors. Marine life flourishes in this crystal-clear water.*

## The Project and Training

Studies will deal primarily with the abundance and distribution of coral reef animals; they will also investigate interrelationships among reef fishes, benthic invertebrates, and the surrounding plankton community. By increasing their knowledge and understanding of population biology and the complex ecology of a coral reef, all participants will gain an enhanced appreciation for the delicate balance of a marine ecosystem.

Working as a research team underwater will provide students with unique challenges in communication and cooperation. Seminars and lectures will cover topics such as: the geological history of the Caribbean and Caymans, oceanography of the western Caribbean, the biology and ecology of corals and coral reefs, the impact of modern development and tourism on Caribbean islands, underwater photography and research techniques.

**Team I** (January 6 - January 29) and

**Team II** (May 3 - May 25)

We will continue a broad, general survey of the subtidal marine environment. In order to maximize our efficiency and provide reference points in this qualitative survey, we will establish 25 x 2 meter transect lines in select areas covering the three major zones of the reef system: back reef, crest, and wall. Collection, identification, and rough charting will be done on the corals. Fishes will be identified and censused. Notes on topography, clarity, interesting biological interactions and other physical and biological parameters will be recorded.

**Team III** (June 10 - July 3) and

**Team IV** (July 6 - July 30)

We will select study sites with a high diversity of coral and fishes, relatively easy accessibility, susceptibility to impact from future developments, and high intrinsic beauty and interest. We will establish quadrats on the reef in each of the major zones and begin a quantitative survey of the corals within each quadrat.

General comparisons of the biotas of the major reef zones will be made and discussed in relation to environmental parameters such as clarity, turbulence, topography, depth, and exposure. Lab time will be devoted to the taxonomy and identification of corals, invertebrates, and fishes. We will also compile a permanent island reference collection of corals.

**Team V** (July 30 - August 20)

We will continue analysis of the quadrats established by Teams III and IV to verify the repeatability of the observations. When we have established the reliability of our quadrat data, we will begin research on specific projects.

Some of the projects we may select include: • the distribution of planktivorous, herbivorous, and carnivorous fishes in relation to substrate complexity; • nocturnal feeding migration in grunts; • diurnal/nocturnal changeover on marine fishes and errant invertebrates on an isolated patch reef; • sponges as microhabitats.

Motivated students with research experience may undertake projects in pairs or groups, or carry out research projects of their own design. Seminars and discussions will include studies and specific reports related to the research project(s) we select.

## Field Conditions

Little Cayman is not a resort. It is an isolated and underdeveloped island, removed from the distractions (and amenities) of tourism. We will have use of a small complex on the southwest shore; one building will serve as a dormitory; the other has a kitchen and dining area. The complex has its own generator for electricity and cold running water. There is one phone on the island for emergency use; a hospital is 15 minutes away by plane.

As on all our expeditions, participants will share all chores, including cooking. There are very few special health hazards. Several stinging marine animals are common, but are easily recognized and avoided. Mosquitos, however, are abundant and unavoidable.



Participants can usually count on two dives per day.



Leader Henry Genthe gives one of his afternoon "lectures."

## Highlights

*The first face to face encounter with a nurse shark. Night diving. Seeing 100 feet down with crystal clarity. Catching your own fish for dinner. Juggling lessons from Henry Genthe.*

## Leader

**Henry Genthe** has had many years experience working as a marine biologist in expeditions all over the world with Sea Education Association and Jean Michel Cousteau. He has taught marine sciences at the University of California at Santa Barbara, where he also received a Masters in Biology. He has led tropical natural history and marine biology tours to the reefs of Roatan Island, Honduras. He is a certified SCUBA Instructor.

**When:** Team I: January 6 - January 29

Team II: May 3 - May 25

Team III: June 10 - July 3

Team IV: July 6 - July 30

Team V: July 30 - August 20

**Level:** Teams I and II: A Teams III, IV and V: B

**Student fees:** \$1,280

**Departs from** Little Cayman Island

# Ecophysiology/Kenya

**Purpose:** To study the environmental factors affecting the survival of black rhinoceros.

## Site

Kenya harbors perhaps the greatest assortment on earth of wildlife still to be seen in its natural habitat.

A country slightly smaller in size than Texas, it presents a kaleidoscopic variety of geography and geology. Its terrain ranges from harsh, dry desert through arid plains and sunny grasslands, to tropical rain forests and snow-capped mountains. Mount Kenya, a 17,058 foot peak rises almost directly on the equator. A string of beautiful blue lakes is the result of the earth-cracking events that created the great Rift Valley, perhaps the most impressive geological fault on our planet.

Kenya is a land of contrast and drama. Lions stalk, kill, and feast on antelope only a few minutes away from Nairobi's modern skyscrapers. It is not unusual to come across a pack of weirdly laughing hyenas or a scurrying warthog, its ropelike tail rising vertically into the air. There are elephants — including old bulls, their ears tattered from many battles, their tusks discolored with age.



Vaughan Longman

*The black rhino, the largest mammal in the equine family, requires a great deal of research to preserve it from extinction.*

The people come from strikingly different backgrounds. The Masai tribe are an especially interesting group of people. Tall, slim and graceful, their elaborate hairdos are kept in place by ocre-dyed mud; enormous earrings and colorful ankle bracelets are worn by both men and women. They live in small baked mud huts in villages, few having been integrated into city life. The nomads, tribal kingdoms, Arab culture and European influences all add to the rich heritage of this growing independent African nation.

Participants will gain an appreciation of the people, as well as the ecology of this part of Africa.

## Background of the Research

The population of black rhino in Kenya has decreased dramatically within the last years to a count of only several thousand. At the same time, the price of rhino horn has risen so drastically that, despite official efforts to protect them, well armed bands of poachers still hunt rhinos in many areas of Kenya, including some reserves and national parks.

The Kenyan Game Department has begun a large-scale program to translocate rhino and other threatened animals from high-risk areas to safer habitats. However, scientific information on the *suitability* of the new habitats for these animals is lacking.

Poaching and translocations are not the only problems facing the black rhinoceros populations. Although these large animals (1000-1500 kg) seem to be able to use their body mass to regulate their body temperature (and thus reduce their immediate dependence on water), their calves may need to thermoregulate behaviorally. Therefore, they need to be placed in a habitat which will fulfill their specific needs not only for food, but also for water and protective shade covering.

Data and information on the dependence of rhino on watering areas, the relationship of the cow and the calf, and how black rhino thermoregulate, are needed. This will help scientists' efforts to evaluate the suitability of possible habitats, to facilitate calf survival, and to avoid more generalized problems which have arisen in the past.



Marcia Hyslop

*Participants get hands-on experience with some of the world's largest and most exotic animals.*

## The Project and Training

In the past, the problems of catching and making measurements on animals weighing as much as a ton have made large animals relatively inaccessible. Tele-metric equipment is now available which allows the remote monitoring of a wide range of physiological parameters. The techniques for holding and capturing animals have been advanced to a point where the safety of all involved, particularly that of the animals, is assured. (Until recently, a capture put such stress on the animals that severe questions arose as to the wisdom of such procedures.)

The project will include a study of behavioral, eco-physiological and thermoregulatory factors.

**Collecting behavioral data:** The first portion of this study will involve tracking rhinos. We will locate and follow by range rover radio-collared individuals. One pair will be observed continuously. We will record behavior movements and drinking frequency. Our portable weather station will record several environmental parameters. The radio collars also transmit ambient temperatures which will be included in our data collection.

**Thermoregulation and heat balance:** In the second phase of this study, rhinos will be tranquilized, captured, and held in boma (wooden cages) where they will be monitored and submitted to a number of tests and measurements including oxygen consumption, surface, nasal and rectal temperatures. Environmental tests on soil and air temperatures and light intensity will also be performed.

Each member of the expedition team will learn how to perform the tests, take the measurements and operate the equipment. The field methodology and recording procedures, as well as the ecosystems and politics of East Africa, are all part of the curriculum.

We will live in the game parks, and work directly with members of the Kenyan Game Department. Students will acquire hands-on experience with some of the world's largest and most exotic animals. This is an opportunity that goes far beyond the most obvious attractions of large animals and spectacular terrain. The team will be investigating the interrelationships of vegetation, climate, environment, and animal life and behavior. Especially for students interested in wildlife management or veterinary medicine, this will be an unparalleled experience.

## Field Conditions

Do not expect a safari in a zebra-striped minibus through half a dozen national parks, with each day's destination a modern game lodge. (Students who want to travel to other sites in Kenya before or after the project may consult us for information and advice; and in particular, a week's climb of Kilimanjaro can be arranged after the expedition if there is enough interest and the border is open).

We will work in Nairobi National Park which has a population of about 30 wild and several penned rhino. The tracking work will be done on recently translocated rhino in Meru National Park and in Amboseli National Park. Our rough tent camp at Nairobi Park is located in a conservation area within 20 meters from the Park's border. A variety of plains game (gazelles, impala, giraffe and lions) will be regular visitors nearby. All water must be brought into the camp and thus showers will be limited.

The constraints and complexities of working in Kenya make the logistics very difficult to plan in advance. Patience and flexibility to adapt to unforeseen problems with vehicles, park permits and other inconveniences are essential. This spontaneity enhances the adventure of the experience.

Academic credit may be available through Wellesley College.



*In the past two years of this project, participants have worked directly with members of the Kenyan Game Department in patrolling and capturing animals.*



*Dr. Langman's research has focused on the physiology of large animals.*

## Highlights

*The howl of hyenas just outside camp at night. The tough, leathery feel of a rhino's skin. The thrill of a rhino capture. The harsh brightness of the Kenyan sun.*

## Leader

**Dr. Vaughan A. Langman** has spent seven years in Africa, four of which were spent living and working in the bush. He has also spent three years living in Nairobi teaching veterinary physiology at the University. He is fluent in two African dialects, and received his Ph.D. in Zoo Physiology. Presently, Dr. Langman holds a position as Assistant Professor of Animal Physiology at Wellesley College. He has conducted this project for the School for Field Studies for the past two summers. SFS Director **Jim Elder** will co-lead the January expedition team.

**When:** Team I: January 2 - January 30  
Team II: May 1 - May 28  
Team III: June 5 - July 1  
Team IV: July 3 - July 30  
Team V: August 1 - August 28

**Level:** Teams I and II: A  
Teams III, IV, V: B

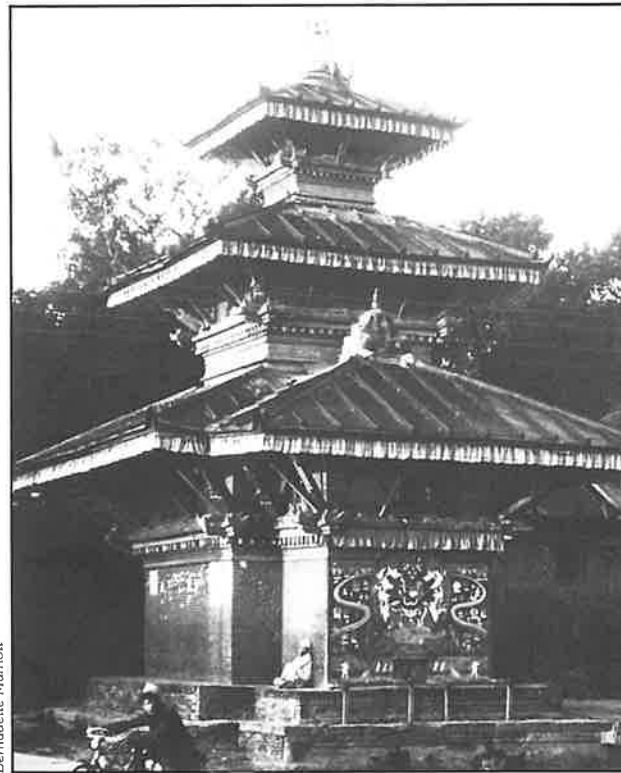
**Student fees:** \$1820  
**Departs from Nairobi**

# Primate Behavior/Nepal

**Purpose:** To continue a study of rhesus monkey feeding behavior and foraging strategies in the forests of Kathmandu Valley.

## Site

Buddhist stupas and Hindu temples, Bengal tigers in lush jungles beneath the Himalaya, a myriad of hill tribes of friendly villagers working rice paddy terraces on mountainsides reached only by days of walking — Nepal has long been almost a definition of the exotic. Rising from the dense tropical forests north of India and continuing up to the high altitudes of the barren Tibetan plateau, this tiny Asian kingdom has always drawn fascinated Western scientists, diplomats and adventurers.



Bernadette Marriott

*Both Hindu and Buddhist temples abound in Kathmandu Valley. The valley became a prominent center of culture when Buddha, born on the Nepal frontier, visited it six centuries before the birth of Christ.*

## Background of the Research

Nepal is being rapidly transformed. Population pressures have caused widespread deforestation of hillsides by the encroachment of rice and cereal crop agriculture, and the corresponding impacts on a wide range of tropical and subalpine flora and fauna. In the years following World War II, chemical pesticides were extensively applied to the dense malaria-infested jungles of the Terai, along the southern border with India. Once the maladies were controlled, people from overpopulated hill forests in the center of Nepal moved down into the Terai and cleared crop lands. A few areas, like Chitwan National Park, were left undisturbed for rare jungle species of crocodile, elephant and tiger.

The Kathmandu Valley, a verdant expanse of tailored rice paddies, water buffaloes and thatched adobe villages built around sculpted religious shrines, is set beneath the highest mountains in the world. Although their acreage diminishes each year due to the efforts of fuel cutters, thick mixed deciduous forests around the Valley support troops of rhesus monkeys.

Because of the pace of habitat destruction, complete baseline data collection on animal behavior and distribution is essential.

## The Project and Training

As part of a continuing five-year research program on rhesus feeding behavior in the wilds, Dr. Bernadette Marriott of Goucher College is returning this summer to the Goshalla Forest outside of Kathmandu. In the West, the rhesus is largely known by its use in studies as a model of behavior and of medical problems of man. But in devoutly religious Nepal, the rhesus is, like all monkeys, regarded as a sacred manifestation of the Hindu monkey god Hanuman. It is not trapped for export or harassed, even within the city limits.

Dr. Marriott's years of work on a free-ranging forest troop (composed of several score monkeys) have raised numerous questions about how both the foraging strategies employed by individuals change at different stages of reproductivity, and how interaction within the troop affects feeding. The work performed thus far has concentrated on influences on rhesus food selection, baseline nutritional data collection and feeding patterns. Observations and questions raised have led to the emphasis this coming year on how social influences affect the process of learning about feeding. This will be accomplished by examining mother-infant interaction, the role of adult males, and other troop social factors.

Our understanding of how a newborn infant learns what foods to eat, in what ratio, and at what times is still imperfect. Although it has become apparent that rhesus monkeys prefer a diet of high-fiber foods, we do not know why they choose the plants they do of those available, or how they learn which ones best meet their needs, or the nutritional content of such a diet.

Since Nepal is a very traditional agricultural society, and one still dependent upon many raw foods gathered from the wild without cultivation, the specific nutritional value of these foods is of great interest to government development planners. Dr. Marriott's work has been incorporated into Nepal's efforts to assay the potential sources of foodstuffs in different habitats around this very diverse country, and to shed light on the nutritional needs of both prehistoric and modern human foragers.

In the forest setting, observers will witness the full range of rhesus social interaction: females babysitting another's young, intertroop wars in which each animal plays a very specific role, males acting as controllers of the group and breaking up disputes between other males. Our trip takes place in early summer, and so it coincides with the end of the birth season. Consequently we will see very little of the mating or breeding behavior. But all the rough and tumble play behavior of juveniles, including mad jumping from tree to tree and riotous wrestling displays, will all be in a day's work.

Because troops are relatively small and stable, we will become intimately familiar with their members and their colorful personalities. Participants will view the cycle of rhesus daily life in the forests as they routinely pair up to observe feeding and behavior, and to follow and plot troop movements. Plant samples will be collected and their biomass and distribution measured, in order to contribute to an understanding of the ecology of the species.

Academic credit may be available through your own school or Goucher College.

## Field Conditions

We will be based in a comfortable, highly sanitary dormitory-like setting in a forested rural area just outside of the constant intrigue and commotion of Kathmandu. Cooking will be performed communally by the group through access to basic facilities. Evenings are

often the best times for comparison of observations, questions, and journeys into town to sample the wealth of restaurants, temples and unpredictable bazaars. Short trips to cultural as well as research sites outside the Kathmandu Valley and a drive through the Himalaya to the Chinese border will allow a survey of the spectacular variety of ecosystems and peoples comprising this complex country.

While no specific background in primatology is required, acute observational skills, a penchant for long hours of work in the forest and an ability to accept the inevitable challenges of research work in the tropics are deemed essential. A strong interest and some academic background in animal behavior is highly recommended. During this monsoon period, the temperatures vary from about 80° in the daytime to 60°F at night. Rain is frequent though not obtrusive and causes the Valley to erupt in lush tropical colors and richness.

While Nepal is known as a center of trekking, religion and alternative lifestyles, this project is instead a rare opportunity to perform important animal behavior studies in a fascinating setting.



Bernadette Marriott

*Although the rhesus is the monkey most widely used in biomedical research, we have little understanding of the species in its natural habitat.*

## Highlights

*Getting to know a family of monkeys at home in a tropical forest. Watching newborns learn about life from their mothers. Exploring Kathmandu's bazaars and then watching placid, beautiful egrets right outside your window. Riding Chinese bikes past villagers working in lush rice paddies, spread serenely beneath the towering Himalaya.*



*Dr. Bernadette Marriott has been studying rhesus feeding behavior in Nepal for the last five years.*

## Leader

**Bernadette Marriott** began her work in Nepal while at the Johns Hopkins School of Medicine in Baltimore. Earlier she had served as a Peace Corps Volunteer in Iran, and traveled widely in South Asia. Her tropical field course in Puerto Rico and Panama was popular at Hopkins, and has indirectly evolved into her continuing commitment to teaching and research in the forest of Nepal. She currently is Assistant Professor of Psychology at Goucher College and a biologist at the U.S. Department of Agriculture.

**When: Team I: June 7 - June 28**

**Team II: July 2 - July 23**

**Level: Team I: A Team II: B**

**Student fees: \$1240**

**Departs from Kathmandu**

# Geology and Volcanology/Iceland

**Purpose:** To study recent volcanic features, obtain an overview of geological processes, and to map lava flows.

## Site

Lying along the Mid-Atlantic ridge, half-way between North America and Europe and just below the Arctic Circle, is the remote and austere beautiful island known as Iceland. Despite its name, the warm waters of the Gulf Stream make Iceland's climate temperate, with winter temperatures similar to New York City. Legend has it that the Vikings conferred the forbidding name of "Iceland" to the prime farm land they wanted to conserve for themselves, and gave the more inviting name of "Greenland" to its northern, barren and colder neighbor. Despite its rich heritage as a Viking colony settled by disgruntled Norwegians in the ninth century and its unique saga tradition in literature Iceland is a modern Scandinavian society of handsome, sophisticated individuals.



Waterfall at Svartifoss, one of Iceland's austere beautiful and dramatic sites.

Iceland is popularly known as the Land of Fire and Ice. Most of the geomorphic processes that have transformed the surface of the planet are still at work here. While the eruption of Mount St. Helens has temporarily focused attention in the U.S. on volcanoes, eruptions and glacial-burst floods are regular occurrences in Iceland. Its dramatic landscape, exposed to the ravages of climatic extremes and relatively denuded of vegetation, presents unique opportunities to see clearly the full range of volcanic and geomorphic processes within a relatively small region.

The interior of the island consists largely of a barren, volcanic plateau covered with icecaps, lava flows and ash, and is accessible only with considerable difficulty in 4-wheel drive vehicles. Settlements are confined to the coastal areas, especially in the south and southwest (almost half of the population of 230,000 lives in Reykjavik, the capital), where the influence of the warming Gulf Stream is greatest.

## Background of the Research

Geologically, Iceland is the only place where the Mid-Atlantic Ridge, at the junction of two major tectonic plates, surfaces above the sea. The great rift valley running along the Ridge is aligned roughly due north-south through Myvatn down to the Vatnajökull icecap in the south. From there it heads southwest through active volcanoes Hekla and Katla, and on to the Vestmannaeyjar Islands, the site of the submarine eruptions in the mid-sixties that formed the new islands of Surtsey and Little Surtsey. Most of our studies and travel will occur along the Ridge and increase our understanding of the dynamics of plate tectonics, volcanism and crustal drift.

Nearly all of the types of volcanoes formed on earth are present in Iceland. Classic cone volcanoes, such as the ice-capped Snaefellsnes, rise gracefully above the fjords and lava flows, complemented by broad shield

volcanoes and dramatic explosion craters like the black cinder mound of Hverfjall at Myvatn. Most numerous are the fissure eruptions several kilometers long which pour out enormous basalt lava floods and form rows of craters. A third of all lava thrown up on earth since the year 1500 is found in Iceland. In the last decade significant eruptions have occurred at Surtsey (1963, 1970), Heimaey (1973), Krafla (1975-80), and Hekla (1980). Further activity is expected imminently at Krafla, near Myvatn.

Low-temperature alkaline hot springs (many are favored bathing spots) are found at about 300 localities spread all over the country. Iceland's 700 geysers go off continuously, spurting up about 330 gallons of superheated water per second. Glaciers cover some 5,000 square miles, or 16% of the country, and range from small cirque glaciers to extensive icecaps. Vatnajökull, the largest glacier in Europe, lies just south of the famed Askja cauldron complex and measures seventy miles in diameter. Roaring meltwater streams bear heavy loads of volcanic ash to vast outwash plain deltas all along the lush green southern coast. While the average global rate of spreading at plate margins is about two centimeters per year, Iceland experiences localized rates many times the average of sudden slipping that creates long fissures.



A typical volcanic cinder cone in the interior near Landmannalaugar. One of the more than 200 volcanoes whose eruptions have contributed to the buildup of all of the land in Iceland.

# Application Form

Name \_\_\_\_\_

Home Address \_\_\_\_\_ Home Phone ( \_\_\_\_\_ ) \_\_\_\_\_  
area code

School/College \_\_\_\_\_ city \_\_\_\_\_ state \_\_\_\_\_ zip \_\_\_\_\_

Address \_\_\_\_\_ School Phone ( \_\_\_\_\_ ) \_\_\_\_\_  
area code

Grade or year in school \_\_\_\_\_

Preferred mailing address ☐ Home: dates \_\_\_\_\_ ☐ School: dates \_\_\_\_\_

I am applying to:

☐ First choice \_\_\_\_\_ Expedition \_\_\_\_\_ Team \_\_\_\_\_ Level \_\_\_\_\_ Dates \_\_\_\_\_

☐ Second choice \_\_\_\_\_ Expedition \_\_\_\_\_ Team \_\_\_\_\_ Level \_\_\_\_\_ Dates \_\_\_\_\_

- ☐ Wait list me for my first choice.
- ☐ Assign me to second choice if first is full.
- ☐ I will require financial aid to participate. Please send a financial aid form.
- ☐ I want academic credit for my participation in this expedition.
- ☐ I would like to be the team photographer for this expedition.
- ☐ I would like to be the team journalist for this expedition.

Training and Experience Related to Your Choice of Expedition:

Academic Courses: \_\_\_\_\_

Field Experience: \_\_\_\_\_

Outdoor Experience: \_\_\_\_\_

Special Skills: \_\_\_\_\_

College Major: \_\_\_\_\_ Plans: \_\_\_\_\_

# Application Form

Name \_\_\_\_\_

Home Address \_\_\_\_\_ Home Phone ( \_\_\_\_\_ )  
area code

School/College \_\_\_\_\_  
city state zip

Address \_\_\_\_\_ School Phone ( \_\_\_\_\_ )  
area code

Grade or year in school \_\_\_\_\_

Preferred mailing address ☐ Home: dates \_\_\_\_\_ ☐ School: dates \_\_\_\_\_

I am applying to:

☐ First choice \_\_\_\_\_ Expedition Team Level Dates

☐ Second choice \_\_\_\_\_ Expedition Team Level Dates

- ☐ Wait list me for my first choice.
- ☐ Assign me to second choice if first is full.
- ☐ I will require financial aid to participate. Please send a financial aid form.
- ☐ I want academic credit for my participation in this expedition.
- ☐ I would like to be the team photographer for this expedition.
- ☐ I would like to be the team journalist for this expedition.

Training and Experience Related to Your Choice of Expedition:

Academic Courses: \_\_\_\_\_

Field Experience: \_\_\_\_\_

Outdoor Experience: \_\_\_\_\_

Special Skills: \_\_\_\_\_

College Major: \_\_\_\_\_ Plans: \_\_\_\_\_

Date of Birth \_\_\_\_\_ Age \_\_\_\_\_

Sex \_\_\_\_\_ Height \_\_\_\_\_ Weight \_\_\_\_\_

Previous accidents, injuries, or special problems: \_\_\_\_\_

\_\_\_\_\_

Swimming ability: ☐ good ☐ average ☐ poor

Parent or Guardian \_\_\_\_\_

Parents' Occupations \_\_\_\_\_

Major Interests: \_\_\_\_\_

Extracurricular Activities: \_\_\_\_\_

Clubs, Organizations: \_\_\_\_\_

Athletic Participation: \_\_\_\_\_

Honors, Awards: \_\_\_\_\_

Travel Experience and dates: \_\_\_\_\_

\_\_\_\_\_

Magazines read regularly: \_\_\_\_\_

Names and addresses of local and school newspapers: \_\_\_\_\_

\_\_\_\_\_

How did you *first* learn about SFS? (Please be specific)

Names and addresses of other persons who might like to receive information about the School for Field Studies:

Attach a 300-word typed Personal Statement, which explains your reasons for wanting to join the expedition, what you expect to learn, and what you expect to contribute.

Be sure to include your \$25 membership fee with the application.

Date of Birth \_\_\_\_\_

Age \_\_\_\_\_

Sex \_\_\_\_\_

Height \_\_\_\_\_

Weight \_\_\_\_\_

Previous accidents, injuries, or special problems: \_\_\_\_\_

Swimming ability:    ☐ good        ☐ average        ☐ poor

Parent or Guardian \_\_\_\_\_

Parents' Occupations \_\_\_\_\_

Major Interests: \_\_\_\_\_

Extracurricular Activities: \_\_\_\_\_

Clubs, Organizations: \_\_\_\_\_

Athletic Participation: \_\_\_\_\_

Honors, Awards: \_\_\_\_\_

Travel Experience and dates: \_\_\_\_\_

\_\_\_\_\_

Magazines read regularly: \_\_\_\_\_

Names and addresses of local and school newspapers: \_\_\_\_\_

\_\_\_\_\_

How did you *first* learn about SFS? (Please be specific)

\_\_\_\_\_

Names and addresses of other persons who might like to receive information about the School for Field Studies:

Attach a 300-word typed Personal Statement, which explains your reasons for wanting to join the expedition, what you expect to learn, and what you expect to contribute.

Be sure to include your \$25 membership fee with the application.



Exploring a recent lava flow which is still hot, participants see geomorphic processes at work.

## The Project and Training

After a flight from Reykjavik to the northern areas of Myvatn and Askja, sites of the most recent volcanic eruptions, and 4-wheel travel through the black lava desert interior, we will reach the study site near Landmannalaugar. The area is famous for its hot springs bathing (the best in Iceland), broad variety of formations and excellent hiking.

Torfajökull is the site of the largest central volcano complex in Iceland, with activity from Pleistocene to recent (historic) times. The area is dominated by rhyolitic volcanism, but interesting relationships are developed due to the mixing of basaltic and rhyolitic magmas. Field study would involve mapping of young volcanic landforms, including recent eruptive fissures, craters and lavas, and the compilation of the tephrochronology of the area, by study of volcanic ash layers in soil profiles. Magma mixing is a little understood triggering mechanism for explosive eruptions. Dr. Sigurdsson's important work contributes to efforts to develop predictive models for the explosions.

Team II may be a more rugged expedition and spend more time in an exploratory effort in the remote Dyngjufjöll Ytri mountain range, west of the Askja cauldern complex. The mountain was formed by sub-glacial volcanic activity during the last ice age and is entirely composed of hyaloclastite or moberg. Its flat-topped surface is pock-marked by thousands of small craters or vents which remain unstudied. The object of this expedition is to survey the crater field and search for clues to the origin of this unique crater formation.

## Field Conditions

Other than a week of rough off-road driving, days will be spent studying fresh lava flows and mapping rugged terrain and hiking into formations. Typical temperatures are in the 50-70°F range in the day, and about 40-50°F at night. Fog, drizzle and wind alternate with beautiful warm days. We will be camping out in farmers' fields and in patches of flower-filled tundra among the lava, ash, and rivers. The scenery is always spectacular and often surreal.



We will do a great deal of hiking and perhaps some backpacking in the interior of the island.

## Highlights

The beautifully symmetrical volcano cones covering vast landscapes. Steaming lava flows still too hot to walk on. Black volcanic sand beaches and emerald farmlands of the south coast. The sense of isolation and wildness of huge lava deserts and enormous icecaps.



Last year's leader Ken Andrasko, instructing during one of his rare serious moments.

## Leaders

**Haraldur Sigurdsson** is a native Icelandic volcanologist, and now professor of oceanography at the University of Rhode Island Graduate School of Oceanography. He has held teaching and research positions in Iceland, Trinidad, and the U.S., has received over a dozen major research grants for work in these places and Italy, and has fifty published papers to his credit. Most recently, he served as a principal consultant for a National Geographic filming expedition to Iceland last summer. This is a rare opportunity to explore Iceland with a native geologist and traveler.

**Kenneth Andrasko** is a writer and editor of environmental books, and was leader of our proglacial features study in Iceland last year. He is now Program Director for the School.

**When:** Team I: July 1 - July 25  
Team II: July 28 - August 22  
**Level:** Team I: A Team II: B  
**Student fees:** \$1340  
**Departs from Reykjavik**

# Marine Mammals/The Gulf of Maine

**Purpose:** To gather behavioral data and conduct population counts on the humpback and right whale.

## Site

Although the humpback and right whales roam hundreds of miles from the tip of Provincetown to Newfoundland, one of their favorite feeding grounds is Stellwagon Bank, a group of underwater hills 25 miles east of Boston, and only 10 miles off shore of Gloucester, Massachusetts.

All kinds of marine life flourish around the bank. Small marine animals and fish feed on the nutrient rich upwelling — deep water forced up to the surface by the bank. The right and humpback whales feed on the small marine animals. Because the whales spend only a few months out of the year here, May and June are ideal months to whale watch on Stellwagon Bank. One can usually spot even the very rare right whales at this time of year. Everyday we will follow the whales as they play and feed. Our travels may take us as far south as Cape Cod and as far north as Maine.

## Purpose and Background of the Research

Early American whalers hunted both humpback and right whales during the 1600's and early 1700's from Cape Cod and other Massachusetts ports. By 1750, right whales had been hunted almost to extinction. Less than 200 animals are alive today. Although our research will focus on the more abundant humpback whale, we have chosen our site and time to maximize the possibility of spotting some right whales as well.

Both right and humpback whales are baleen whales or *mysticeti*. Instead of teeth, *mysticeti* use a series of horny plates called baleen or "whalebone" to filter plankton from the seawater for food. These sea-going mammals are first seen as fossils from 30-million years ago and probably evolved from toothed land animals. Friendly and playful, these intelligent animals have intrigued man for hundreds of years.

The humpback is one of the easiest baleen whales to identify in the field. It has unmistakable fieldmarks and very acrobatic behavior. It often breaches (leaps out of the water) or flukes (slaps the water with its tail).

The migratory humpbacks spend the winter breeding season off Bermuda and the banks of the Caribbean where little or no feeding takes place. During the warmer months, they come up to the North Atlantic to feed. Although the exact population of humpbacks is not known, there are probably between 1,500 and 3,500 in the North Atlantic from May to September.

Humpback and right whales are on both the U.S. and International Endangered Species Lists. Little is known about these animals. More information and basic data are needed to insure the proper future management of the waters they inhabit. Their social systems are poorly understood and comprehensive knowledge of one species can provide a basis for comparisons in others.

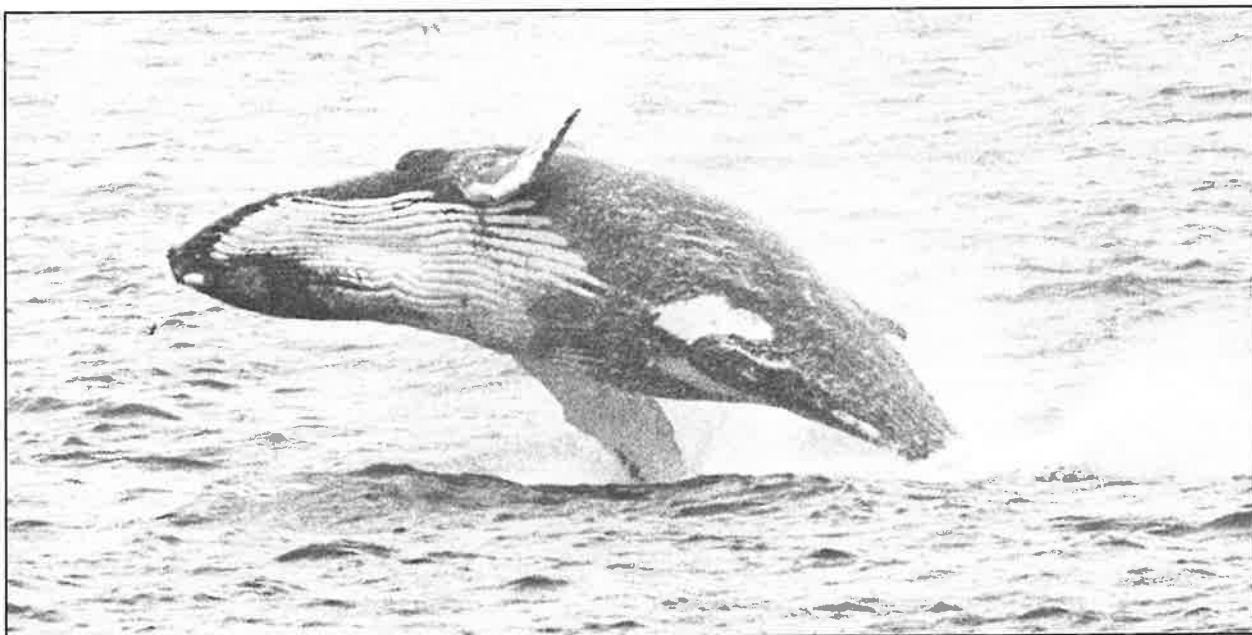
## The Project and Training

Our study will have many aspects. We will divide into teams and rotate responsibilities for data collection so that everyone gets experience in all the functions and procedures. Many hands are needed for whale research and days will be very busy.

Some students will look out for the whales. When a group is sighted, we will set our course to follow them.

We will learn to recognize individual whales by the black and white pattern on the underside of their tail flukes, or by the coloration and configuration of their bonnet (head). These identifying features, which do not seem to change throughout a whale's life, are unique in each whale. To identify whales and complete an ongoing whale census, we will photograph the flukes.

We will also set up a hydrophone, a device for listening to whale sounds. Although the mating call or "song" of



Jane M. Gibbs, New Hampshire Whale Watch

A breaching humpback, propelling its 40-ton body almost clear out of the water. This whale is about 50 feet in length.

the humpback is well-known, little is known about the frequency and significance of their wide range of vocalizations. It is thought that the humpbacks may use sounds for echo location of food, or for group communication. We will try to correlate whale sounds with their feeding behavior to shed some light on how important humpback vocalizations are on the feeding ground.

Each student will keep a daily log of his or her observations. The whales often come very close to the boat, especially if it is a sailboat, and it is possible to observe their behavior close-up. Surprisingly human in their social interaction, the whales frolic, flirt, mother their young, and cleverly trap their fish prey with "bubble nets." Because each whale is unique in its markings and behavioral characteristics, we will probably become well-acquainted with individual whales.

Academic credit may be available through the University of Rhode Island or Shippensburg State College, Pennsylvania.

## Field Conditions

We will either live aboard a 56-foot schooner, the *Sway*, or use a large motor boat. If we use the schooner, we will all learn how to sail her, following the whales by day, and anchoring in the nearest harbor at night, eating and sleeping on board. If we travel by motor boat, we will set up a base camp on a small island and camp there at night. If stormy weather keeps us ashore, we will explore the old fishing and whaling towns of Gloucester or Provincetown.

Students should be prepared for the many moods of the sea. Within hours, a glassy calm ocean can erupt into a lashing summer squall. In general, the May and June seas are calm and the air is tinged with spring coolness.

## Highlights

*Watching a whale gracefully breach 20 yards away. Seeing its enormous eye looking back at you. Trying to decipher and decode their songs. Living the rugged life of a sailor. Seeing the sunrises, sunsets and stars from the sea.*



A feeding humpback. This one is using the "bubble-net" method: he blows a circle of bubbles to corral a school of fish, then comes up underneath it with open mouth. The birds try to pick up the left-overs and fish which are forced to the surface.



Jane M. Gibbs, New Hampshire Whale Watch

A humpback "spy-hopping". Curious humpbacks will approach our boat to check us out. They hold their bodies vertically to inspect objects above water. Whales cannot see forward with both eyes, but down and out from each side. By standing vertically, they can look forward out of both eyes.

## Leader

**Dr. Herbert Hayes** teaches at Shippensburg College in Pennsylvania. Last summer, he taught courses in whale behavior on the *Sway* for the Marine Science Consortium. The courses were a great success and he is looking forward to taking students to sea again this year.

**When:** Team I: May 5 - May 28  
Team II: June 8 - June 30

**Level:** A

**Student fees:** \$990

**Departs from** Gloucester, Massachusetts

# Wildlife Conservation/Glacier Bay, Alaska

**Purpose:** To make observations and collect data on harbor seals to determine if changes in ice conditions and human activities are affecting their population.

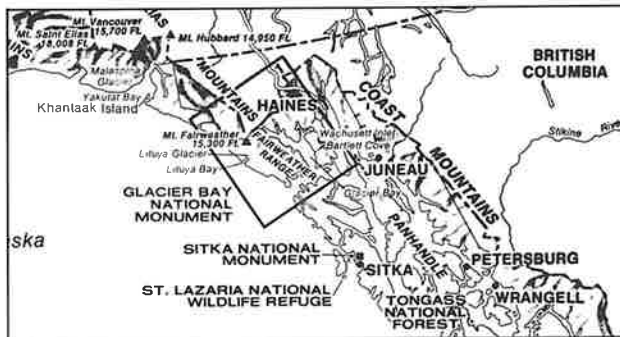
## Site

The spectacular Glacier Bay National Monument is located in southeastern Alaska, approximately 100 miles northwest of Juneau. Here the ice age still lives. The Bay is fed by glaciers that descend from towering mountains clothed in perpetual snow. There are over twenty tremendous glaciers and many smaller but equally impressive ones, illustrating all stages, from actively moving ice masses to those which are nearly stagnant and dying.

The glaciers are rivers of ice, sometimes thousands of feet deep, which flow slowly down the mountain valleys because of the great weight of the snow and ice which are constantly accumulating at their sources high in the mountains. The famous Muir Glacier is one of the most active on the Alaska coast. It has a sheer face, rising from 265 feet above the water, and is nearly two miles wide.

As recently as 200 years ago, most of what is now Glacier Bay was still covered by ice at least 4,000 feet deep. The retreating glaciers have left behind a diversity of plant and animal life that dramatically represents different stages of succession and life zones.

The unusually rich variety of marine mammals that frequent the waters of Glacier Bay include humpback whales, harbor porpoises, killer whales, minke whales, and harbor seals.



The square indicates the area of our work.



Ken Andrusko

*In Glacier Bay the Ice Age continues. Only 200 years ago, most of what is now the Bay was still ice.*

## Background of the Research

One of the largest concentrations of harbor seals in southeast Alaska is found within Glacier Bay. In the summer most of the harbor seals are in the upper bays. Starting in May, female harbor seals give birth to pups, nurse, and rest on the icebergs that float down the inlets from the Glaciers. In Muir Inlet about 1,000 seals rest on the icebergs at a given time and about 300 pups are born on these ever changing platforms. Harbor seals also rest and give birth on a number of islands in Glacier Bay.

During the first month of its life, a harbor seal pup is dependent on its mother for the rich milk she provides. The separation and possible abandonment of a pup by its mother during this critical time would be fatal. Harbor seals are easily disturbed by human activities and the boat traffic that frequents the waters in front of the glaciers where the seals rest could pose a threat to the seals. At other locations, repeated disturbance of harbor seals has resulted in the abandonment of an area by the seals. One of the objectives of the study will be to document boat traffic and disturbances of the seals at their pupping and resting areas.

Muir Glacier (which is the source for most of the ice in Muir Inlet on which the seals rest and give birth) continues to retreat. As it retreats there is an increasing possibility of a dramatic change in the ice conditions on which the seals depend. The exact timing of this change cannot be predicted with any certainty, but our research will serve to either provide additional information on the harbor seals to help to evaluate the changes, or possibly to monitor the initial stages of these changes.

Glacier Bay is an important breeding area for harbor seals in Southeast Alaska. Harbor seals are also a major and popular component of this National Park. If either ice conditions or human activities are negatively affecting the harbor seal populations, it would be a major loss to the Park.

The harbor porpoise is another marine mammal that regularly inhabits Glacier Bay in large numbers. This porpoise has proven very difficult to study and consequently little is known about its biology. If time permits, we will also study aspects of the biology of harbor porpoises.



John Colanabokidis

*The moody weather, the imposing mountains and the vast expanse of ice and snow instill a sense of awe.*



Harbor seals rest and give birth on a number of islands in Glacier Bay.



## The Project and Training

Students will spend the first two to three days at the Park Headquarters at Bartlett Cove. This time will be spent: 1) participating in some introductory presentations on the history, geology, and biology of the park, 2) getting background information on marine mammal biology and this research project, and 3) learning kayaking, camping, and other survival skills essential for the project.

Transportation to Muir Inlet will be by kayak and will take several days. Almost all observations of seals will be from land sites on either side of the inlet. Binoculars, spotting scopes, and cameras will be used to aid observations.

Students will make counts of adults and pups, monitor vessel traffic, document disturbances, and record other relevant data. The second half of both the first and second sessions will include observations of seals and porpoises at some of the islands in mid-Bay, between the mouth of Glacier Bay and the glacier-fed Muir Inlet. Team I will have more of an emphasis on the work in Muir Inlet and Team II will focus more on the work in mid-Bay.

## Field Conditions

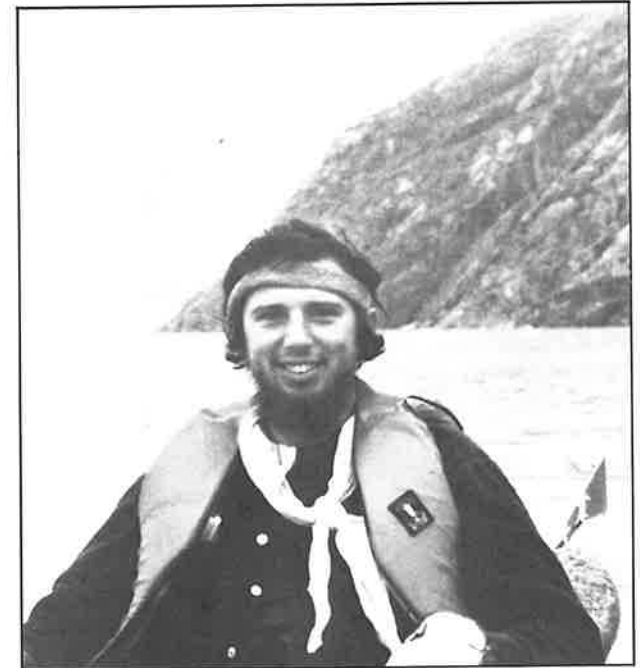
The weather in Glacier Bay can be unpredictable. Students should be prepared for cold weather which often occurs near the glaciers and rain. Life at the field sites will be somewhat spartan. The kayaking, rugged terrain, and camping conditions require sound health and will be challenging. We will camp and conduct our research in such a manner to minimize any impact on the pristine surroundings. Food will be prepared in the field; it will be basic and healthy.

## Leader

**John Calambokidis** is a 28-year old research biologist. He is a principal in the Cascadia Research Collective and has worked on numerous government contracts for behavioral research on fur and harbor seals since 1977. He co-led an SFS expedition to study seals in Puget Sound.

## Highlights

*The constant rumbling of glaciers. Watching baby seals being born. Kayaking among the harbor porpoises and icebergs. The silence, stillness, and sense of isolation.*



Leader John Calambokidis has been studying seals for the last five years.

**When:** Team I: June 5 - July 2  
 Team II: July 3 - July 30  
 Team III: August 1 - August 26  
**Level:** Team I: B Team II: A Team III: A and B  
**Student fees:** \$1280  
**Departs from** Glacier Bay

# Natural Resource Policy and Geology/ The Grand Canyon

**Purpose:** To help gather data on the environmental effects of the present park management plan.

## The Site

The Grand Canyon is perhaps the most widely recognized natural feature in the world; yet despite all the photographs and descriptions one has seen and read, it never fails to astonish on first sight. The carving of the Colorado River through millions of years of geological time has produced an open and living textbook of the history of the earth. The huge gorge is literally a mile deep and is full of an ever-changing spectrum of color. First explored by John Wesley Powell in 1869 in an epic expedition down the Colorado River, the Canyon now hosts over 3 million visitors every year, topping the list of visited natural attractions in the U.S. An additional 14,000 come to run the rapids of the Colorado River which runs for 300 miles through the deep gorge.



*The largest gorge in the world. Extending a distance of 217 miles from the Marble Gorge to the Grand Wash Cliffs, the Grand Canyon is up to 7,000 feet deep. It is 13 miles wide at its widest point.*



*The Glen Canyon Dam, which controls the flow of the Colorado River, has altered the natural ecological balance.*

## Background of the Research

The Park Service has the difficult task of preserving the ecological integrity of the Grand Canyon in the face of the many unecological demands placed upon it. Millions of visitors seek access to this natural wonder; utility companies want the freedom to tamper with the flow of the Colorado River to suit their own needs. Many studies went into the formulation of present park management policy, its rules and regulations that attempt to minimize the potentially adverse impact of the many interest groups.

Budget cuts in the present administration have forced the Park Service to curtail some badly needed studies. The School for Field Studies has offered to help the Park Service to continue its research and is in the process of obtaining a special research permit to conduct field studies on human and burro impact on the inner gorge.

Although this desert ecosystem seems harsh and overwhelming, it is in reality very fragile. Overuse and abuse can severely damage it.

Man has already tampered with the Canyon's natural ecosystem. When Glen Canyon Dam was built on the Colorado River, upstream of the Grand Canyon, it caused a dramatic alteration of the Canyon's natural balance. By drowning hundreds of miles of canyon and controlling the flow downstream, the clear and cold bottom flow from the dam no longer sustains native fish. At its flood stage, the river used to flush detritus and plant life downstream and thus deposit new beaches. Now thick strands of tamarask (a plant that thrives on dam regulated flow) congest the shorelines while trash and waste collect on overused beaches.

## The Project and Training

The first days of our expedition will be spent learning about the background of the Canyon, its geology, wildlife, and the present management policies that affect its use. Then we will begin to float slowly down the Colorado River in rafts, monitoring the geology and biology of the inner gorge.

The Park Service has authorized an ongoing study of the relative degree of human impact on the flora, fauna, and geology of the canyon. Twenty-eight of the camping beaches have been selected as sample beaches and are periodically investigated.

As part of this project, we will visit each sample beach, lay down transects, and collect data (sand discoloration, charcoal content, and litter) to assess the impact of last year's 40% increase in allowed park visitors. Up until last year, the beaches were becoming clearer as a result of the Park's more stringent restrictions. We will investigate whether the change of Park policy in response to interest group pressure and visitor demand has reversed this trend.

In another controversial program, the Park Service ordered the removal or destruction of the wild burros in the Canyon that were originally introduced by man.

Thousands of these animals have roamed the Canyon for years, destroying plant life and crowding out indigenous animals.

By sampling vegetation along 100 meter transects, we will be able to document the vegetation recovery rate. At two sites we will set 200 Sherman live traps and over the course of three days measure the concentration of animals living at the sites. We expect to determine if skunks, ring-tailed cats, mice and other small mammals (which had been adversely affected by the large burro population) are repopulating.

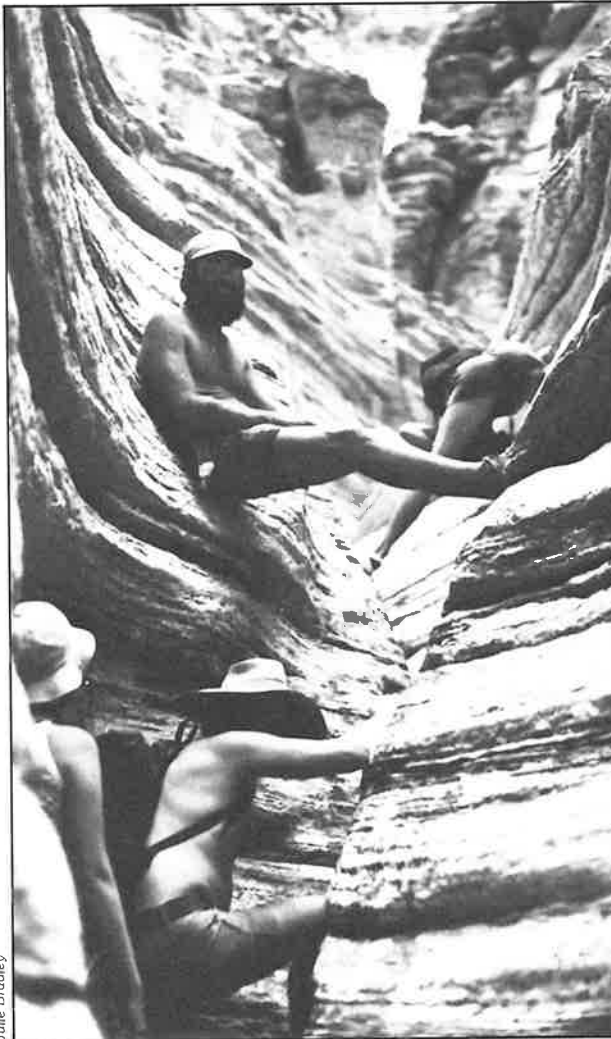
The Colorado is not the only scenic canyon river. Because access to the Grand Canyon is so limited, canyon lovers are discovering that there are indeed other beautiful canyons which have been carved in the Southwest, notably by the Green River which cuts through Utah and joins the Colorado River above Glen Canyon Dam. These beautiful spots are just beginning to suffer the use and abuse that has plagued the Grand Canyon for years and initial human impact studies are just beginning.

The Park Service is extremely selective in choosing who shall do its research. Researchers must vie with all other interested river travelers, both commercial and private, to obtain the limited user day-permits. If the Park Service feels that the research will significantly "contribute to better understanding of park resources and environments and of their use by people" they will grant a permit. Although we have applied for several permits on the Colorado River and on the Green River, the Park Service research needs will dictate the exact location of our final projects.

Academic credit may be available through the University of Virginia.



Running the rapids of the mighty Colorado River.



The canyon walls reveal millions of years of the geological history of the earth.

## Field Conditions

Be prepared for a land of extremes. Running the famous rapids will be cool and wet; clambering on the canyon walls to collect data will be hot and dry. Although there may be a shower or two, the hot desert sun will dominate most of the days.

The work will not be exceptionally strenuous, however negotiating huge rapids and climbing on the crumbling cliffs will require group cooperation and care.

## Highlights

Embarking on a 20-day river journey. Being thrown about in a 10-man raft over the most popular white water rapids in America. Disappearing down into the mile-deep canyon, a billion-year-old record of geology. Sunny days and fabulous sunsets.



We will stop at sample beaches to collect data.

## Leaders

**Dr. Steven W. Carothers** is a research ecologist at the Museum of Northern Arizona. An experienced white water guide, he has led over 50 trips down the mighty Colorado. He also leads field ecology hiking trips over the Grand Canyon's rugged terrain, and consults for the forest service, ranches, and other parties interested in environmental problems.

**Dr. Robert Dolan** is a professor of environmental sciences at the University of Virginia. He has taken students on river trips to conduct original research. He also helped write the present Grand Canyon Management Plan.

Dr. Carothers and Professor Dolan have done research together in the Grand Canyon since 1972.

**When:** Team I: May 2 - May 25  
Team II: July 6 - July 30  
Team III: August 3 - August 26

**Level:** A

**Student fees:** \$1420

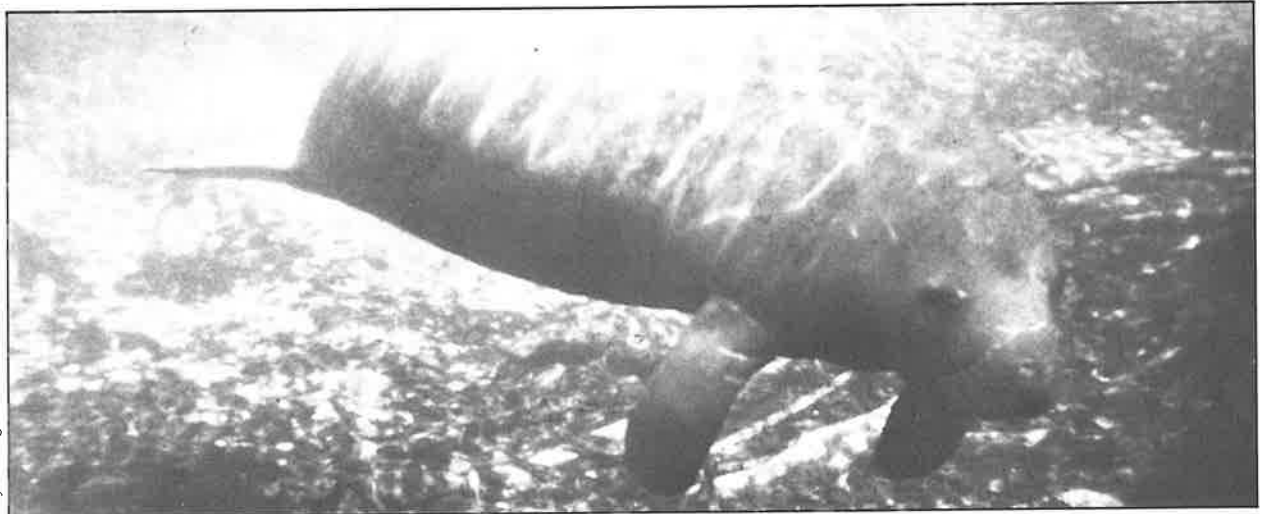
**Departs from** Flagstaff, Arizona

# Endangered Species Behavior/Florida

**Purpose:** To observe feeding and social behavior of the manatee or sea cow, and follow their movements in response to temperature changes.

## The Site

The Crystal River is, as the name suggests, a crystal-clear, spring-fed river on the west coast of Florida. It flows into the Gulf of Mexico near the town of Crystal River, 60 miles north of Tampa. The waters of the Crystal River serve as winter refugia for a population of 60-70 West Indian manatees (*Trichechus manatus*). Manatees, also known as sea cows, are aquatic mammals that may reach a body size up to and exceeding 300 kg. and subsist almost exclusively on a diet of aquatic vegetation. They were once very numerous throughout Florida. But their extreme docility and rather odd appearance, combined with the unfortunate fact that their meat was considered excellent in taste, resulted in their virtual elimination from Florida's waters by the end of the last century. In 1893 a state law banned further killing, and saved them from extinction. The Crystal River community is probably the largest aggregation of manatees in the U.S.



Key Etheridge

*A manatee's body, while tremendous (up to 1200 lbs), is wholly streamlined. His front limbs are paddles, his back limbs have completely disappeared, and he has a broad, horizontally oriented tail flipper.*

## Background of the Research

Man has always been a bit baffled by the manatee. It is a member of the order Sirenia, named in honor of the mythical mermaid conjured up by sailors. While other Sirenians occur off the coasts of East Africa, Australia and South Asia, the three species of manatees reside only in the rivers of Central West Africa, in the Amazon basin, and along the shores of the Caribbean and the east and west coasts of Florida. Only the latter populations seem to be stable or increasing.

In the mid-fifties, manatees — long thought absent or ignored — were studied in the Everglades. In 1967, the Crystal River congregation was discovered by a graduate student. The place is extraordinary. Numerous springs, ranging up to sixty feet deep and thirty feet wide, discharge six hundred million gallons of pure water a day at a constant and pleasant temperature — 23.7°C (75°F). The springs have created a broad river surrounded by dense forest and encroaching development that flows seven miles to the Gulf of Mexico. The

increased impact of man has made the waters murkier, and life for the gentle manatee more difficult.

The manatee is a peaceful creature whose rhythm of life follows changes in the water temperature. In October, when the Gulf cools down, manatees swim upriver to the warmer spring waters. In March or April they return to the open waters of the Gulf, dispersed along the southern coasts. During the winter, when we will be studying them, they tend to move up and down the river in response to subtle temperature changes and feeding needs.

Manatees are very independent, do not constitute herds or have recognized leaders, and are without continuing ties between mothers and calves. They do, however, love to play with each other and are unusually tolerant of and affectionate toward human swimmers (unless they wear SCUBA gear). The wide range of sounds manatees emit seem less efforts at communication than expressions of emotion and pleasure. They kiss and embrace, and the males amorously chase cows in estrus.



Bill Hennemann

*The headwaters of the Crystal River host a winter colony of manatees.*

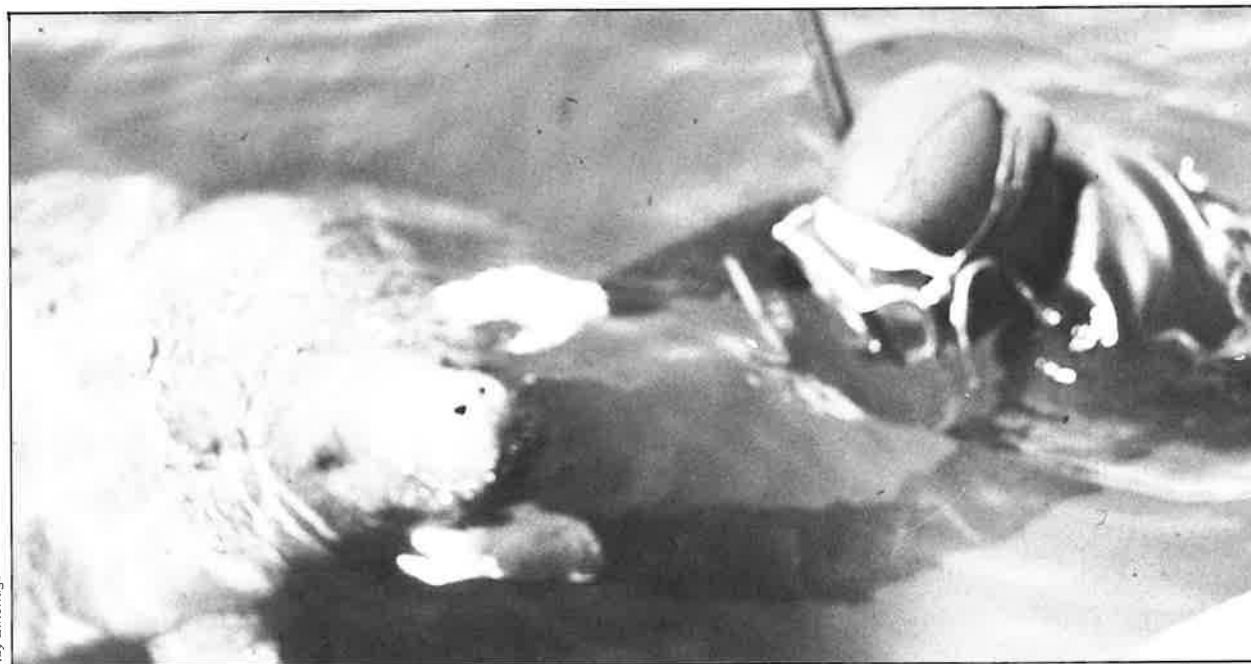
## The Project and Training

Our study of these herbivorous marine mammals will include: 1) following their movements by boat; 2) radio tracking individual manatees by boat for 24-hour cycles (if we can obtain the necessary permits); 3) observing and recording their behavior using glass-bottomed buckets, and/or mask, fins, and snorkel; 4) noting and sampling aquatic vegetation and recording the incidence of each type of vegetation in the manatee's diet. We will record the location, sex, and estimated age of each individual observed, follow the behavior and movements of individuals and try to understand the social structure and overall behavior of the population.

Tracking and observation of individuals are aided by the unfortunate pattern of skin scars resulting from encounters with motorboat propellers. Hydrophones will be utilized to record and analyze feeding sounds and chew rates, and further estimates of how much manatees are eating. Various environmental factors, including localized changes in salinity, temperature and vegetation distribution, will be monitored through regular data collection.



*Although they are derived from a common terrestrial ancestor and are distantly related to elephants, manatees are strongly modified for aquatic life. The upper lip is a short, thick, snout-like implement used in grazing on submarine vegetation. An adult may eat as much as 200 pounds of vegetation a day.*



Manatees are fabulously outlandish and lovable beasts

## Field Conditions

Mid-Florida in January varies in temperature from beautiful 70°F days and cool nights to fairly wet, damp cold days in the 40's. If the radio telemetry work is performed, it must occur on a 24-hour basis, with rotating shifts tracking in the boats. The work can be hard but always stimulating because of the contact with the animals. We will tent at a campground a few miles from the river, but have access to a motel for cooking, warming up, showering and sometimes sleeping.

Despite their large size, manatees are extremely pacific and present little or no hazard to even the most brash of swimmers. This will enable us to make many of our observations at extremely close range, using mask, snorkel, and (perhaps) wet suits. For this reason prospective participants should be capable swimmers.

## Leaders

**Kay Etheridge** has an M.S. from Auburn University and is a Ph.D. candidate in the Zoology Department, University of Florida. She has conducted studies on the physiological and behavioral ecology of reptiles and mammals (including manatees), and has taught courses in general biology and physiology. She enjoys a variety of sports including swimming, volleyball, and karate.

**Bill Hennemann** is a graduate student currently finishing his Ph.D. at the University of Florida. He has taught courses ranging from general biology to genetics to ecology and vertebrate biology at the University of Florida, and has worked on a variety of marine birds and mammals. Bill was the coleader of last summer's SFS expedition studying the giant tortoise in the Galapagos Islands.

**When: January 5 - January 28**

**Level: A**

**Student fees: \$1090**

**Departs from Tampa-St. Petersburg, Florida**

# Arctic Plant Ecology/Brooks Range, Alaska

**Purpose:** To conduct a series of vegetation studies along a 500-mile transect of the forest and tundra ecosystems of central and northern Alaska.

## The Site

The Brooks Range of far northern Alaska personifies the essence of wilderness. In an uninhabited area the size of California, the broken backbone of the Range rises from the taiga forests of the mighty Yukon River. Its rugged divide is penetrated only by high passes and meltwater rivers through castleated canyons. The Range runs from the Chukchi Sea abutting Siberia some 700 miles east to the Arctic National Wildlife Range and the far northern Yukon.

Wolves, barren ground grizzly bears and birds of prey circulate in the area through which we will be passing. The 80,000-head Porcupine Herd of caribou sweeps through the Range on its biannual migrations from the forests to the south to the staggering silence and open space of the North Slope tundra.



*Aerial view of the Haul Road traversing the North Slope tundra with the Brooks Range in the background. We will travel this 500-mile road to explore the entire range of ecosystems in central Alaska.*



*Fieldwork near Toolik Lake, north of the Brooks Range*

## Background of the Research

In 1979 the Alyeska Pipeline Company built a 500-mile Haul Road to carry pipe and supplies through the completely undeveloped, roadless wilderness to a string of isolated Pipeline work camps. The Haul Road was recently opened to the public as far as Dietrich, south of the Brooks, but the remaining several hundred miles are still closed to all but research and maintenance and trucking crews. The rough, gravel road's presence allows biologists a unique opportunity to traverse the entire range of three forest and five tundra ecosystems in central Alaska: from the taiga, black spruce bogs and birch forests on up to the

riverine, hillside, alpine, tussock and coastal tundras. The road ends at the mammoth Prudhoe Bay oil field and refinery complex set surrealistically on the Arctic Ocean.

A series of continuing studies of around thirty established vegetation plots located at intervals along the length of the road has concentrated on looking at how climate affects plant growth in the Arctic. Since the highway runs almost due north-south, the effects of latitude, altitude and weather can be conveniently analyzed. Descriptive comparisons of the sites have largely been carried out, so attention has shifted to both short- and long-term comparative assessments of several factors at a few sites.

## The Project and Training

Our expedition will be led by Dr. Ned Fetcher of Duke University, who will be returning for his sixth year of work on these studies. The trip will constitute an exemplary chance to study plant ecology and Arctic vegetation in the field, and therefore has been organized as a special program for students with a demonstrated interest in the subjects under consideration.

After a day or so in Fairbanks, the team will drive north and west in a van to spend three or four days replicating the work of a fire ecology and revegetation study conducted by several researchers in 1970. A big burn occurred the year before, and so we will learn about the tundra's ability to recover from fire. This will help present an overview of tundra vegetation (especially vascular plants). Measurements of biomass by means of harvesting, separating and weighing plot samples will be made.

Tundra plant demography (population distribution) will be assessed at a number of sites along the journey north, as we camp out in sturdy tents along the spectacular road.

The effects of water on plant growth will be determined by comparing primary production of vegetation inside and outside of water tracks, both south and north of the Range. Several days will also be devoted to trying to understand the very unusual spacing of alder bushes, to see what relationship exists between vegetation pattern and the size of individual bushes.

At the crest of the Divide lies Atigun Canyon, a sinuous, precipitous gorge inhabited by Dall sheep, grizzly bears, foxes and other birds and mammals. The Toolik Lake area will be base camp for travels around the Divide, and journeys further north out onto the vast coastal tundra that rolls in gentle swelling waves from the Brooks down to the edge of the ocean at Prudhoe Bay. Long-term plant demography studies are being set up on the slope to look at leaf turnover rates and tundra response to both natural and man-made disturbances. The trip back to Fairbanks allows another look at all the wealth of flora, fauna, and geology arrayed so impressively along the route.

## Field Conditions

August is the best time to visit northern Alaska. The vicious bugs are largely gone, the ground has drained off winter's snows, and the host of large mammals is actively foraging to prepare for winter. Weather varies greatly from fine days in the 70's F to stormy, windy and cool days of mist. The awesome scale of storm-fronts on the North Slope is unimaginable until one sees them stagger in overhead from Siberia. While light snow may occur in the mountains, it is unlikely to last more than a day or two on the tundra.

Camping in the magnificent open country will be stunning but rigorous, and virtually every day will be spent hiking and studying plants outdoors. The photographic potential is high, especially as the tundra berries and flowers change color to golds and scarlets late in the month.

This expedition is aimed at students with a serious interest in the subjects under study, especially upper-class biology and forestry majors. Recommended prerequisites include some courses in ecology and botany, and ideally some field work. Some statistical analysis of the raw data will be performed in the field. Inquiries about eligibility are welcome.



*The vastness of the Brooks Range is awesome. Every day will be spent hiking and studying plant ecology and arctic vegetation in the field.*

## Highlights

*Watching the subtle response of life to the rigors of the Arctic climate and beautiful mountains. Living out in the broad tundra for weeks among the wildlife with 20 hours of daylight. Arriving out on the serene North Slope after a 500-mile journey through forests, peaks and deep valleys.*



*The tundra is most exciting when seen up close.*

## Leader

**Dr. Ned Fetcher** received his Ph.D. in range science from Colorado State in 1977 after studying at Harvard and Wyoming. He began a continuing interest in tropical botany while a Peace Corps Volunteer in Nepal, and conducts research in Panama and Costa Rica in addition to Alaska. He is currently a Research Associate at the Duke University Phytotron and has been on numerous botanical, mountaineering and hiking expeditions.

**When: August 10-August 31**

**Level: B**

**Student fees: \$1200**

# Fine Print

## Expedition Levels

**Expeditions are graded A or B.** Level B expeditions are more ambitious in their research goals and more rugged in their living conditions. In some cases, Level B expeditions will follow up work begun by Level A expeditions.

**Level A** is an introductory course and requires no previous experience. It is less strenuous, assumes little academic background and outdoor experience, and is often comprised of younger students.

**Level B** is generally best suited for someone with one or two college-level courses in the academic discipline, and the basic outdoor skills necessary for living and working in extended rugged conditions.

Exceptions are occasionally possible.

## Application Process

1. To apply, complete the **Student Application**. Please type.
2. Include a 300-word Personal Statement which explains your reasons for wanting to join the expedition.
3. Enclose a check for \$25 (your Membership and Application Fee.)
4. Mail all of the above, in one envelope, to:

**School for Field Studies**  
**P.O. Box 171**  
**Prudential Center**  
**Boston, MA 02199**

## Acceptance

Acceptance is on a *first-come first-served* basis until the expedition is full. You will be notified by the School, and sent information regarding logistical and travel arrangements, equipment and documentation needs, and further details on the project.

You will be called by the expedition leader to discuss the expedition and your application. You may decide that the choice is inappropriate; the leader may decide the same.

If the School accepts your application and you agree to join, you must then immediately reserve your place with a non-refundable deposit of \$350. The deposit deadline is 30 days prior to the expedition departure date. Full tuition must be received by the School at least 30 days before departure as well.

It is to your advantage to apply as soon as possible. We do maintain a waiting list for expeditions which have been filled.

## Expedition Briefing Booklets

An Expedition Briefing Booklet will be sent to you upon receipt of your application. It will give you detailed information on your project and the anticipated field conditions. It will answer your questions about travel arrangements, what you need to bring, and what you should do to prepare for the expedition (reading list, physical conditioning, etc.) Booklets may be requested before applying.

## Tuition

The School is a nonprofit organization. We try to keep tuition as low as possible. On a cost/day basis, our tuition is generally at least **35% to 50% lower** than any other program you might find in places where we work, regardless of the nature or purpose of the program.

These lower costs are possible for several reasons. We receive substantial donations of funds from foundations and individuals. We also receive substantial donations of housing, equipment, and other types of support for many projects from individuals and institutions who believe in what our students and the School are doing. On the average, tuition covers only 60% of the true cost of running the School and our projects.

You, as a participant, are willing to give your labor and money to help. You are also willing to forego the luxuries of hotels and cooks in order to take care of yourself (which actually can be much more fun). This willingness gives you and your expedition team special access to unique areas of the world which are closed to most tourists and which require special permits.

The student tuition pays for food, accommodations, instruction, and ground transportation during the expedition. It includes all group equipment, medical supplies, and scientific instruments and material. It does not include transportation to and from the departure point. Personal gear, such as packs and sleeping bags, and personal equipment, such as SCUBA tanks, are the student's responsibility, as are medical insurance, passports, visas, and inoculations.

The tuition fees listed in the catalogue are based on estimates made nearly a full year before the project begins; they are based on many variables — currency rates, outside project support, staff airfares, enrollment rates — all of which may change. **Thus, the tuition for each expedition is tentative until confirmed in writing** by the School. If there is an increase of over 10% before a project starts, fully enrolled participants may withdraw and receive a full refund.

## Refunds

Refunds are rarely made. Most of the costs of a field project are incurred well in advance of the expedition's departure. Students who withdraw and fail to carry through jeopardize the success of an expedition and the costs of replacing participants are high. Refunds are made only when expeditions are cancelled.

## Tax Deductions

For some expeditions, student fees and directly related out-of-pocket expenses, such as airfare, may be treated as a tax deductible contribution to a scientific research effort. Details are available upon request. Individual tax circumstances vary; therefore, each expedition contributor should consult his/her own tax advisor.



## Travel Arrangements

In order to insure orderly arrivals and departures at the site, as well as the best possible group fares, the School has made arrangements with a travel agency to handle all details. Plane, train, bus and boat travel reservations should be handled through them. Further information will be sent to all applicants.

## Responsibility

In organizing and managing these expeditions, the School for Field Studies (SFS), its agents, employees and staff give notice that they act solely on behalf of and for the benefit of the participants, on the express agreement that SFS shall not be liable, financially or otherwise, for non-performance or unsatisfactory service; for injury to persons, including death; for loss of, or damage to property; for accident or delay; and/or for expenses rising from strikes, weather, quarantine, sickness, government regulation, or from any act or omission of its agents or employees, and/or airline, railroad, bus company, automobile rental agency, hotel, or other supplier of service.

SFS reserves the right to refuse any applicant to any expedition if it deems him/her unsuited for the project for any reason.



**All expeditions and dates are tentative until verified and confirmed by the School.**

SFS expeditions are very different from the usual travel, educational or adventure programs; each project is unique and often cannot be implemented exactly as planned. There are a number of factors which, although we monitor them closely, are beyond our control. 1) For example, over 50% of our projects take place in highly regulated and sensitive environments. The projects in Kenya, Iceland, the Galapagos, Mount St. Helens, and the Grand Canyon depend upon obtaining specialized permits. 2) Some projects depend on the goodwill and generosity of individuals and institutions which lend us equipment and housing. 3) Tenuous weather situations (such as hurricanes in the Caribbean) or natural disasters (such as another eruption of Mount St. Helens) or changes in political climates may require last-minute changes. All applicants should understand that these and other variables may necessitate changes before or in the course of an expedition. Participation on an expedition requires the flexibility to adapt to such changes. Indeed, part of the adventure may be not having the expedition run exactly as planned. In other words, the rhinos are not always where we plan them to be.

## Student Conduct

SFS reserves the right to require any participant to withdraw from any expedition at any time, if the expedition leader deems his/her acts or conduct — including use of drugs not authorized by a medical doctor and uncooperative behavior — to be detrimental to or incompatible with the interests, harmony, comfort, or welfare of the expedition. Should such a withdrawal occur, SFS will notify parents if the student is under 21 and return the student to the point of departure of the expedition, at which time any and all responsibility on the part of SFS will cease.

## Field Conditions

Please note that living conditions during an expedition tend to be primitive — meals may get repetitious, hot showers a long awaited luxury, contact with the outside world only in emergencies, and so on. You will generally be sleeping in small tents and cooking meals as a group. There is exposure — to weather, to thick and thin air, and to things that stick, sting, or bite. There are rewards that come from this effort — your awareness will grow, you will become closer to your teammates, you will be removed from the day-to-day problems of home, as you live with the natural processes that you are studying.

A typical day might involve rising early and cooking breakfast. The morning might be spent with lectures and discussions, a lunch break, and the afternoon collecting data. Evenings may be free for time alone or to write in your journals; there may also be special collecting forays if necessary, or lectures. Occasional days off as a team may allow exploring the countryside, an excursion to a different ecosystem, or the chance to pursue an independent project. Day-to-day schedules are part of the briefing booklets.



## Financial Aid

Financial aid in the form of partial scholarships is made available to qualified students who require assistance in order to participate. Students aged 16 to 21 desiring assistance should submit with their application a request for a Financial Aid Form. Students 21 or older may be given aid in the form of an interest-free loan.

Applicants seeking financial aid are advised to apply as early as possible.



## Academic Credit

Many students receive academic credit for participation in an SFS expedition. While the School for Field Studies itself does not grant university credit, it does recommend that course credit be awarded to those who complete an expedition successfully.

To avoid the cost and problems of transferring credits from another institution, it is preferable for students to arrange credit through their own schools.

Students should first seek the advice of their academic advisor or dean concerning credit for an independent project. SFS staff and faculty support such proposals and will cooperate with schools and colleges to meet their academic requirements. The School will provide an outline of the research project planned and a copy of the final report. The principal leader will award a grade for participation and/or a prepared report if requested.

Students interested in receiving credit should notify all parties well in advance. Credit is rarely possible to arrange after a student has departed or returned.

In addition, the School is currently discussing an arrangement with a number of universities to extend credit to their students for satisfactory completion of an expedition. Some SFS faculty are able to extend credit through universities with which they are affiliated, as described in the individual expedition listings.

# The School for Field Studies



Terry Plank

A participant in last year's project in Iceland studies stereoscopic pairs of aerial photographs of glacial and lava formations.

The School for Field Studies is a nonprofit charitable corporation for educational and scientific purposes. Our program is made possible through the generous and sustained support of the Andreas Foundation, the Hunt Foundation, the Reader's Digest/Wallace Funds, the Polaroid Corporation, and a number of individuals.

The School has been assisted in many ways by many groups and organizations. Among those whom we acknowledge as friends who have supported our efforts are:

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**Boy Scouts of America**  
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The School for Field Studies admits students of any race to all the rights, privileges, programs, and activities generally accorded or made available to students of that school and does not discriminate on the basis of race in administration of its educational policies, admissions policies, scholarship and loan programs, and athletic and other school-administered programs.



Back: Julie Bradley, Sarah Blodgett, Marina Leslie.  
 Front: Jim Elder, Linda Cregg, Ken Andrasko

Cover photos: Christian Masters, Fred Dodd, Chris Neefus.  
 Illustrations: Judith Du Bois. Catalogue: Linda Cregg



*An SFS expedition is not easy. But solving the problems as a group is part of the fun.*

**You may not be able to become one of our students, but you can still help while participating vicariously!**

Tuition income covers only 60% of our operating costs. We rely on the generosity of foundations, organizations and individuals like yourself for the remaining support.

Become a **FRIEND OF THE SCHOOL** with a \$25 tax-deductible contribution, and receive our regular newsletter, *Quest*, our yearly catalogue of expeditions, and the annual *Expedition Journal* — a yearbook of our projects and their results — for one year.

It is a good way to stay in touch if you plan to join an expedition in the future.

Become a **SPONSOR** with a contribution of \$100 or more. You may elect to support fully or partially a deserving student on an expedition. If you request it, the student will be informed of your involvement so that you can hear from him or her upon his/her return.



The School for Field Studies is a 501(c)(3) nonprofit corporation. FRIENDS and SPONSORS may treat their donations as tax-deductible contributions under Sec 509(a)(1) and 170(b)(1)(a)(ii) of the Internal Revenue Code of 1954, as amended.

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- ☐ I am on your mailing list and would like to continue to receive information.
- ☐ I would like to participate in an Expedition in 1982.
- ☐ I cannot participate this year, but I want to join an expedition in the future.

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Address: \_\_\_\_\_  
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 Enclosed is my \$25 contribution
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