

FIRE AND ICE

Real-Life Adventures of a Volcanologist

Bernard Chouet
and Mark Alexander

Proposal

Mark Alexander
P.O. Box XXX
Woodside, CA 94062-0008
650.465.7965
creatingyourlife@yahoo.com

OVERVIEW

FIRE AND ICE: *Real-Life Adventures of a Volcanologist* is a 70,000- to 80,000-word first-person narrative of the volcano-climbing adventures of Swiss-born Bernard Chouet, an MIT-trained scientist working for the U.S. Geological Survey, and the world's leading pioneer in predicting volcanic eruptions.

Bernard's life is one of high adventure: While teaching sailing at Club Med in Sicily in 1969, he climbed Mt. Etna and fell in love with volcanoes. That summer he watched the moon landing and the next year accepted a fully funded invitation to work in the NASA-supported Man-Vehicle Lab at MIT. His work there eventually became connected with an attitude control system for astronauts in space.

After receiving his Master's, he moved from Aeronautics and Astronautics to Earth Sciences, acquired a second Master's and a Ph.D., and began traveling the globe, climbing volcanoes in Alaska, Hawaii, Italy, Central and South America, Japan, the Caribbean, and off the coast of Africa. Bernard is also a professional photographer who has documented his travels, so the text can be filled with first-hand, royalty-free photos.

As a mountain guide, Bernard has led expeditions to Huascarán, Peru, and to Mt. McKinley, Alaska (with Ray Genet, who died on Mt. Everest). He and a fellow scientist nearly died in a three-day blizzard on Mt. Baker; he has been trapped between lava flows that caused his socks to smoke (reported in *TIME* magazine, attached); and he has saved lives by predicting eruptions (Redoubt, Alaska, 1990). Others who have remained unaware of his work have tragically died (Galeras, Colombia, 1993). His pioneering work has even made the cover of *Nature* magazine (March 28, 1996, attached). The news media frequently calls upon Bernard to comment upon earthquakes, volcanic eruptions, and other matters of geological concern.

FIRE AND ICE conveys the passion and excitement that a real scientist feels. No other book about volcanoes attains a comparable degree of narrative dramatic sweep, or personal insight and conviction.

The prologue and first three chapters have been written. The remaining nine chapters and an epilogue will likely be completed eight months after contract.

COMPETITION

Books on volcanoes tend to focus on the science and history of volcanoes. Such books include Richard Fisher's 1997 VOLCANOES: *Crucibles of Change*, and Robert and Barbara Decker's 1998 VOLCANOES. (Robert Decker pulled strings to get Bernard his job at the USGS.)

However, a recent book has been published, VOLCANO COWBOYS (July 2000), detailing some of the activities of a team of geologists at the USGS who were on the scene of the Mt. St. Helens and Pinatubo, Philippines, eruptions. Although that book attempts to explain the progress in volcanic prediction, it makes no mention of Bernard Chouet, who has in fact *pioneered* the latest and significantly accurate methods of volcanic prediction for the USGS. In fact, Mt. St. Helens supplied the key that helped Bernard develop his predictive model. VOLCANO COWBOYS is also written in a more detached, scientific voice, while FIRE AND ICE is written personally and dramatically.

Two other books are on the horizon. The first is GALERAS (April 2001) by Stanley Williams. Prof. Williams led a team of scientists and tourists into the crater of Galeras in Columbia when it erupted, killing six scientists and three tourists. Williams and others have called for more research into volcanic prediction. However, as FIRE AND ICE demonstrates in its one chapter on Galeras, Bernard had already modeled predictive standards on volcanoes like Galeras. In fact, he had supplied a report to local officials in Columbia that outlined the steps to take in analyzing the data. Bernard had planned on attending the conference that Prof. Williams was involved in, but he and his colleagues from the USGS did not get approval from the State Department to attend this meeting (due to escalating Columbian drug violence and U.S. government personnel kidnap concerns). Had Bernard attended, he would have seen the Galeras data and stopped the excursion that led to the deaths.

The second book is NO APPARENT DANGER: *A True Story of Science, Heroism and the Deadly Power of a Volcano*, (April 2001) by Victoria Bruce. This book also focuses on Galeras and includes material from interviews with Bernard. However, FIRE AND ICE presents one chapter on Galeras and presents a significant personal perspective regarding volcanic predictions and the nature of the tragedy that Bruce's book lacks.

Although almost three dozen books are titled FIRE AND ICE, only one is about volcanoes: Stephen L. Harris's 1980 out-of-print FIRE & ICE: *The Cascade Volcanoes*, a scientific treatment. Of the others, 24 are novels, mostly romance, and 7 are non-fiction, primarily art or literary criticism. If the title proves to be cliché, alternate titles include LAVA AND ICE, which is unique, and THE FIRE WITHIN, which though less unique can play off of both volcanoes and the excitement that stirs a volcano climber's heart.

MARKETING INFORMATION

The market for FIRE AND ICE is primarily popular and significant. Volcanoes rank with dinosaurs in general interest and fascination. Readers love adventures in exotic places and at high altitudes. FIRE AND ICE recounts a variety of adventures on both volcanoes and mountains. While several popular books have been written about adventurous mountain climbers, only one has been written about volcano geologists, while none have focused on a single volcano and mountain climber/scientist.

FIRE AND ICE tells stories from Bernard Chouet's point of view. The authors have taped interviews with sources at MIT and in Alaska, and have scheduled interviews with scientists in California, Hawaii, Italy, Sicily, France, Colombia, Mexico, Spain, and Japan. The authors also plan a trip to a volcano in Hawaii for a grand experiment sometime in 2001.

Volcanic science is woven in gradually and as part of the adventure so that the lay reader is not overwhelmed with technical terms. Although some mathematics is mentioned, no equations are used. Analogy and metaphor occasionally provide means for the reader to grasp more technical concepts, so the reader's attention is focused more on the adventure and less on the science, although science does permeate the text.

AUTHORS' INFORMATION

Bernard Chouet has published numerous scientific articles in many USGS publications and in prestigious science magazines, including *Nature*, *Science*, *IEEE Transactions on Systems, Man and Cybernetics*, *Bulletin of the Seismological Society of America*, *Journal of Geophysical Research*, *Geophysical Research Letters*, and *Journal of Volcanology and Geothermal Research*.

He has given numerous presentations and workshops at organizations and universities around the world, including MIT, Caltech, USC, Stanford University, U.C. Santa Barbara, Univ. of Alaska, Univ. of Washington, Univ. of Tokyo (Japan), National Research Institute for Earth Science and Disaster Prevention (Japan), Univ. of Grenoble (France), Univ. of Paris (France), Keele University (UK), Birmingham University (UK), Università degli Studi dell'Aquila (Italy), Osservatorio Vesuviano in Naples (Italy), Univ. of Geneva (Switzerland), Federal Polytechnic in Zurich (Switzerland), University of Granada (Spain), National University of Mexico, Seismological Society of America, American Geophysical Union, International Association of Volcanology and Chemistry of the Earth's Interior, and Los Alamos National Laboratory.

He has been honored as a Swiss National Science Foundation Fellow, a European Space Research Organization Fellow, a fellow of the Japan Society for the Promotion of Science, and has received the U.S. National Performance Appreciation Award.

He currently works at the U.S. Geological Survey in Menlo Park, CA, as part of the Volcano Hazards Program.

Mark Alexander began his education in computer programming. Upon selling his first magazine article to a computer magazine, and a second to truck magazine, he switched his studies to language and literature and became a freelance writer and editor. He founded a university literary magazine before becoming a teacher.

He has taught Freshman composition at California State University, Sacramento, Latin and Journalism at a private middle school, Business Writing at a business college, Legal Writing to paralegals, and Problem Solving Mathematics at Intel Corp. He has also conducted executive-level writing workshops for California law enforcement at California Polytechnic at Pomona. In November 2000 he gave a talk at Harvard's Radcliffe Institute for Advanced Studies on "Shakespeare's Law."

He works as a freelance technical writer for a variety of Silicon Valley companies, including Hewlett-Packard.

FIRE AND ICE**Book Outline****Prologue: Redoubt Volcano, Alaska—January 2, 1990**

Teaser: Third-person. Partial recounting of the eruption of Redoubt, and how Bernard helped to save lives.

Chapter One: *Lava Bombs on Mt. Etna*

1969. 23-year-old Bernard teaches sailing in exotic Club Med and becomes a volcano tour guide. He's caught between lava flows that results in smoking socks and spends a visceral night alone on Etna, watching its fireworks. After watching the moon landing, he dreams of being an astronaut, and decides to accept a paid graduate position at MIT in the NASA-supported Man-Vehicle Lab.

Chapter Two: *From MIT to Photobalistics on Stromboli*

1971-73. At MIT Bernard works 100 hrs/week with both Prof. Larry Young, Director of Man-Vehicle Lab, and Prof. Albert Hopkins, developer of Apollo computers. His Master thesis is on an attitude control system for astronauts working in Zero-G. Bernard discovers Earth and Planetary Sciences and meets Tom McGetchin, a geologist who loves volcanoes. They plan a trip to Stromboli, a volcanic island off the coast of Italy, for a photobalistics experiment. 1000-ft. fire jets at night. They get to within 100 feet from the main vent with a high-speed Hulcher camera that shoots 10 fps (originally used in atomic bomb tests). Falling bombs of exploding molten lava.

The next year Bernard must choose between NASA and volcanoes. NASA chooses for him by closing down manned flights after Apollo. Bernard moves to Planetary and Earth Sciences and writes his second Masters thesis—a classic paper on photobalistics. Bernard, Tom, and others go to Guatemala and Chile to climb several volcanoes.

Chapter Three: *Snowblind on Mt. Baker*

1974-75, Bernard meets Prof. Keiiti Aki, a world-renowned seismologist from Japan, who becomes his new advisor. But Aki thinks there's no hope of making sense of volcanic data and gets Bernard into seismology. Bernard begins Ph.D. work, and goes with three others to climb Mt. Baker in Washington state. They climb to the crater. After two days of clear skies, two guys offer to take extra equipment down, leaving Bernard and another man with only a tent and personal gear. Soon they are caught in a near-deadly 56-hour blizzard. Bernard keeps them alive, although they come close to dying.

Chapter Four: Adventures with K. Aki

1976-77. La Soufrière erupts. 70,000 evacuated. Bernard flown to Guadeloupe by Claude Allègre, director of the Institute of Physics of the Globe (IPG) in Paris. He arrives for a State dinner at the Governor's mansion. Best food, beautiful women. A socio-political event, not a volcano problem. Bernard wants to work, but the helicopter fly-by of the volcano is a joy ride with officials. Bernard gets an inside look at power. No one has any real volcanic data. On his return to MIT he reports to Frank Press, Chairman of Earth Sciences, later Science Advisor to President Carter. Bernard finishes his Ph. D. and plots to get Aki out to the Cascades (California, Oregon, Washington) hoping he'll fall in love with volcanoes. The plan works, and Aki converts completely to volcano studies. Bernard and Aki travel to Hawaii for magma chamber experiments.

Chapter Five: Rivers, Slides, and Catastrophe Man

1978-79. Bernard teams with Swiss friend, Michel to climb Mt. McKinley with Ray Genet, a famous Everest climber. 26 days on the mountain, 30 people, blizzards. They reach summit. Bernard and Michel take six expedition members down other side. The six include a chiropractor, a heart surgeon, a teenage boy, and Catastrophe Man, who falls in crevasses time and again and takes pictures while the others try rescuing him. As they cross glacial lakes, the heart surgeon loses it, says he must get home, takes off with the stove. Freeze-dried food becomes useless. While crossing rivers with chest-high glacier water, Bernard nearly drowns, while two others are washed downstream. All body fat is gone. They walk 60 miles, last several miles without shoes, and arrive at a gravel road where they are picked up by a Park Service bus and taken to Park Headquarters and Village. Bearded, scruffy, they are treated like heroes.

Bernard and Michel open an expedition business and try again next year with experienced climbers. The new group is a motley crew who leave behind important food and items to lighten load. Bernard and three others on a rope fall down a ¼-mile ice slide toward a crevasse.

Chapter Six: The First LPs on Mt. St. Helens

1980-81. In 1980, Bernard attends a conference in Tokyo, Japan, travels to Sakurajima, Aso, other volcanoes. He becomes friends with the husband and wife team of Maurice and Katia Kraft, the famous daredevil volcanologists who later died while filming a pyroclastic flow at Unzen volcano in Japan in 1991. Mt. St Helens erupts in 1980. Bernard visits the volcano the next year. He enters the crater and places an instrument next to the lava dome. Beautiful Long Period events (LPs) are recorded. *Breakthrough in volcanic prediction*. The pattern reminds him of his studies at the Federal Polytechnic in Lausanne, Switzerland, concerning hydroelectric power plants. The harmonic "Water Hammer" effect creates an acoustic resonance that builds, causing plants to blow up when attempting to shut down water flow. First paper published five years later.

Chapter Seven: From Mt. Huascarán to Mt. Etna

1981-83. Bernard, Michel, and others go to Peru, visit Lake Titicaca, climb El Misti and have a failed attempt on Huascarán. Bernard and Paula (his future wife) meet at a party in Nyon, Switzerland. He introduces her to his world with a trip to Etna. She's extremely fearful, because in 1979 Etna had erupted and killed many people. They stay in Antonio's new home built on side of Etna. (Destroyed later in the year by a lava flow.) Incredible view of volcanic fireworks and the ocean. They visit Stromboli and Vesuvius. Bernard lands a job with USGS in Menlo Park, CA.

Chapter Eight: Lahar on Mt. Ruiz

1983-87. Bernard starts work at USGS and becomes friends with Herb Shaw, brilliant author of *Craters, Cosmos, and Chronicles*. They go to the Puu Oo vent of Kilauea in Hawaii. In South America, Ruiz erupts in 1985, killing 22,000 with a lahar. Volcano Crisis Assistant Team (VCAT) goes. Bernard doesn't go until the following year where he meets volcanologist-seismologist Fernando Gil Cruz. Fernando shows him piles of paper records with beautiful LPs. The system is now stable, but Bernard shows them that whenever there is long-term LP seismicity, there is a potential for an eruption and they may have to evacuate people. Fernando and his team are delighted. The next year, Ruiz generates LPs, they evacuate, it erupts, and everyone is very happy.

Chapter Nine: Pele Rising

1986-88. Bernard and Aki plan an experiment on Puu Oo, which sets the stage for a grand 1988 experiment with 90 seismic stations. Paula arrives late in the experiment. She is initially fearful of approaching the vent, but Bernard crawls carefully to the edge staring into golden lava lake, churning like a giant washing machine, foundering, crust breaks, big doming bubbles. Gas piston events. Increasing activity of doming bubbles, increasing until all coalesces, covering surface, becomes a firestorm. Incandescent gas shoots 1000 feet into the air. Droplets of liquid magma fall, burning micro-holes in his clothes. Spectacle too intense to pull away. An hour later, Paula stares over the edge and is so taken by it that he has to hold her by the belt. Time stops. Six hours later they hear the helicopter. As they move away, Bernard reflects that the lava pond is getting higher. Expensive equipment may get swallowed by an eruption.

They fly back to HVO, and volcanologist Bob Koyanagi says, "You're lucky because Pele's showing off for you." Pele is the legendary goddess of Kilauea. Story of intense rain drowning experiment, and how a cylindrical hole opens to allow experiment. Bernard's colleague calls it "spooky." Also covered: Aki's experience with the famous Dog of Pele, and how scientists give gifts to Pele.

Chapter Ten: Redoubt and Galeras—Lives Saved and Lives Lost

1988-93 Expansion of Prologue regarding Redoubt but from Bernard's viewpoint. Bernard travels several times to Redoubt. Recounting of Pinatubo eruption in the Philippines while Bernard is in Alaska. A lava dome appears in the Galeras crater in Columbia. Bernard flies down and explains how LP activity indicates a periodic releasing of pressure. He writes a report explaining what to look for prior to an eruption. He gives copies to local authorities and the USGS. A volcano workshop is held in Pasto near Galeras in January 1993. Because of drug cartels, the State Dept. does not grant Bernard and his colleagues from the USGS permission to attend. A field trip of scientists and tourists led by Stanley Williams enters the crater. Galeras erupts, killing nine people. Later that year, Bernard is approached by NATURE magazine to do a review article on LPs.

Chapter Eleven: *Through the Eastern Gate*

1992-95. Bernard conducts experiments on Stromboli in 1992, and participates in an experiment on Vesuvius in 1994. In 1995 he spends three months in Japan. Incredible trips all around Japan, to volcanoes, to Kobe (which experienced a devastating earthquake), and special trips to a Kyoto temple closed for 400 years, but opened just while Bernard is there.

Chapter Twelve: *Magma Force*

1995-2001: Small-aperture antenna and broadband experiments on Kilauea. *Huge breakthrough*. Now able to pinpoint sources for tremor and magma activity through a "transparent" view of the internal structure of a volcano. Bernard set to conduct final grand experiment in 2002 that gives a full 3-D color image of the interior of Kilauea (much like the latest 3-D color bio-scans now available in hospitals). Bernard also travels to Mexico and conducts a broadband experiment on Popocatepetl, which recently erupted.

Epilogue: Geneva, Switzerland - Winter 1961

Wraparound close: Third-person. A 16-year-old teen enters a film house in Geneva and watches a French documentary, *Rendez-vous du Diable (Meeting with the Devil)*, about French volcanologist Haroun Tazieff. He watches as Tazieff and a young Sicilian, Antonio Nicolosi, go to the Belgian Congo, Africa, enter the crater of Nyiragongo, and film the active lava lake. Riveted in his seat, the teen falls unexpectedly and deeply in love with volcanoes. He leaves the theater excited, wondering if he could ever have such adventures. But the cold Genevan air reminds him that he lives in conservative Switzerland, and such adventures seem so far away, hardly within reach. He goes home and, for weeks after, dreams about being on that volcano. The memory fades and the excitement shrinks down into a forgotten, hard-shelled seed, waiting to germinate, years later, on a living volcano...