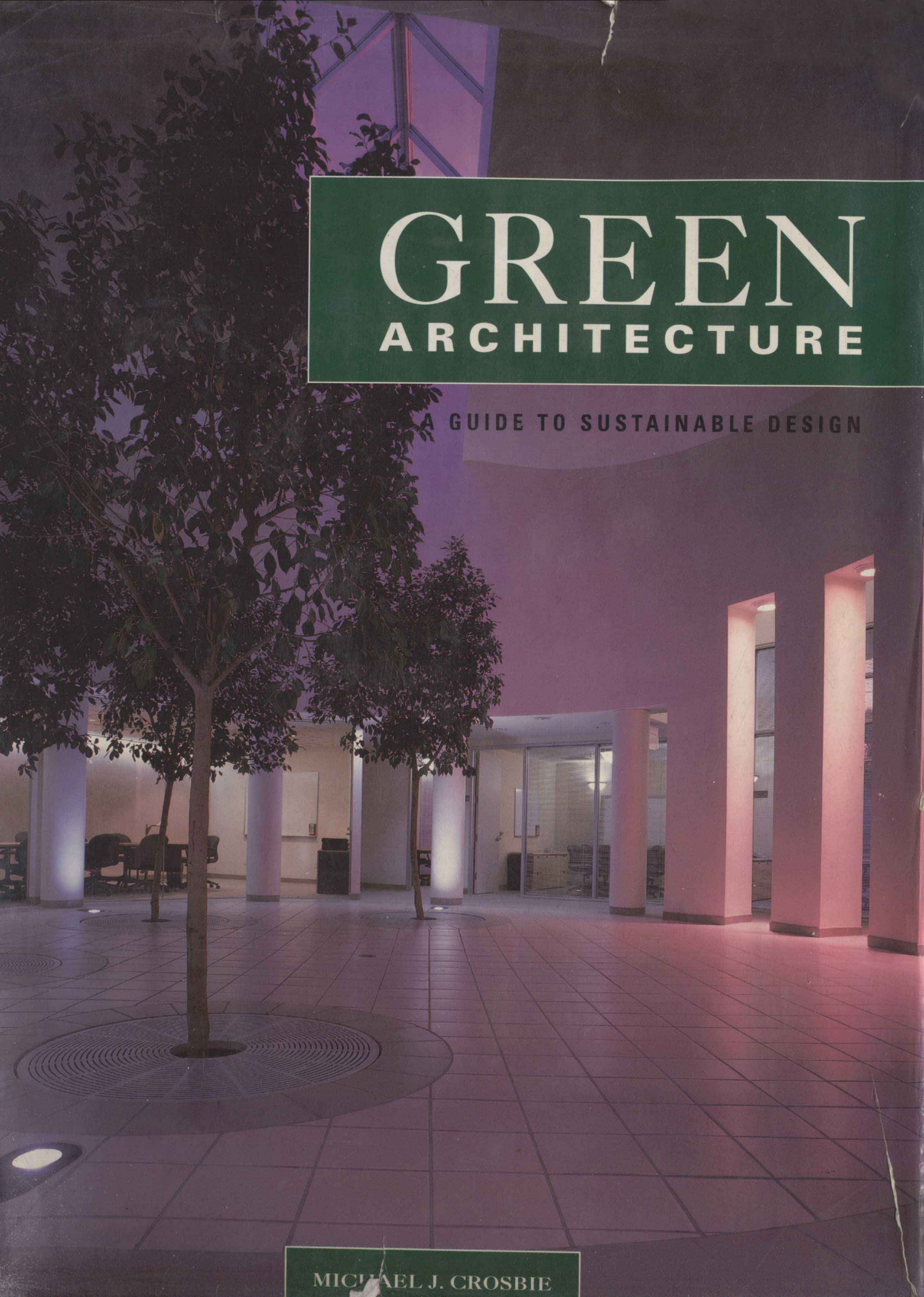

GREEN ARCHITECTURE

A GUIDE TO SUSTAINABLE DESIGN

MICHAEL J. CROSBIE

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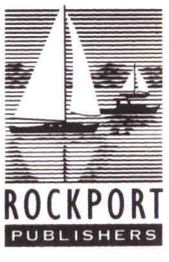

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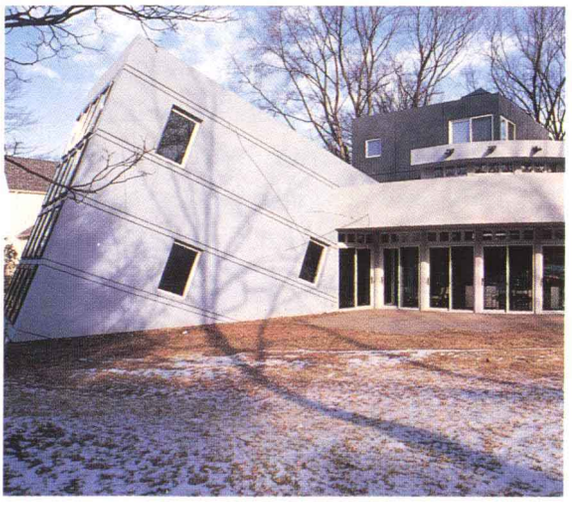


FOREWORD

Garrett Hardin's famous essay, "The Tragedy of the Commons," shows how a village common pasture suffers from overgrazing because each villager puts as many cattle on it as possible, since the costs of grazing are shared by everyone, but the profits go to the individual. Hardin argues that this is a metaphor for our current global ecology. An impressive body of scientific data on global systems supports Hardin's claim and confirms what native Americans and indigenous people worldwide have known and celebrated for centuries–that we are all interconnected and interdependent.

For the first time in human history we have the technology to monitor and document the problems we are creating in the global commons. For example, we now know that the chlorofluorocarbons we created to increase our comfort by improving insulation and coolants also deplete the protective ozone layer that, ironically, increases the need for energy, insulation, and coolants. It also allows ultraviolet rays to enter our atmosphere, reducing global food production and increasing the incidence of skin cancer and eye disease. In his book *Biologic*, David Wann observed "environmental deterioration is a lack of relevant information . . . [and] poor design is responsible for many, if not most, of our environmental problems." Now that relevant information is becoming available, are we willing to re-examine our designs?

The planet's population of 5.5 billion continues to grow at 1.7 percent annually, doubling our population every 40 years. As this expanding global family consumes resources that exceed the capacity of the commons, architects are beginning to question the design of buildings as sculpture, as objects separate from nature. The debate concerning style becomes irrelevant, if not irresponsible, when our designs create more waste and pollution than the planet can absorb and cleanse. Our grandchildren will care if our designs improve or diminish their quality of life, but will they care if our buildings are postmodern or deconstructivist?

In the summer of 1993 thousands of architects, planners, landscape architects, developers, builders, manufacturers, and suppliers gathered in Chicago on the centennial anniversary of the Columbian Exposition. Some brought their proposals for the future and inspiring examples of projects exploring these new concepts. Many more brought their concerns. There was much discussion about the reliability of new information, appropriate design responses, and much debate about the definition of "sustainable development." The World Congress of the International Union of Architects and the American Institute of Architects adopted a "Declaration of Interdependence for a Sustainable Future" that places environmental and social sustainability at the core of practice and professional responsibility. In addition, the Interprofessional Council on Environmental Design, a coalition of architecture, landscape architecture, and engineering

organizations, developed a vision statement to pursue this new ethic "as a multidisciplinary partnership."

The work Mike Crosbie has collected in this book is that of individuals and teams who are seeking to create a new ethic, fueled by the belief that our present designs are destroying the commons. It is significant that Mike has selected the work of North American architects, because it is the "American way of life" that is one of the greatest threats to sustainability. We are setting all the records for consumption, waste, and pollution. Our designs are causing stress, illness, and reduction in productivity, in addition to excessive consumption and pollution. Our community designs are contributing to the isolation, separation, and fear that grips and debilitates our society. Ironically, just as we are becoming aware of the flaws in these existing designs, the developing world is rushing to duplicate the American way of life.

Architects and designers have some very interesting choices to consider at what may become the most powerful moment in human history. Will we choose the traditional role of creating symbols that document the focus of our society? Or will we instead take a leadership role in designing buildings and communities that are worthy of duplication? Will we explore designs that encourage the cultural change required to restore the quality and sustainability of the commons?

As you examine the work of the architects and designers in this book, ask yourself these questions: Are their assumptions about the global environment reasonable? Does their work reflect the new ethic they espouse? Could this direction revitalize the profession? Is this an opportunity for you and the next building you design?

The people whose architecture is represented here do not have all the answers. In fact, most of them have more questions than answers. But they share a common belief that design can create greater efficiency and restore biodiversity. They believe that good design will serve as pedagogy, informing and empowering the users to participate in creating communities that respect and celebrate all life, including the lives of future generations.

— Robert Berkebile
Kansas City, Missouri

Mr. Berkebile is a founding member and past chairman of the American Institute of Architects' Committee on the Environment.

EDITOR'S NOTE

The health of any new paradigm in art, science, or politics can be measured by the proportion of spirited commitment to that new world view. The paradigm's vitality can also be gauged by the degree of tolerance for opposing points of view that collect around it. Green architecture, as evidenced by the brief essays in this book, and the work presented herein, has all the hallmarks of a healthy paradigm. The architects and designers most dedicated to this way of practice do not move in lockstep. The debates that they forward here are passionate and compelling, and the work is varied. Occasionally the rhetoric outweighs the accomplishments to date. So it is with all great paradigm shifts.

The object of this collection is to introduce you to a different way of thinking about architecture that takes our role as stewards of the planet Earth to heart, in a way that has never been done in architectural history. True, the architecture of indigenous peoples exhibits some of the same sensitivity to climate and materials. But the form and content of indigenous architecture are not a conscious, deliberative choice on the part of its makers. It is limiting in that it is the only thing its creators know how to make.

We, on the other hand, can select from a plethora of technology and materials. The designers in this book have made a conscious decision to reorder their priorities and make a new path for architecture. Because it is an approach that is sensitive to our planet's capacity to support us, it represents a maturing of the modern mind. As is true of all authentic architecture, it is part of a larger world view that is daily debated in our society.

I want to thank the people at Rockport Publishers and the AIA Press for their help in bringing this collection to fruition. Nancy Solomon, formerly of the AIA's *Environmental Resource Guide*, provided valuable guidance. I am grateful to Robert Berkebile for his illuminating Foreword, and to the architects and designers in this book for graciously allowing their accomplishments — their work and their words — to be included. I am also indebted to the various photographers who generously permitted the publication of their work.

— *Michael J. Crosbie*
Essex, Connecticut

To Forrest Wilson,
who taught me
to keep a stiff upper
heart of oak, which
is a renewable resource.

JERSEY DEVIL

Stockton, New Jersey

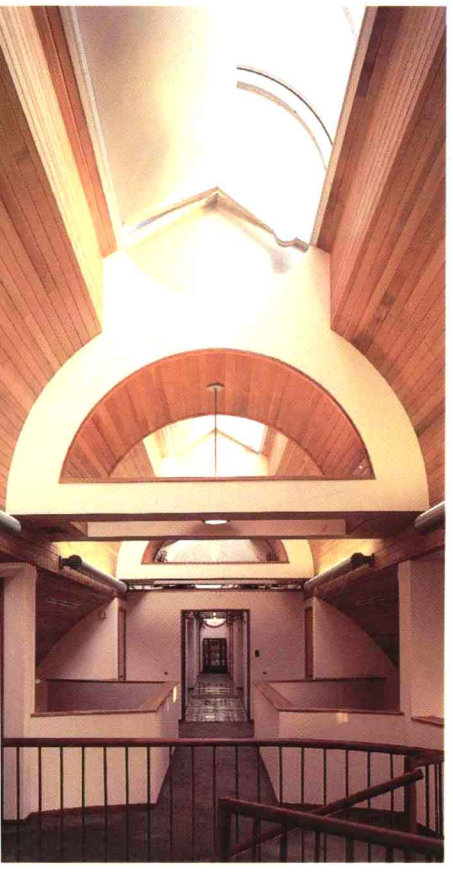


Photo: Kenneth M. Wyner

With my Jersey Devil partners, Jim Adamson and John Ringel, I've been involved in energy-efficient architecture and on-site practice for over 25 years. In architecture school in the 1960s, we followed research in the space program, figuring that a self-contained environment in space would spin off materials and methods for a self-contained environment on this planet. After graduation we started Jersey Devil, a nomadic design/build group making energy-efficient structures, one at a time, and living on site in efficient Airstream trailers and walking to work every day.

When the energy crisis hit in the mid-1970s, we were joined by scores of other Americans who began to innovate in response to skyrocketing fuel costs. President Carter installed solar collectors on the White House and initiated tax credits for energy-saving buildings. With government support, alternative energy enterprises began to spring up and many architects began to consider energy use as an issue in their buildings.

In 1981 Ronald Reagan became president and quickly removed the collectors from the White House, repealed the tax credits, and funneled massive financial support to the nuclear, coal, and oil industries, fostering a bogus energy glut. Architects stopped designing energy-efficient buildings (the media seemed to be tired of them anyway) and postmodernism became the rage (the perfect style for the Gipper, by the way — all face and no space).

In 1988 George Bush took over and the architecture fashion wheel spun around to deconstructivism — an appropriate style for a president who, in a not-so-subtle display of his energy policy, dropped so many bombs on Iraq that it looked like a decon project when he got done.

We had the problems, priorities, and the solutions right in the 1970s. Since that time, the architectural profession has taken so many wrong turns, flirted with so many goofy styles, that sometimes I'm embarrassed to be part of it. (On the other hand, sometimes I think the profession is embarrassed that I am part of it.)

Now Bill Clinton is president and there's a return to energy issues. This time around it's called "green" architecture. It's about time. Buildings consume almost 40 percent of all energy (not including the energy embodied in the materials, shipping, and construction). Nuclear energy, oil, and coal represent death and environmental destruction. Solar energy, recycling, and renewables represent sustenance and survival. If architects want to contribute to the continuation of the species, green architecture needs to be more than a passing style.

— Steve Badanes

Photo: Alan Weintraub, funding by the Graham Foundation

HILL HOUSE

La Honda, California

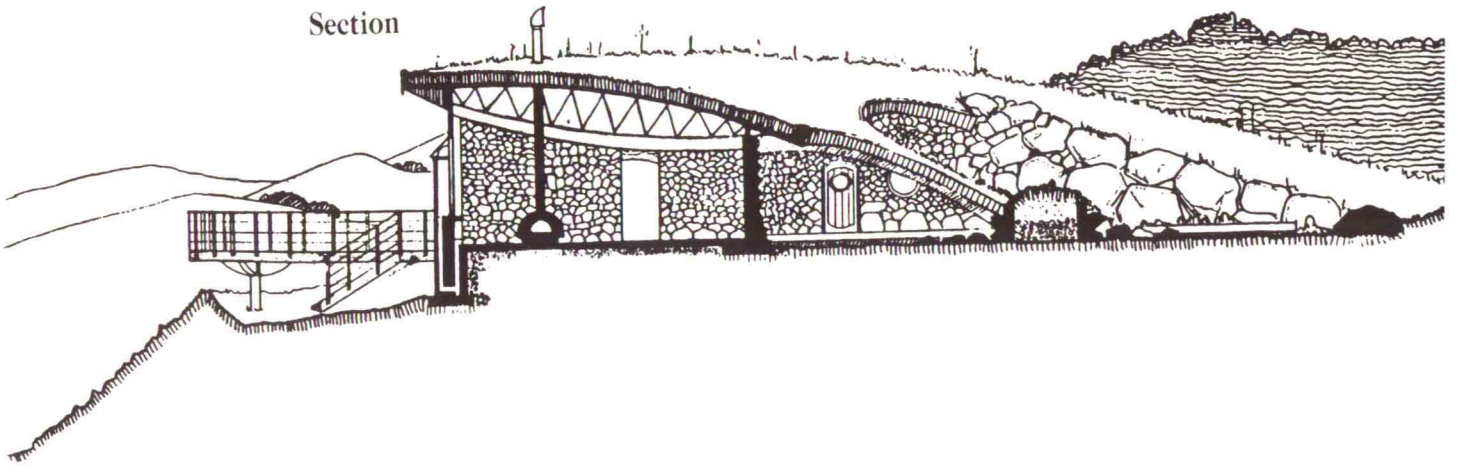
TOP: *A low profile blends the house with the topography. The low profile also protects the house from high winds.*

Photo: Alan Weintraub, funding by the Graham Foundation

Sited on a spectacular ridge top, 10 miles from the Pacific Ocean and 50 miles south of San Francisco, this house appears as the hilltop's smile. It is often buffeted by winds of more than 100 miles per hour, so the design cuts the house into the hill to present a low profile to coastal storms. The house sits in a south-facing bowl, allowing the winds to move right over it while allowing generous sunlight.

By following the contours of the ridge and using earth berms, stone from the site, and a sod roof, the house blends into the natural terrain. This strategy reduces heating and cooling loads and provides fire, wind, and earthquake resistance. To compensate for swings in temperature, the house's thermal mass of concrete and stone, and the fact that it is buried into the hill, helps to stabilize its temperature. The larger the mass of the structure, the slower its response to temperature fluctuations.

A Trombe wall that operates primarily by a convective loop is 60 percent below the floor level to allow for direct gain windows above the view. The wall curves from south to southwest and its passive solar components, such as glass and concrete, contrast with the softer, natural forms and materials of the east and north sides composed of earth, boulders, and fieldstone. A wind-powered pump provides water to a storage tank, which is then gravity-fed into the house. Domestic hot water is solar heated.

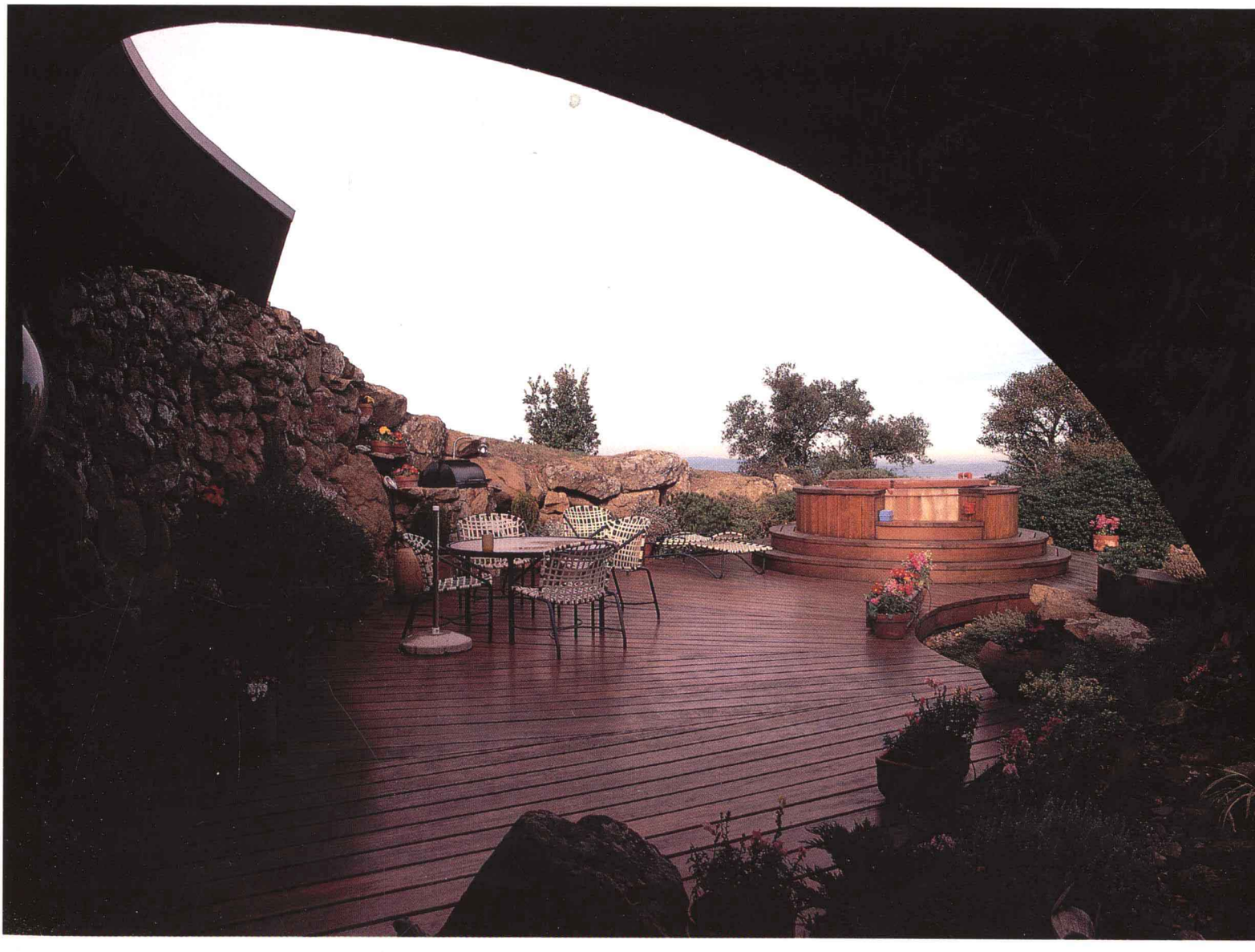


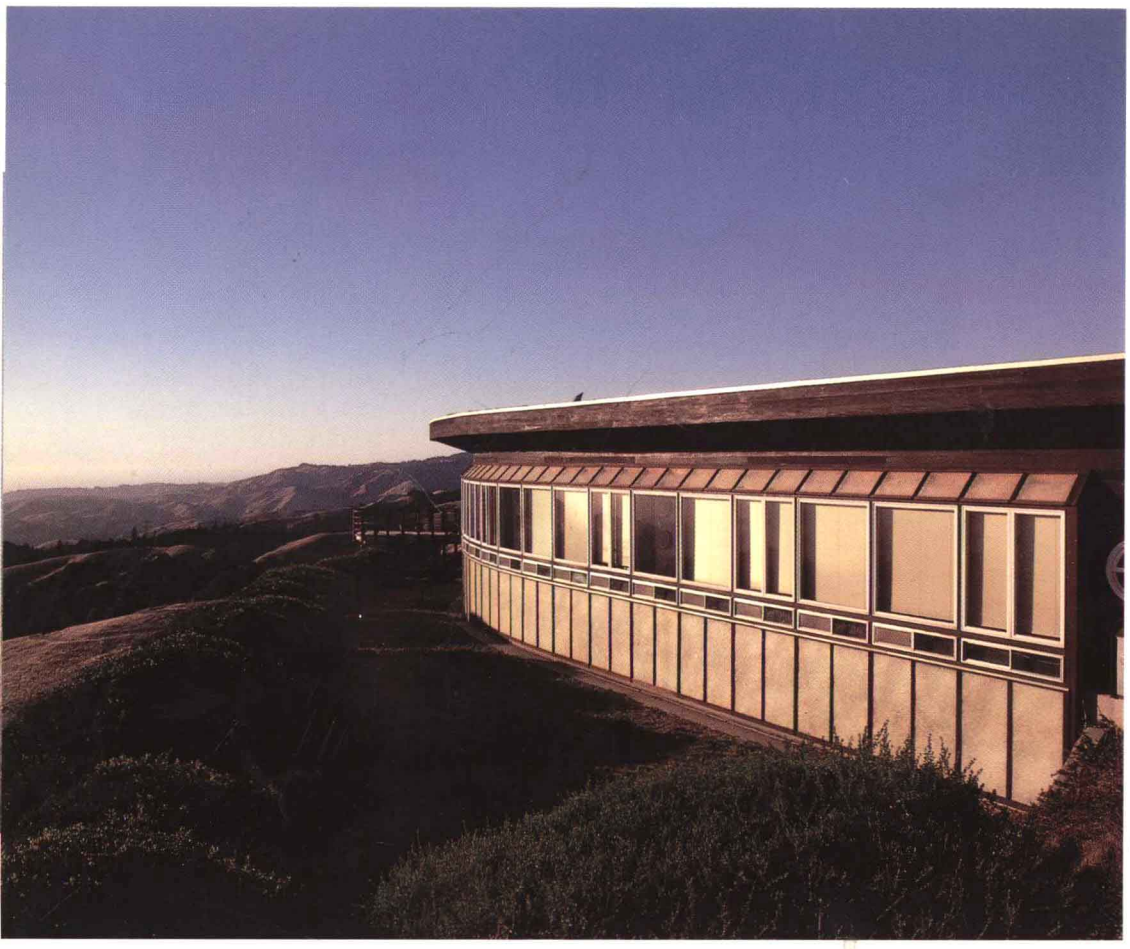
RIGHT: *The inner court is a green oasis. The space is protected from high winds that pass over the house.*

Photo: Alan Weintraub, funding by the Graham Foundation.

BOTTOM: *A view of the court deck from under the "tongue." The hot tub is heated with solar collectors.*

Photo: Alan Weintraub, funding by the Graham Foundation.



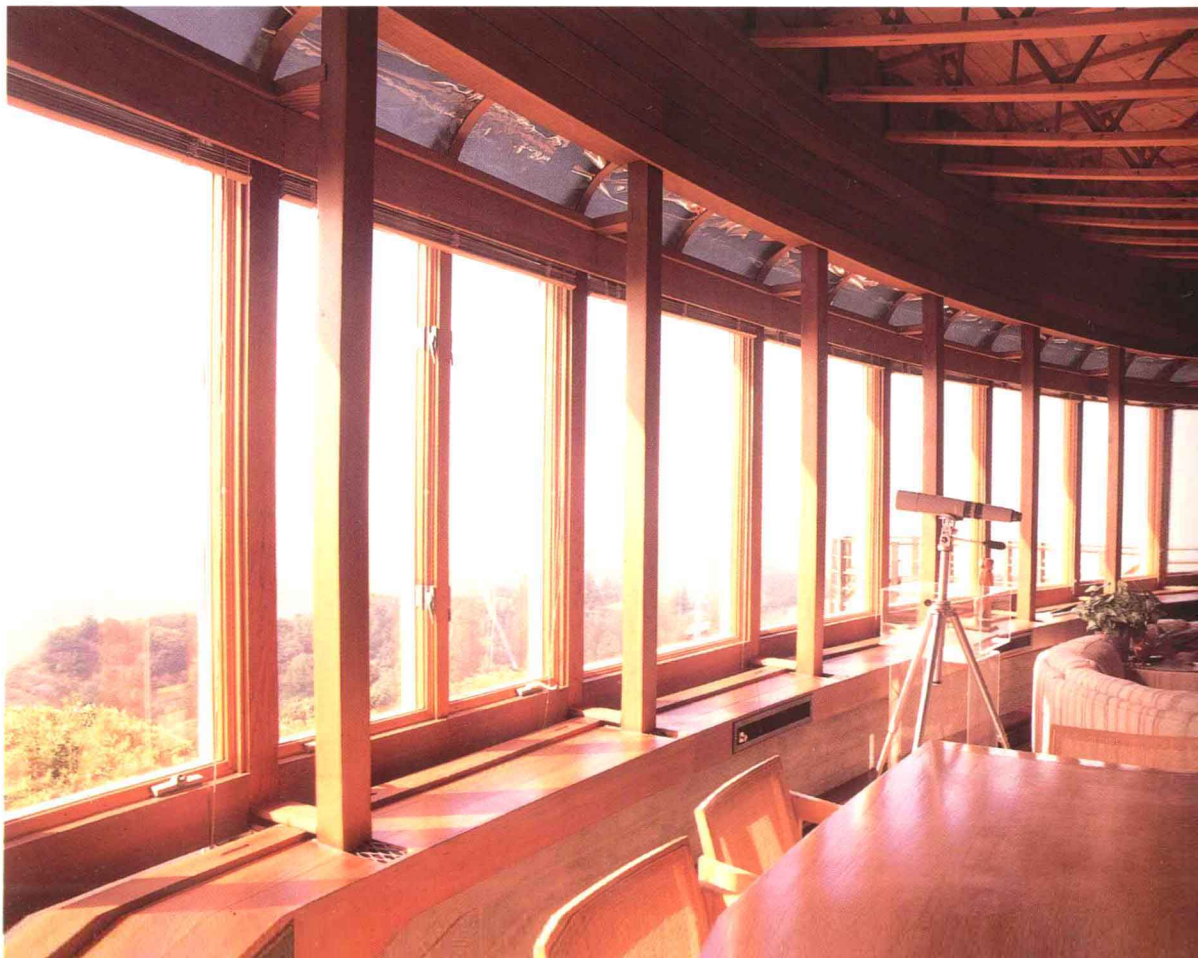


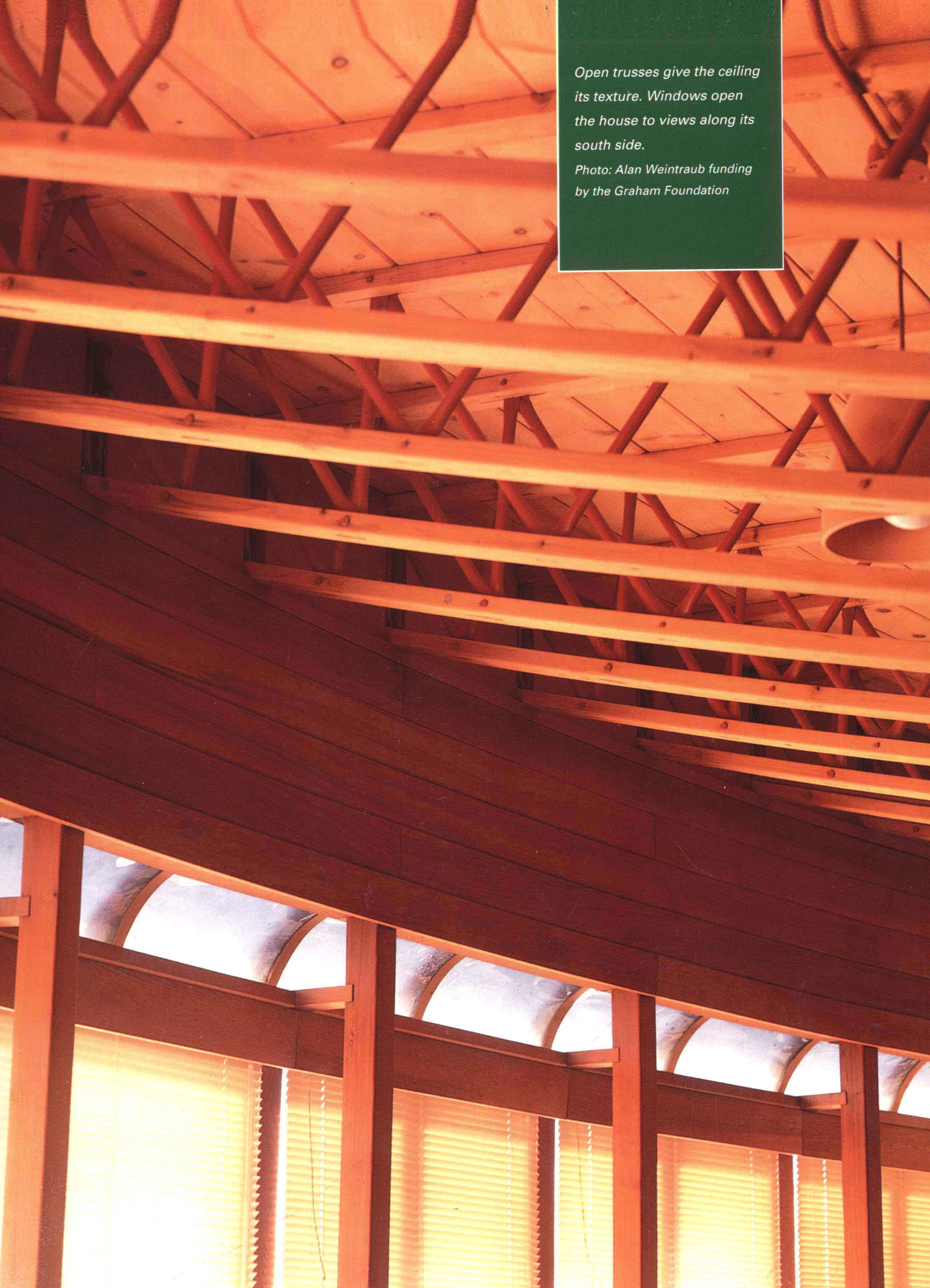
LEFT: *The lower portion of the wall is for thermal storage. The wall curves from south to southwest.*

Photo: Alan Weintraub, funding by the Graham Foundation.

BOTTOM: *Banks of windows extend along the hillside elevation. These windows also allow spectacular views of sunsets.*

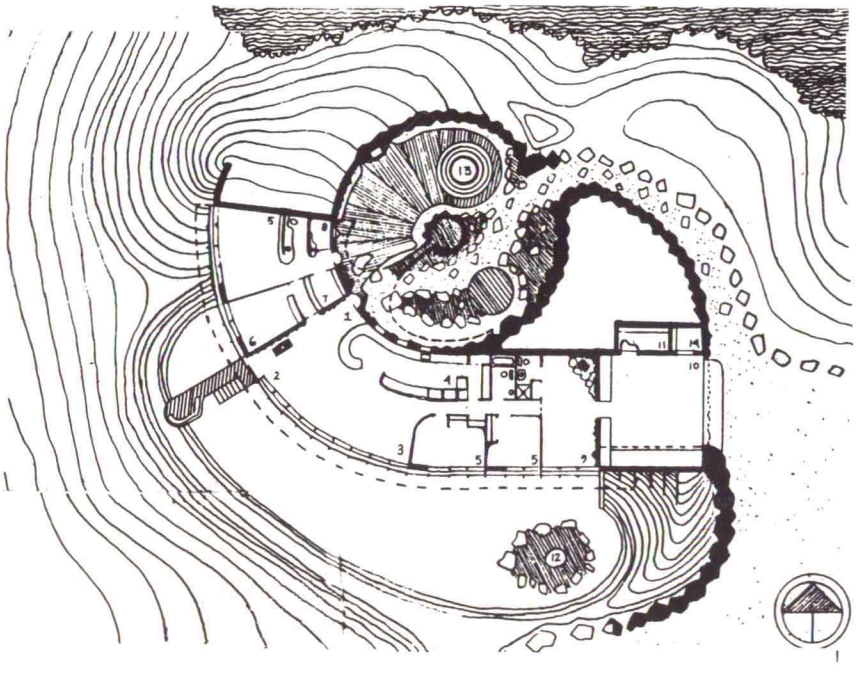
Photo: Alan Weintraub, funding by the Graham Foundation.





Open trusses give the ceiling its texture. Windows open the house to views along its south side.
Photo: Alan Weintraub funding by the Graham Foundation

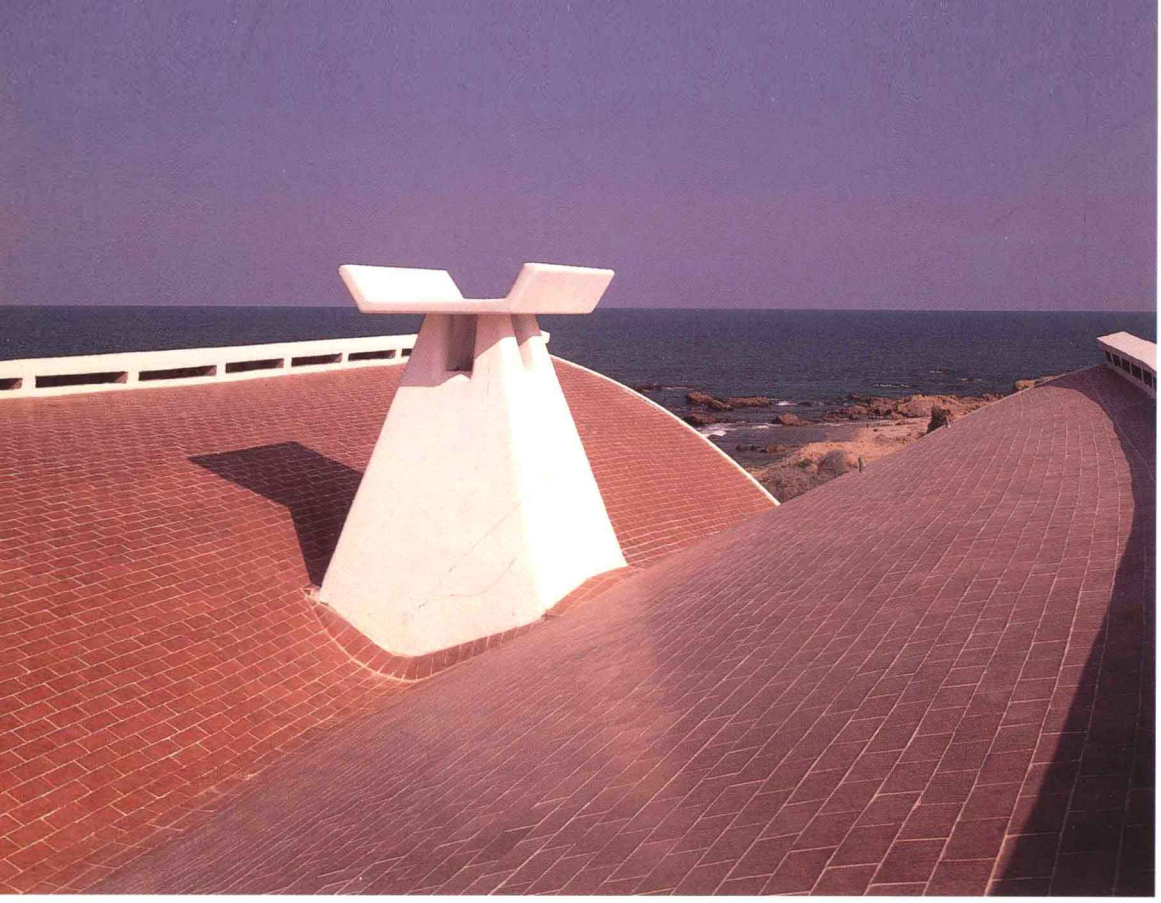
1. Entry
2. Living
3. Dining
4. Kitchen
5. Bedroom
6. Study
7. Closet
8. Shower
9. Family
10. Garage
11. Wine Cellar
12. Vegetables
13. Hot Tub
14. Utility



TOP: *Rockwork uses the products of excavation. This material also provides thermal mass.*
Photo: Alan Weintraub, funding by the Graham Foundation

TOP: *The house from the air gently protrudes from the hill.*
Photo: Bob Moore

LEFT: *A viewing deck on the hillside offers spectacular views. This element is accessible from the living area.*
Photo: Alan Weintraub, funding by the Graham Foundation



LEFT: *Detail of the tile roof, with venting in center and at edges. This roof's structure is composed of lenticular trusses, which give it its unique shape.*
Photo: Alan Weintraub, funding by the Graham Foundation.

BOTTOM: *View from the study. Open windows funnel prevailing breezes throughout the house.*
Photo: Alan Weintraub, funding by the Graham Foundation.