COMMUNITY GEOTHERMAL TECHNOLOGY PROGRAM

SILICA BRONZE

Conducted by

Henry Bianchini

1989

SILICA BRONZE PROJECT

Final Report
Submitted to the
Community Geothermal Technology Program

Henry Bianchini
P.O. 1199
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October 1989

NOTICE

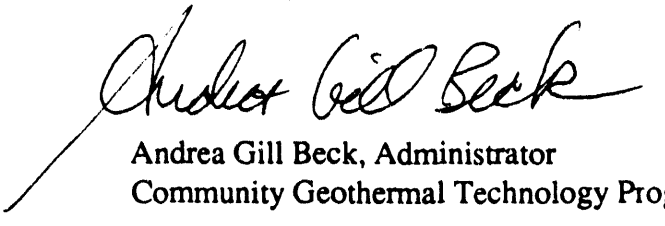
PREFACE

This is a report of work performed for the Community Geothermal Technology Program, a small grant program administered jointly by the Hawaii Natural Energy Institute and the State of Hawaii Department of Business, Economic Development and Tourism.

This project was one of five funded under the second phase of the program, which was awarded in 1988. Funds for this phase were provided by the U.S. Department of Energy, the County of Hawaii, and donations from private businesses.

The opinions expressed in this report are those of the author, and are not necessarily shared by the program administrators, funding agencies, or others involved in the program. Responsibility for the accuracy of the data provided in this report lies with the author.

The enthusiasm, talents, and efforts of the grantees are much appreciated, and I look forward to continuing to work with them and with future users of geothermal heat and by-products.



Andrea Gill Beck, Administrator
Community Geothermal Technology Program

Hawaii Energy Extension Service
Dept. of Business, Economic Development & Tourism
99 Aupuni St. #214
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SILICA BRONZE

INTRODUCTION

When applying for the Community Geothermal Technology Program grant, my intention was to see if I could incorporate the waste silica from the HGP-A geothermal well in Pohoiki with other refractory materials for investment casting of bronze sculpture. I ship materials in from the mainland for this process, and if the silica here could be used, it would reduce my business costs.

One of the refractory materials I use for casting is brick dust, which must be shipped from Los Angeles. Since it is not commercially marketed, ordering a supply entails a special trip to the mainland. I incur costs for ocean shipping and delivery, as well as for the material.

Another material available for refractory use is silica sand, which can be purchased locally in Hawaii for about $20 per 100-pound bag.

Although these materials are not costly, they represent the second largest expense (after propane for the furnace) for my bronze casting business — about 15 percent of my total expenses. Replacing them, even partially, with geothermal silica can mean a very real reduction in my operating costs.

The grant awarded to me was $15,000. I started the project in August 1988 and completed it in August 1989. I am still working with the silica in my foundry and have also incorporated it into frescoes, ferro-cement painting, and sculpture.

CONCLUSIONS

The major conclusion of the project was that I could successfully incorporate the waste silica into my bronze casting, using the "lost wax" process. I also discovered uses for the silica in my other art work.

Investments for casting bronze sculpture need a lot of material. I finally used about 50 percent silica, 25 percent red cinders, and 25 percent brick dust. The remaining ingredient is a binding agent, such a plaster and water. The materials are mixed to a slurry and poured around the wax prototype sculpture. This is done in a cylinder which is lined with chicken wire for strength.

I tried using various proportions of silica in the mixture, but found 50 percent the most successful. Using a higher percentage of silica made the investments too light, and they did not have the strength to contain the molten bronze.

Another of my findings was that I would probably not need to dry the silica before using it in an investment. I needed to reintroduce it to water when it was mixed with the plaster, brick dust, and cinder. However, it is important to wash the silica repeatedly to clean it thoroughly of all salt and residue. For long-term storage, I feel it is better to dry it. When the silica is wet for any length of time, algae will form on it, rendering it useless for investment purposes.

Another discovery I made as I developed other types of sculpture and painting was that dry silica could be added to the ingredients. It mixed well with the cements and paints that I use. I developed a fresco technique for coloring both ferro-cement sculpture and fresco paintings. The silica made the cement sculptures lighter and the paintings more durable.

In bronze sculpture during lost wax casting, the silica made the investments lighter and easier to handle. They were more porous so the gases could escape. This again was very beneficial.

I also found that I could use the silica as a flux on top of the molten bronze. It would melt and act like glass, picking up slag and impurities from the metal.

In terms of future plans, I will continue to cast bronze in my foundry. It is my hope that I will be able to obtain waste silica from the geothermal wells. However, this will be determined by the future plans and development of geothermal facilities on this island. At this time, it is uncertain whether silica will continue to be available.

I found the Natural Energy Laboratory of Hawaii staff and especially Andrea Gill Beck, CGTP Administrator, to be very helpful, always willing to share any information in relationship to the project, and most pleasant to work with. They were always available to answer any questions I had. Also, thanks to Dr. Donald Thomas of the University of Hawaii at Manoa for his assistance.

DESCRIPTION OF WORK

Construction of Silica Washing and Drying Facility

Water was an important part of this project, since plenty of it was needed to wash all salts and residue out of the geothermal silica. An area approximately 35 by 30 feet was cleared near my workshop for the water tank, solar drying room, and storage area. This had to be filled with rock, cinder, and finally sand for the surface to be level. Then a pad of cement was poured for the base of the water tank, which was constructed by encircling the pad with special wire and rebar. Cement was then sprayed from the inside out. This took several sprayings. A final layer was applied to the outside and troweled. The water storage tank has a diameter of 15 feet, is 7 feet high, and holds 10,000 gallons of water.

Next a cement slab was poured with drains inserted in the cement for the silica-wash run-off. On top of this, framing was erected for a roof to cover the water tank and drying/ storage area. This building is 18 feet long by 15 feet wide, with a height of 10 feet at the peak of the roof, sloping to 8 feet.

On one side of the roof were laid four 8 by 22 foot glass panels. About 2 feet below the glass, two large racks, 7 by 7 feet, were built of two-by-four construction-grade lumber and braced every two feet to support the weight of the wet silica. Onto the rack frames were placed layers of different gauge wire screen with openings of 1/2 by 4 inches, 1/2 by 3 inches, 1/8 by 4 inches, and 1/8 by 3 inches.

A layer of fine cotton batiste was laid on the wire screens to keep the silica from washing away while allowing the water to drain through. The wire and fabric were held in place with a molding of wood nailed down all the way around each rack. Completely encircling these racks, inside the roof, was a hose with holes punched in it at approximately one-inch intervals. This system was turned on twice daily for 45 minutes to 1 hour to wash the silica thoroughly. It was periodically stirred and turned to ensure complete washing. This was done for a period of one week, after which the silica was allowed to solar-dry beneath the glass panels.

When thoroughly dry, the silica was in the form of a very fine, sandy powder. It was then stored in plastic buckets which were closed tightly to seal out any moisture. More wet silica was then placed on the racks and the entire procedure was repeated. The amount of silica processed during the project was not measured, but the total is estimated at about one ton (wet).

Bronze Casting

In the process of lost wax casting, I started with a wax prototype of a sculpture. This wax must be "invested," that is, surrounded by a material which can be poured around the wax and allowed to harden. It must withstand high temperatures as the wax is melted away. At least two-thirds of the investment must be refractory material such as silica sand, brick dust, cinder, or grog (shards of fired clay). The remaining ingredient is a binding agent, such as plaster and water. These materials are mixed into a slurry and poured around the wax prototype. This is done in a cylinder that is reinforced with chicken wire for strength.

The silica powder was particularly useful in improving the texture of the investment slurry if the mixture was too wet. Powder could be added easily to bring the slurry to the proper pudding like texture.

This investment is left undisturbed for approximately 30 minutes to harden. It is then placed in a kiln or oven and baked for 24 hours at 1,250° F. This eliminates all moisture and

wax residue, leaving the cavity inside the investment clean. The cavity left by the melted wax is in the exact shape of the desired sculpture.

Next, bronze ingots are placed into a crucible, which is then heated in a propane-fired furnace to 2,150° F. In about one hour the ingots have melted and are ready for the pour. The furnace is turned off, the crucible is removed, and the molten bronze is carefully poured into the cavity of the investment. It is then left to cool. After cooling (the length of time varies with the size of the piece), the investment is broken off the sculpture, and a work of bronze emerges.

The bronze sculpture will then go through numerous finishing procedures: grinding, applying a patina, and polishing. Patinas are the coloration of bronze through the application of chemicals. This is an art in itself, and an artist must develop his own formulas if he works in the bronze casing medium. Some sculptures will be mounted on marble, various types of wood, poured cement, or stone, depending on the particular piece and what the artist feels appropriate. Certain sculptures do not require a base.

Ferro-Cement and Other Techniques

Ferro-cement art involves the application of cement to a steel armature, such as one formed of reinforcing bars. The sculpture can be shaped wet or dry The origin of the technique is actually the construction of ferro-cement boats.

Using geothermal silica in the cement made the sculpture lighter and easier to move. Part of the mortar sand normally used in the cement mixture was replaced with silica. The amount of silica varied, but perhaps replaced about one-third of the sand. The silica was not coarse enough to allow its use exclusively because it would not have the necessary strength.

The silica was especially handy when the cement mix was too wet, since adding silica rapidly improved the texture to a workable, putty like consistency. Also, since the silica is white, adding it to the cement had the effect of brightening the colors.

I also developed a method of painting on wet plaster, an adaptation of the fresco technique. Silica was added to the plaster, and color added to the wet surface. Adding a small amount of geothermal silica strengthened the surface of the plaster.

Exhibition

In August 1989 I had a one-man show of fifty-eight works at the East Hawaii Cultural Center in Hilo, Hawaii. Of these works, about one dozen bronze sculptures were cast using waste silica.

I also showed five ferro-cement sculptures ranging in size from three feet to seven feet, which incorporated the waste silica, giving them strength and lighter weight. I also incorporated the waste silica into a plaster mix that I used on two large 4 by 8 foot fresco panel paintings; again, the silica gave the plaster mixture strength and reduced its weight. These were experiments in the use of geothermal silica which were successful, but the use of the silica was not essential to the pieces created.

The use of the silica for the investment casting was of much greater benefit, and I would like to continue that.

In November 1988 some bronze works and some photographs were exhibited at the Natural Energy Laboratory of Hawaii's Puna Geothermal Facility during the laboratory open house. I gave a demonstration and talked about the grant project and my work in general.

Time Schedule

Steps	Months after Grant Award
	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
Materials Purchased	s ----------c
Equipment Built	s ----------c
Experiments	s ----------c
Final Report	ongoing s --c
s = started c = completed	

FISCAL REPORT

The grant for this Silica Bronze project totalled $15,000, most of which went to supplies and salaries. No equipment was purchased from grant funds; the equipment used was provided as a cost-share from my existing foundry. Since no Natural Energy Laboratory of Hawaii (NELH) facilities, equipment, or labor was used, NELH waived the facility use fee.

As a result of the project, two bronze sculptures were donated to the Community Geothermal Technology Program to demonstrate this use of waste geothermal silica. One has been mounted in a permanent display at the Puna Geothermal Facility visitor center. Their total value is $2,300, based on sales of other works in the same series.

APPENDIX A
ILLUSTRATIONS

E X H I B I T I O N

"INVOLUNTARY METAPHORS"

The recent works of Henry Bianchini

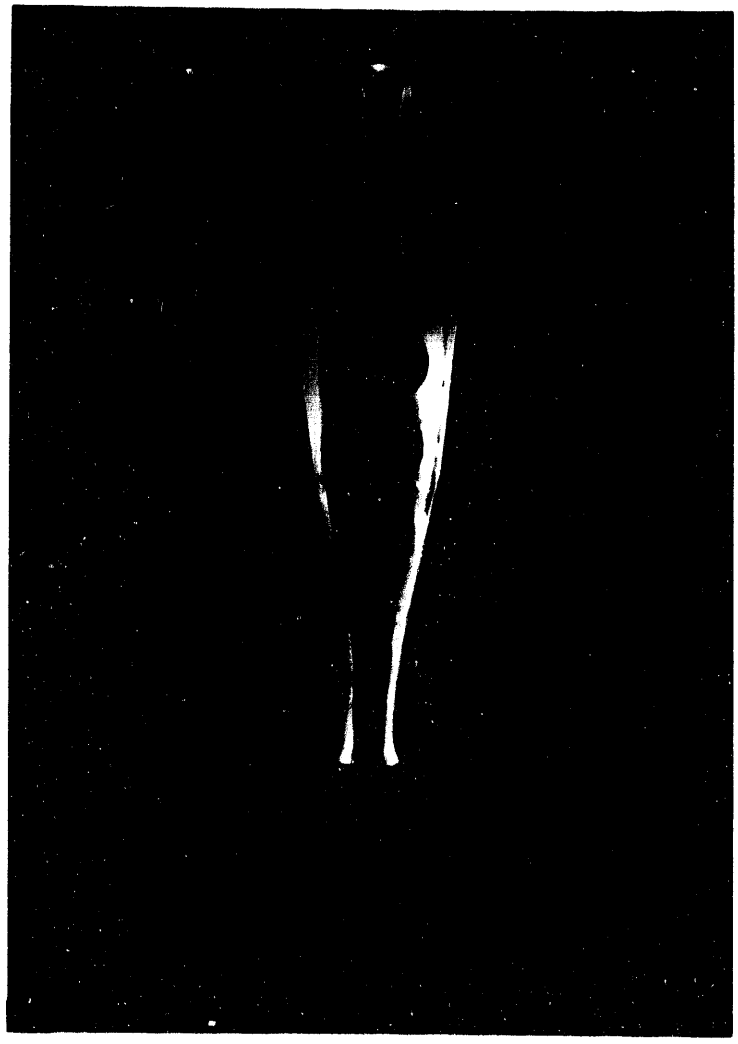
Exhibition announcement and illustration of a bronze sculpture created using an investment containing geothermal silica.

August 4 - August 30, 1989

Opening Reception
Friday, August 4th
6:30 - 9 pm

Refreshments
LIVE MUSIC

East Hawaii Cultural Center
141 Kalakaua Street Hilo, HI 96720



"KAHUNA" - Bronze & Cast Stone, 31" - Henry Bianchini

Artist Henry Bianchini removes the investment from a poured bronze sculpture, then quenches the still-hot metal in water (above). Bronze pieces awaiting polishing and finish work (below).

APPENDIX B
BIOGRAPHY

Henry Bianchini, Sculptor-Painter

Henry Bianchini was born December 28, 1935, in San Diego, California. His exposure to the folk arts of the Virgin Islands, the East Coast, and New Foundland during childhood travels made him extremely interested in the arts at an early age.

Henry married Dianne Denton in 1965 and started building a sailboat (30-foot Trimaran) in their back yard. They launched it nine months later and began a six-year adventure that brought them to the Big Island in 1969, where they decided to settle.

Henry pursued his love of the arts with great excitement, carving Hawaiian woods ('ohi'a, kamani, etc.) and painting. His love of bronze sculpture became a focus, and the ability to cast his own work became a reality in 1984 when he set up a foundry in his studio in Puna.

Henry's devotion to fine art and his endless hours of labor have enabled him to earn a living with his work. He has had numerous one man and group shows, and his work is owned by collectors in Hawaii and on the mainland. He has had several public commissions, and his work is exhibited at galleries throughout the Hawaiian Islands.

APPENDIX C
CURRICULUM VITAE
Henry Bianchini
Sculptor

Born 1935
Marital Status – Married, 3 children

Exhibitions:

1972-89	Spring Arts Festival (Juried), Wailoa Center, Hilo, Hawaii
1974	One Man Show, Hilo Library, Hilo, Hawaii
1977	One Man Show, Volcano Art Center, Volcano, Hawaii
1980	Group Show, Campus Center, University of Hawaii at Hilo
1983	Signs '83, Invitational, Amfac Center, Honolulu, Hawaii
1984	Group Show, Connoisseurs Gallery, Mauna Lani Bay Hotel, Hawaii
1984	Group Show, "Chisel & Palette," Wailoa Center, Hilo, Hawaii
1984	Group Show, Susan Spiritus Gallery, Newport Beach, California
1984	"Exposition, A Big Island Invitational," Wailoa Center, Hilo, Hawaii
1985	Group Show, Vision Gallery, San Francisco, California
1986	One Man Show, "The Interplay of Form," Volcano Art Center, Volcano, Hawaii
1986-89	Group Show, Big Island Wood Show, Wailoa Center, Hilo, Hawaii
1986	Group Show, Hawaii Craftsman '86, Honolulu, Hawaii
1986	Artists of Hawaii, Honolulu Academy of Arts, Honolulu, Hawaii
1986	Group Show, Studio 7, Holualoa, Hawaii
1987	Group Show, Nikko Gallery, Waimea, Hawaii
1988	Dedication, King Kalakaua Statue, August, Kalakaua Park, Hilo, Hawaii
1988	Ampersand Show, East Hawaii Cultural Center, Hilo, Hawaii
1988	Ampersand Magazine, Alexander and Baldwin, Inc., September 1988 Issue
1988-89	Two Television Interviews, Spectrum Hawaii, "Light in Art" and "Hilo Artists"
1989	One Man Show, "Involuntary Metaphors," East Hawaii Cultural Center, Hilo, Hawaii
1989	Group show, Visions of the Volcano; Juror, Laila Twigg Smith, East Hawaii Cultural Center. Traveling to Contemporary Museum, Honolulu, and Stones Gallery, Kauai, 1990

Commissions

1977	Aza Summers, AIA, Carved Structural Post, interior of a commercial building, Pahoa, Hawaii
1985	Life size bronze, Mother and Child theme, "Ho'okamalani," front entrance of the

1988 Life size bronze of King David Kalakaua, Kalakaua Park, Hilo, Hawaii
1988-89 Geothermal Grant, Energy Extension Service, State of Hawaii

Theatre Set Designs

1983 "Fiddler on the Roof," UHH Theatre, Hilo, Hawaii; Published in *Theatre Crafts*, 1986
1985 "Archie and Mahitabel," UHH Theatre, Hilo, Hawaii; Consultant for many other UHH Theatre productions; Also lecturer for technical staff
1987-88 Design and Set for Choreographer/Dancer Eva Lee

Other

1983 Teacher, Keaau Elementary School, Gifted and Talented Program, sculpture techniques
1985 Consultant, East Hawaii Cultural Center, Hilo, Hawaii
1988-89 Teacher, Malamalama School, grades 6, 7, & 8 wood carving classes

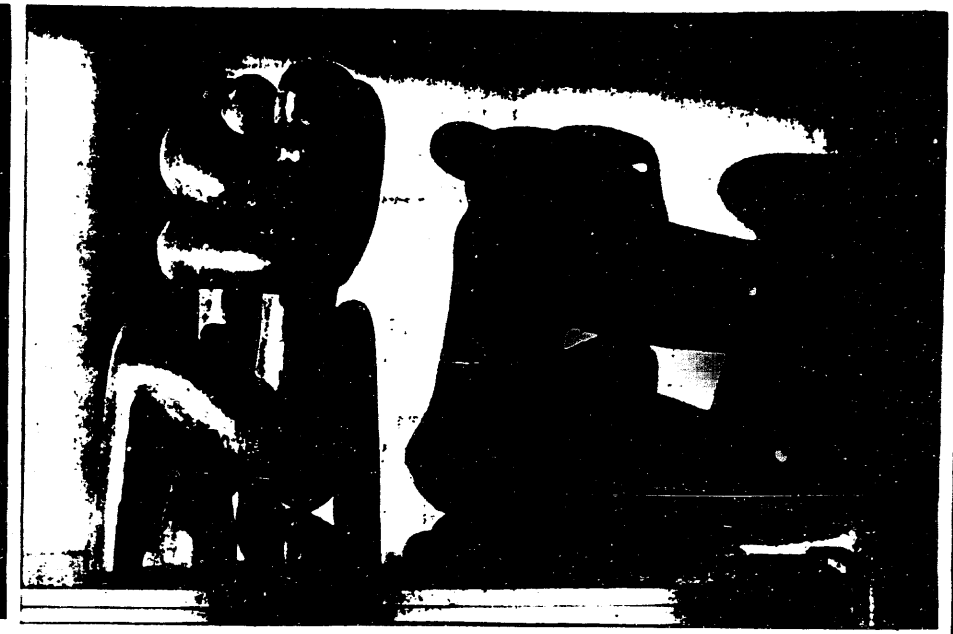
Galleries Displaying Work

Volcano Art Center, Volcano, Hawaii
Maya Gallery, Waimea, Hawaii
East Hawaii Cultural Center, Hilo, Hawaii
Stories Gallery, Lihue, Kauai
Gallery of the Pacific, Mauna Lani Bay Hotel, Hawaii
Studio 7, Holualoa, Hawaii
Gallery of Great Things, Waimea, Hawaii
Art Loft, Honolulu, Hawaii
Susan Spiritus Gallery, Newport Beach, California
Vision Gallery, San Francisco, California

APPENDIX D
NEWS ARTICLES

SCULPTURE EXHIBIT — Currently showing at the East Hawaii Cultural Center is the work of Henry Bianchini in a major one-man exhibition of his sculpture. Late in 1988 Bianchini received a grant from the Hawaii Natural Energy Institute to do research on the uses of the silica waste byproduct from the Puna geothermal well. He used this silica for investing bronze works in the lost wax process. He is finding further ways to incorporate the silica into fresco paintings and cast stone and ferro-cement sculpture. "Soul Birds" is pictured here. "I have been finding new materials to further my interest in classical and experimental directions," said Bianchini. The exhibition, at the Old Police Station Gallery, can be seen until Wednesday. The gallery is located at 141 Kalakaua St. in downtown Hilo. It is open Monday through Saturday from 9 a.m. to 4 p.m.

ARTIST AT WORK — With mallet and chisel in hand, Henry Bianchini, in his Puna studio, is in the process of carving a 1986 ohia wood sculpture that is included in his current show.



EMOTION IN WOOD — Another ohia wood sculpture on view at the East Hawaii Culture Center Gallery is this modern piece of a couple embracing, the shadow on the wall expanding its consciousness.

Bianchini's bronze, wood, fresco sculpture & panels on exhibit

Henry Bianchini has been arduously honing his skills as a sculptor of bronze and indigenous Hawaiian woods for 18 years. More recently, he has added a new dimension to his repertoire with fresco ferro cement sculptures and panels.

A representative collection of 57 of these works of art opened in an exhibit Friday evening at the East Hawaii Cultural Center gallery, and will continue through Aug. 30.

Along with the fresco sculpture, bronze castings, wood and stone carvings, there are very new fresco panels which he describes as "Pele's creation of a new temple of Wahaula."

In the 20 years that he has lived in Puna, Bianchini has come a long way in perfecting his art and achieving public recognition.

Two examples are public commissions for a life size bronze sculpture "Ho-okamalani" placed at the entrance to the new Kaiser Hospital on Oahu in 1985, and the bronze statue of King David Kalakaua, appropriately erected in Kalakaua Park in Downtown Hilo last year. There also have been private commissions.

Bianchini, a modest man, depicts himself as one who has "a thirst for experience, and a strong need to take on unknown challenges related to his world of art.

"The ferro frescoes are an example of my experimentation with new materials," he says. "I am excited about new materials and their potential. I collect all sorts of found objects, and have a large resource stock to draw from and to experiment with."

In the current exhibition, he has focused attention on the garden space and its enhancement with sculpture.

"I have always felt that sculpture, if it is the proper scale for the surrounding space, is at its strongest out-of-doors. I firmly believe that large contemporary outdoor sculpture can enrich our lives the way a Bach fugue can," he earnestly explains.

Bianchini observes that sculpture increases one's pleasure of even a modest home garden. While bronze ornaments are prized in garden settings, he says more affordable sculptures as the fresco ferro cement ornaments can be valuable enhancements to those who are interested in their surroundings.

The artisan has had numerous one-man and group shows at galleries throughout Hawaii Island. He has exhibited at the Honolulu Academy of Arts, and entered large collections of work in the Hawaii Craftmens shows in Honolulu.

In addition, he has created set designs for University of Hawaii at Hilo Theatre productions, including the 1983 "Fiddler on the Roof," for which his work was hailed in the national magazine "Theater Craft."

His work is in collections nationally, and is represented in galleries throughout the state and in California.

—By Maxine Hughes

Hawaii Tribune-Herald Aug. 6, 1989

Henry Bianchini eschews the premeditative work of sketching or model-building, opting for spontaneity in his sculptures. At left is "The Dance," a piece which shows his mastery of negative space. His current show, "Involuntary Metaphors" is in the Old Police Station Gallery in Hilo.

Artist unleashes forms' essence

Involuntary Metaphors, recent work by Henry Bianchini, sponsored by the East Hawaii Cultural Center: At the Old Police Station Gallery, 141 Kalakaua St. in downtown Hilo; through Aug. 30. Hours: 9 a.m. to 4 p.m. Monday-Saturday.

IN speaking of his work, sculptor Henry Bianchini has noted that "the tactile values of materials have deep urgings."

This observation, in one sense a corollary of the title of the exhibition itself, touches the heart of Bianchini's work. Matter as the wellspring of meaning is what this work is about, and Bianchini creates form and surface loaded with visual and kinesthetic experience.

Bianchini works directly with his chosen material, eschewing the premeditative work of sketching or model-building.

Carving and finishing of wood, or modeling of wax which is then invested for casting in bronze, each provides an ideal combination of spontaneous impulse on the one hand and interactive shaping on the other. Artist and material engage, in essence, in a silent dialogue in order to arrive at a shared statement.

Two sculptures in wood, "Avocado Figure" (1975) and "Abduction of Hina" (1989) bracket the exhibition chronologically and also suggest the range of formal variation present in Bianchini's work.

The earlier work approaches the figure with a sense of stylization, linking the psychic sensuality of pose with the sinuous surface of the wood, and eliding certain anatomical features as in the fusion of head and arms.

The later work is more highly abstracted and elusive, as is perhaps fitting in this evocation of a goddess who occasionally takes human form.

Bianchini's work in cast bronze, which he produces in his own foundry, most often retains a strong sense of the plasticity of the wax original from which it was cast. Bianchini is a master of negative space, and this is most evident in the bronzes, whether focused, totemic works such as "The Chief" and "Kahuna," or more fluid, organic forms such as "The Dance" and "Reclining Figure II."

BIANCHINI has most recently begun working in ferrocement, with occasional polychrome inclusions. The material is built up on a metal armature, and strongly resembles black sand. A recent series, "Soul Birds," which depicts lively congregations of creatures, even evokes an image of living things having taken on lava skins.

For all its intuitive impulse, his work is clearly disciplined both formally and historically.

At a time when traditions may be suspect and postmodern appropriation is touted as legitimate strategy, Bianchini manages to find a comfortable balance. He comments, "I have never avoided influences. I would have considered doing so cowardly and a disservice to myself. I believe that we all are influenced but we must strive to add something in the continuation."

So one may find in this work the resonances of modern artists Gris and Braque, Lipchitz, Moore and Giacometti as well as those of indigenous Hawaiian and Northwest Indian sculpture — influences which do not reduce Bianchini to derivation, but connect him to a larger and longer tradition.

It is a tradition in which the facets of form lead into both spatial and temporal sequences of perception and, in so doing, create ways in which a form itself may address meaning both literal and metaphorical.

Much of Bianchini's work is figurative; this frame of reference thus embraces both the particularities of human gesture and experience, and the universal compulsion of life's energy.

ART SCENE
By Marcia Morse

Star-Bulletin art critic Marcia Morse is an art instructor at Honolulu Community College and an artist in her own right.

END

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3/22/94