Acid Ball Sculpture Proposal

Title: *Azimuth*, a Globe Sundial

Artist- Aaron Loveitt

Partners in Astronomy- Woody Sullivan & Sasch Stephens

Azimuth: Motivation

Bellingham's location along the shoreline of the Salish Sea has supported in turn a rich native culture, a determined generation of pioneers, and now a thriving city re-defining itself after a century of heavy industry. It is a place where tall trees grew, fell, and now grow again; where salmon continue to nourish us; where the snowmelt rivers build the soil our farmers till; where today Whatcom County surges with a revitalized healthy community. All the while the sun continues to rise over the mountains, cross overhead, and set once again behind the ocean. Every day its energy brings life to us and to the world beyond our horizon. Daily we spin together and yearly we orbit along our planet's ancient path. Measured in sunlight and shadows slowly moving across the landscape, we experience time.

The Acid Ball, a beautifully rusted relic from the time of Bellingham's industrial boom, will be re-appropriated to become a sculptural bridge between our city's past heritage and its promising future. As we dismantle the tools of a resource-intensive heritage and design a healthier economy for the future, public art should help illustrate this profound transition. The Acid Ball will be transformed by astronomy and geography to reveal Bellingham's location in time and space relative to the world at large. The piece will fascinate the viewer both day and night.

We propose to transform the Acid Ball into the sculpture *Azimuth,* a Globe Sundial that represents our planet and at the same time acts as a scientific instrument. Basic properties of the Acid Ball (its shape, its rivet patterns, its large nozzle ports) make the Globe Sundial naturally emerge from the relic itself, almost as if the sculpture was in fact the Acid Ball's original purpose. Our sculpture also subtly references historical activities that have long shaped Bellingham and its waterfront: seafaring exploration, commercial shipping, transportation, navigation, and worldwide outlook in general. We believe this is a

very successful solution for the Acid Ball because through this design the work has a synonymous relationship between the artifact and the sculpture, between the sculpture and Bellingham, between Bellingham and the world, between the the energy of the Sun and the energy of Earth's civilization.

Globe Sundial: The Visitor's Experience

The first impression for a (daytime) visitor will be of a giant globe, resting in orientation, showing the continents and major islands of the Earth as curved plates attached to the surface. The noticeable pattern of rivet lines corresponds neatly with the grid of longitude and latitude. Further inspection reveals that Bellingham is located exactly at the top of the globe, and the globe's north pole is aligned with the real Earth's north pole, that is, the globe is tilted so that its north pole points to the North Star Polaris. Thus the globe in Bellingham is oriented exactly as is the entire Earth - *this means that when sunlight illuminates one portion of the globe at a certain time (say, from Japan to New York), then at that very moment the real Earth is also being illuminated in exactly the same manner*. The dividing line between dark and light on the globe corresponds precisely to where it is occurring on the Earth at the moment, showing the locations of all the sunrises and sunsets then simultaneously taking place. This profound connection then allows the globe to be a sophisticated sundial, designed in many ways to show not only the current time in Bellingham, but also at all other locations on Earth.

The viewer will be drawn to its band of gnomons wrapping around the equator with their corresponding markers. Immediately the planetary sculpture becomes something more; an unusual instrument to be deciphered. With observation the viewer will gain a uniquely true perspective of the Earth as well as the fundamental human relationship with time.

Globe Sundial: Features

Many features of the Globe Sundial will be educational, fascinating, and fun

Geography:

The Earth's continents and major islands will be made of ¼" thick Corten steel plate, laser cut to shape and formed to match the curvature of the sphere. The riveted divisions of the Acid Ball, defining key lines of the Earth and the sundial alike, will bisect the continents, creating an integrated design. Bellingham's location, at the top of the globe will be marked with a large bronze rivet that can be seen from Roeder Ave and the Granary building deck.

During the Day:

Evenly spaced along the equator stand 24 arched gnomons, each representing an hour (15° of longitude). The gnomon hours will be distinguished by groups of 1-12 hand-forged bronze rivets marking the sequence of time along the sundial clock. As the sun passes from east to west, the gnomons will cast their continuously changing shadows on the surface of the Globe. At any given time, the gnomon receiving the most direct sunlight will have the thinnest shadow, indicating the time in Bellingham. Consequently, the country that lies beneath that gnomon is experiencing 12-noon. For example, *when the sundial marks 7pm in Bellingham it also shows that it is 12-noon in Australia.* Like watching the hour hand on an enormous clock, the shadow lines swing across the face of the Azimuth Globe Sundial until they merge with the dark of Bellingham after dusk.

Night Time (Alternative A):

Located along the North side of the sculpture is a series of ground lights. The lights are timed with the Earth's daily rotation and seasons, so that after the Sun sets, time on the sundial will fade from sunlight to projected light. Each light marks the Sun's location (local noon) on the other side of the world, while the gnomon shadows continue to mark the time in Bellingham. This feature illuminates distant continents as well as projects a beautiful shifting wash of light across the sphere. In time, the last artificial light will fade as the Sun rises over our foothills. We have various design solutions for this series of lights including an integrated bench, an earthen swale, or the free-standing lights as rendered.
See image Azimuth: Night Time

Lighting Alternative B:

Another approach to illuminating the work is to line the shorelines of the world with LED strip lights. Each landform would be elevated an inch above the surface of the Acid

Ball allowing a gap to place the LED's. Approximately 600 linear feet of weatherproof LED strip lights would be fastened 4 inches behind the edge of the steel shoreline. The wiring would run in through the globe to a junction box buried at the South Pole. At dusk the lighting would outline Earth's landforms with a wash of light. The technical aspects of this lighting approach have been thoroughly worked out and include a tamperproof 14-year life span before expected lighting maintenance. Our budget itemizes Alternative A, however Alternative B is still very cost efficient.
See image Lighting Alternative B (disregard the peg style gnomons)

Explanatory Plaque:

A large, well designed plaque (~2-ft-square) will explain the astronomy of Globe Sundial, how to read the time, the history of the Acid Ball, and the sculpture's many special features.

Sculpture Finish:

After the surface lead mitigation of the Acid Ball, whether via sandblasting or solvents, we will return its beautiful natural patina by accelerating the metal's oxidation. This can be done with a variety of environmentally safe techniques, including simply salt water and/or a dilution of vinegar and hydrogen peroxide. The Corten steel continents will also have a rust patina but will be a different hue and surface quality so as to distinguish them from the oceans (the Acid Ball surface) in a subtle and intentional way. The steel gnomons and bronze hour markers will add further dimension, creating a cohesive, appropriate aesthetic. The metal will then be finished with an oil-based finish that will add richness and durability to the sculpture. Aside from steel's natural beauty, a benefit to this rust patina approach is its inherent resilience and low maintenance needs.

Maintenance Plan:

Azimuth will be a well-constructed sculpture built to last a very long time and will require very little maintenance. After its completion only periodic lighting replacement would be expected, and even then only every ~14 years.

Optional Astronomical Features

It is paramount that the sculpture alone capture all of the needs for a successful public work, but there are also many other features that can create additional opportunities for interaction, education and even events. Below is a list of three such additions.

Solar Sights:

Visitors can sight through holes in the ball's surface (capped with cast glass 'lenses') to observe the setting sun at the starts of the four seasons: vernal equinox, summer solstice, autumnal equinox and winter solstice. Sighting holes will also exist for the location on the sky where the next *total* solar eclipse will occur for Bellingham. This turns out to be at 5:41 am PST on 16 May 2618 ! Visitors can contemplate waiting for 501 years for this rare exact alignment of the sun, moon, and Bellingham.

This feature has been included in the project Budget.

Foundation Arrows:

The concrete foundation anchoring the sculpture or an external walkway around the sculpture would have imbedded and engraved arrows pointing towards significant planetary bearings (*azimuths*) along the horizon. For example:

-Summer solstice sunrise and sunset

-Winter solstice sunrise and sunset

-Vernal and autumnal equinox sunrise and sunset

-Major lunar standstill sunrise and sunset, 18.6 year cycle

-Minor lunar standstill sunrise and sunset, 18.6 year cycle

-Cardinal points: N,S,E,W

-Magnetic north and information on its yearly drift

-Sunset on the day of Bellingham's incorporation

Points of Interest:

Identified with either a large bronze rivet or even its own sundial gnomon we could mark locations of significance, for example the seven sister cities of Bellingham around the globe. If marked with its own gnomon, the date of the year can be read from the sun's shadow, and using this we could commemorate special dates in the history of Bellingham -

perhaps we can hold a public contest to suggest the handful of dates that should be included.

Sculpture Construction Process Summery

~3 months from start to finish (*See Budget for further process detail)*

Phase I

-Excavate and pour approximately a 5ft wide, 20ft diameter foundation ring (COB)

-Remove the existing legs, scheduled in conjunction with the relocation of the Acid Ball

-Position globe on foundation oriented to Bellingham's exact latitude and azimuth

-Apply rust patina to cleaned globe

Phase II

-Draft landform cut files and have laser cut from ¼" Corten steel plate

-Form the plates to match a 194" radius convexity

-Make the gnomons with corresponding hour markings

-Make any additional astronomical/sculptural details

-Design and manufacture the Explanatory Plaque

Phase III
-Install Earth's continents and major islands
-Install sundial gnomons
-Install any additional details on the globe and/or around its base (viewing sights etc.)
-Apply finish
Phase IV
-Install, wire and program all lighting
-Install Explanatory Plaque
-Project Dedication

In Conclusion

This is a rare and inspiring opportunity to create a profound and relevant work of art for our community. To create a sculpture that speaks to who we are as a community and a culture, where we stand within the world and within the solar system, and to mark this period in time historically and environmentally. We believe that *Azimuth* will become a rich and timeless sculpture that for many generations will celebrate Bellingham's waterfront development with a monument truly on a global scale.

Thank you for this fantastic opportunity,
- Aaron, Woody & Sasch

Azimuth Sculpture Proposal Budget

Project Budget Summery-	Outsourced Expenses	$8,300
	Combined Team Costs	$19,875
	Fabrication Costs	$62,575
	Material Expenses	$16,975
	Total Project Cost Estimate	$107,725 +sales tax

Outsourced Contracting

3D digital rendering

Precise Acid Ball digital model

Generating 1:1 scale landforms and then flattened & drafted for laser cut files

Model foundation slab dimensions and various astronomical elements

Simulation of lighting for best illumination design/setbacks

Westgate Design Works- ~$2,500

Laser Cutting

Cutting of landforms from ¼" Corten steel to digital model's specifications

Laser cutting, rolling and press-breaking Gnomon arcs to rough shape

Cutting of guide for checking the curve of the steel to match acid ball radius

K&K industries- ~$4,600

Electrical

Wiring of installed LED spotlights and programming of lights/solar timing

Northwave Electric- ~$800

Signage

Partial creation of Explanatory Plaque as well as potential inlaid foundation slab graphics

Bay Engraving- ~$400

Total outsourced labor estimate- ~$8,300

Globe Dial Team Costs

Combined sculpture design labor	-80 hrs
Combined astronomy and mathematics labor	-50 hrs
Surveying of astronomical components of Globe Dial	-15 hrs
Facilitation of 3D digital rendering	-20 hrs
Potential astronomical additions	-30 hrs
Design of Explanatory Plaque	-40 hrs
Sculpture concepts admin and project coordination	-30 hrs
Total Team labor- 265 hrs @ $75/hr-	-$19,875

Globe Dial Sculpture Fabrication Labor Tally- Altility Art Studio

<u>Facility Overhead</u>-

3.5 months of total shop usage $7,000

Additional Insured liability increase- $150
General project manufacturing admin & coordination- -40 hrs

Design-

Design, samples and re-design of specific sculpture elements -40 hrs

Geography Component

Coordination of laser cut file generation with cutting facility -10 hrs
Parts pick up -3 hrs
Sanding landform edges of steel to a soft, finger safe radius -12 hrs
Press-forming landform steel plates into a 194" radius convexity -30 hrs (x2 workers)
Final surface sanding of Corten steel forms -8 hrs
General parts catalogue & organization -4 hrs

Blacksmithing, Fabrication & Machining

Complete 24 arched Gnomons shapes -20 hrs
Hand-forge 156 large bronze hour indicators -40 hrs
Rivet bronze markers onto 24 gnomons -40 hrs
Forge and assemble various bronze markers for "locations of interest" *i.e. marking Bellingham, sister cities, etc.* -12 hrs
Fabricating stand and frame for Explanatory Plaque -12 hrs
Design and fabricate housing for ground lights -40 hrs
Design and fabrication of other astronomical sculpture details -35 hrs

Glass Casting

Design and fabricate 8 2" thick cast glass lenses to be added as the astronomical sights (sculpt original, make mold, cast and cold-working)-35 hrs

On Site Acid Ball Fabrication

-Removal of existing legs- *timed and coordinated with Acid Ball relocation* -8hrs (x2 workers)
-Removal of miscellaneous Ball appendages- *misc. hooks, sharp pieces as well as smoothing marks from previous legs etc.* -5hrs (x2)
-Potential removal of rivets that interfere with Continents placement -5 hrs (x2)
-Oversight for quality of lead mitigating sandblasting or solvent process- *a very thorough and consistent etched surface is necessary for proper natural rust patina.* -3 hrs
-Facilitation and oversight of slab foundation for accuracy of dimensions and any astronomical elements -6 hrs
-Preparation and facilitation of locating globe to exact orientation-8 hrs
-Patina- *acceleration of natural rust patina through one of various patination techniques* -20 hrs
Drilling- *approximately 200 ¾" diameter holes will be drilled and threaded into the surface of the Acid Ball for the rivet-esque attachment of the continent land forms, as well as holes for attaching gnomons* -25 hrs (x2)
Drilling/torch cutting roughly 8 4" diameter holes for astronomical "sights" -8 hrs (x2)
Bolted assembly of landforms- *team of 3 as well as a rented man lift*

	-20 hrs (x3)
Installation of 24 gnomons	-10 hrs (x2)
Installation of 8 cast glass lenses	-5 hrs (x2)
Installation of other astronomical sculpture details	-10 hrs (x2)
Installation of Explanatory Plaque	-3 hrs (x2)
Finishing- Apply oil finish after desired rust patina-	-10 hrs
Anticipated unknown fabrication labor	-30 hrs
<u>Lighting</u>	
R&D of various LED ground lighting concepts	-20 hrs
Location and installation of approx. 8 sculptural ground lights	-10 hrs
Facilitation of lights programming to match solar phases-	-3 hrs
Total fabrication labor tally-	-739 labor hours
@ $75/hr	-$55,425
Plus facility overhead ($7,150)	-$62,575

Materials-

Corten steel plate	~$3,100
Gnomons steel bar	~$2,200
2.5” diameter solid bronze rod for hour and location markers	~$2,100
Ground light housing materials	~$450
Casting glass	~$275
Exterior LED spot lights	~$1,200
Programmable timer of lighting- *timed with sun & seasons*	~$300
Spotlight electrical hardware- *wiring, j-boxes etc.*	~$300
Primary Globe Sundial hardware- *Geographic and gnomon fasteners*	~$600
Consumables- Forging, grinding, welding, and cutting fuel & materials	~$850
Glass kiln firing expense-	~$225
Patina materials	~$350
Oil Based finish	~$375
Unknown material costs	~$300
Equipment Purchase	
Hougen mag drill for numerous drilled and tapped holes	~$1,250
Drill bits and Taps	~$250
Equipment Rental	
Man Lift- 45ft height, 30ft reach $1,100/week plus 1 day rental for finishing	~$2,450
Generator welder	~$400
Total Materials Estimate	$16,975

Acid Ball Sculpture Proposal Slide List

Azimuth, a Globe Sundial
Aaron Loveitt, Woody Sulivan & Sasch Stephens

1) **Artist**: Aaron Loveitt
Title: *Dial*
Materials: Florescent tubes, steel, wood, rope, motor-
Dimensions: 35' x 17' x 7'
Year: 2012
Description: Time-lapse photo
This kinetic "dial" was exhibited during the demolition of the first building at GP, marking the transition of Bellingham's waterfront from an industrial past to a progressive future.

2) Aaron Loveitt
Track- Mouth of the Nooksack
Forged railroad track
60" x 6" x 9"
2015
Forged from a 2ft chuck of railroad rail, this sculpture is part of a series that explores Bellingham's heritage through resource extraction and the landscape. The slender taper drawn from the rail follows the Nooksack River starting at the mouth and extending approximately 10 miles up stream.

3) Aaron Loveitt
Welcoming Gate
Cast glass, cedar, basalt, stainless steel
15' x 15' x 5'
2007
Created in collaboration with Lillian Pitt, this work creates a gateway entrance onto the Confluence Project's Land Bridge. The Welcoming Gate commemorates the indigenous peoples along the Columbia River Gorge.

4) Aaron Loveitt
Welcoming Gate Detail

5) Aaron Loveitt
Hollow
Corten steel
6' x 6' x 5'
2014

Created for a site-specific exhibit at Big Rock Garden Park, this work is inspired by the hollowed out old growth stumps that can be explored in our remote forests.

6) Aaron Loveitt
Swell
Formed Aluminum
14’ x 4’ x 1’
2013
This permanent site-specific sculpture is symbolic of a wave entering the forest and moving between two Doug Fir trees as if they were below the water line.

7) Aaron Loveitt
Reprise
Forged steel and basalt stone
7’ x 4’ x 4’
2011
This private commission is a sculptural interpretation of the proportions of the golden ratio.

8) Aaron Loveitt
Salmon Journey
Carved and polished columnar basalt, forged steel
8’ x 3’ x 3’
2010
In collaboration with Lillian Pitt this sculpture commemorates the life cycle of the salmon species as a window into the social and environmental health of our culture. This is a permanent public work located in Cannon Beach, OR

9) Aaron Loveitt
Division
Railroad rail
9' x 32" x 10"
2016
A symbolic watershed formed from a 9ft length of railroad rail, this work exemplifies how resource extraction follows the lines of our landscape. The title remarks upon the current cultural clash with regards to a proposed coal terminal delivered by rail to our shoreline.

10) Aaron Loveitt
Shift
Salvaged galvanized steel
96” x 60” x 40”
2013

Created for COB's exhibit "Nature in Balance- artists addressing climate change through sculpture", this site-specific work is in proportion to the flatiron building in a state of architectural collapse and/or organic growth.

11) Aaron Loveitt
Escalade
Florescent Tubes, steel, guide wires
40' x 20' x 1'
2008
Created during the 2008 collapse of the US Stock Market, this work draws a correlation between the era's influx of line graphs and the peaks and v alleys that define our landscape horizons.

12) Aaron Loveitt
Spiral Staircase
Rust patina steel
12' x 5' x 10'
2016
Part of a large exterior project, this staircase is an example of an oiled rust patina similar to proposed sculpture finish.

13) Woody Sulivan
Wall Sundial
Coated Aluminum and copper
30' x 20'
1994
Physics/Astronomy Bldg. of the University of Washington, Seattle; bars and tubes on southwestern wall indicate time of day and date.

14) Woody Sulivan
Bowl Sundial
Basalt rock
5ft diameter
2003
Private owner; hummingbird at bowl center casts shadow on engraved surface of bowl, indicating time of day and date.

15) Woody Sulivan
Reflection Ceiling Sundial
Painted ceiling
20' x 12'
2011
Private owner; small mirror on south-facing window sill casts spot of light on ceiling with complex pattern of lines indicating many astronomical quantities such as current declination and azimuth of sun, sign of zodiac, number of hours of daylight today, commemorated dates such as family birthdays, etc.

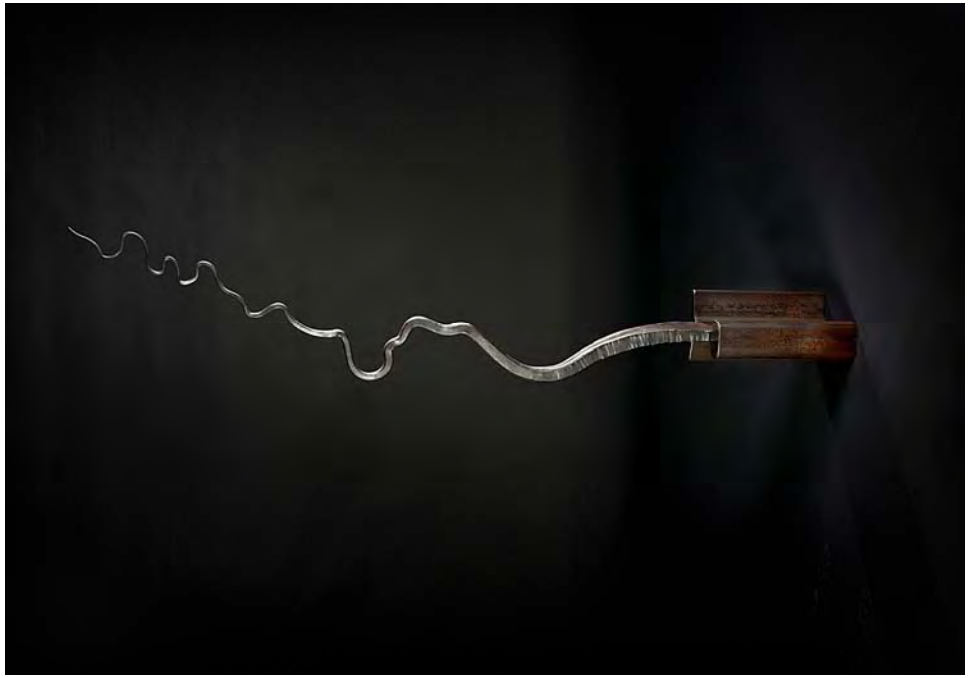
16) Woody Sulivan
Stairway Sundial
Marked walls and steps
20' x 12'
1998
George Suyama Architects office, Seattle; 10-inch aperture in wall casts moving spot of light on walls and staircase.

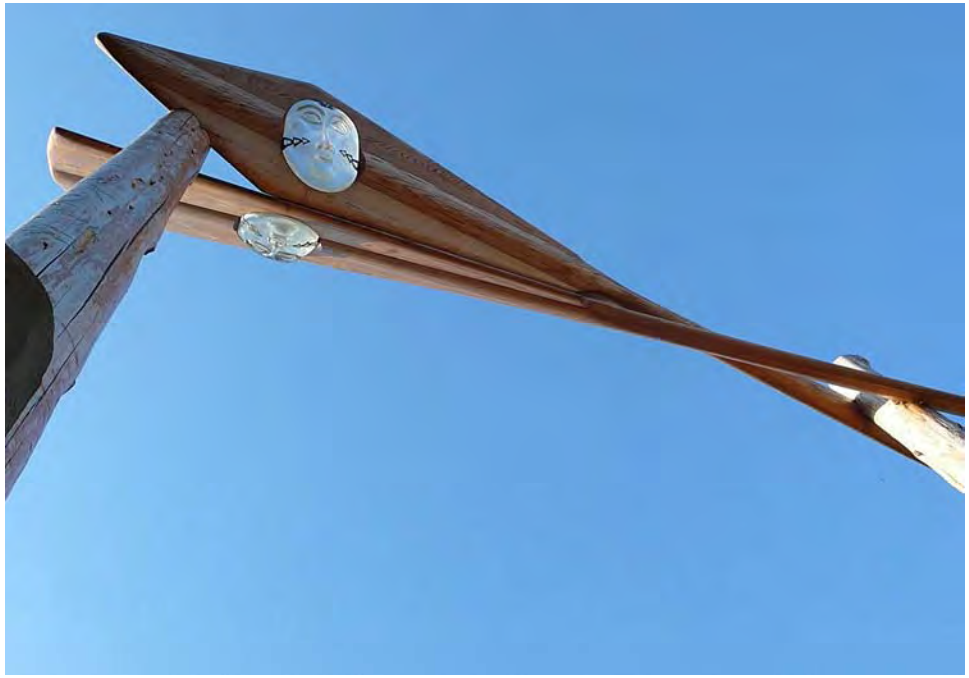
17) Woody Sulivan
Shepherd's Pillar Sundial
Bronze and stainless steel
10' x 3' x 3'
2002
University Prep School, Seattle; user moves gnomon on top until shadow is vertical, and then reads time of day and date.

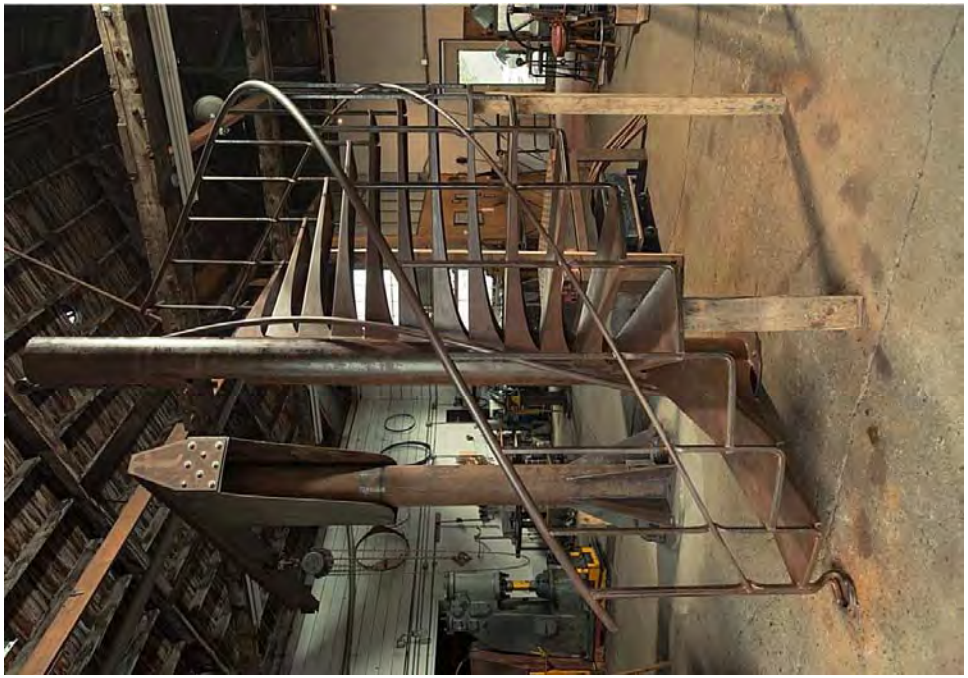
18) Woody Sulivan
Oculus Table
Coated steel and glass
4' x 4'
2013
Exploratorium Museum, San Francisco; user slides table around inside a room until sunlight falls on table, orients table using city landmarks visible from the room, and reads the time and date in the bowl.

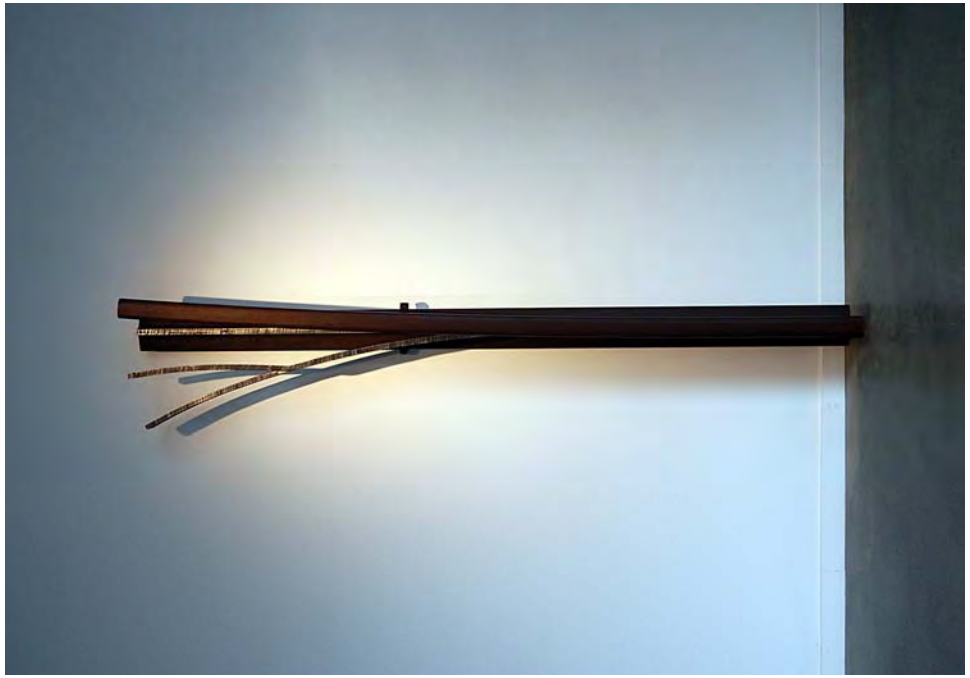
19) Sasch Stephens
Out Standing in his Field
Wood
20' x 6' x 8'
2005
An artistic depiction of the equator and polar axis which also serves as a very precise sundial.

20) Sasch Stephens
Sundials & Sunflowers
Mixed media
Current
Various working interpretations of sundials

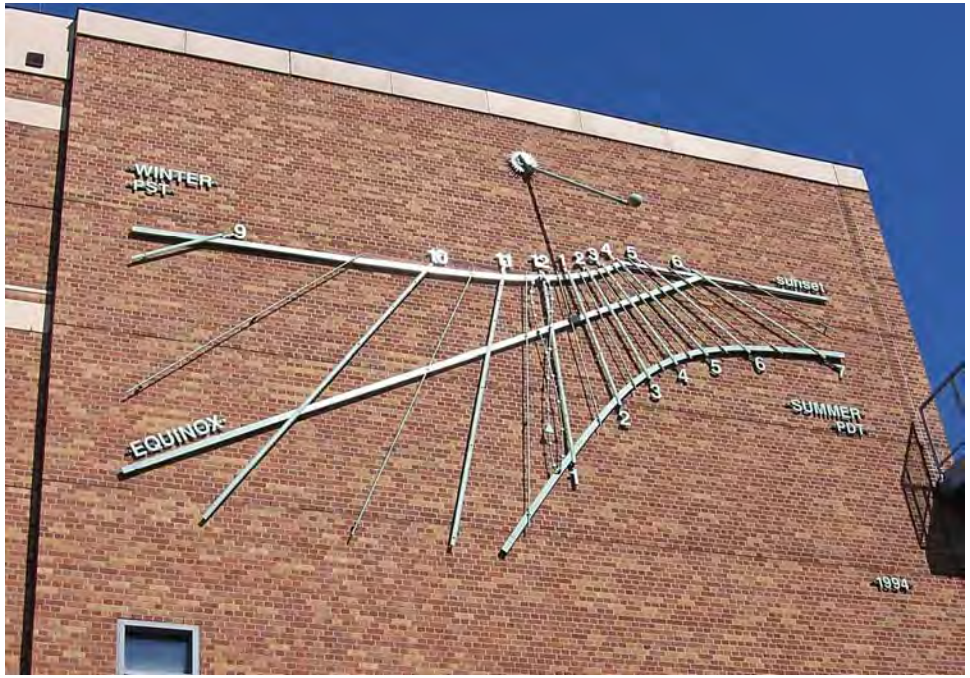









"We are stronger standing together
than we are standing alone."


WINTER
PST
EQUINOX
SUMMER
PDT
sunset
1994


Solar Declination
Vernal Equinox
Summer solstice


Winter Solstice
Summer Solstice

Acid Ball Sculpture Proposal- Azimuth Team References

Aaron Loveitt's References

Lillian Pitt- Portland based public artist and project collaborator
(503) 252-1854
lillianpitt@hevanet.com

Robert Hall- Art patron
(360) 527-1701
daylightbobk@gmail.com

George Drake- Public art advocate and president of Sculpture Northwest
(360) 734-9757
snw.gdrake@gmail.com

Woody Sulivan's Reference

Rebecca Cummins- Art professor (Photomedia) at University of WA
(206) 778-7521
rcummins@uw.edu

The Sundial and Bellingham

Throughout the time of human existence on our planet, people have watched the motions of the heavens with awe and wonder. It is notable that the more centralized groups have left behind amazing structures: monuments, temples and observatories, which testify to the importance of their fascination. A few examples: Stonehenge, Anasazi buildings in SW U.S., observatories in South America and Jai Singh observatories in India. The edifices attest to the importance to them of the movements of the celestial bodies, their interplay with the seasons, the sustenance life and to their very survival.

As our societies and lives have become more complex and less described by our interactions with nature, we have slowly moved away from recognizing and appreciating the essential aspect that the planetary movements have on our lives, barely noticing the faithful march of the sun in it's path across the sky. The original people of this area patterned their days upon the available sun and the seasons. The first immigrants who came here did as well. Those who arrived in the mid 1800's had little reason to have a watch. Later on, those who had watches set them in relation to the sun, noon at that particular spot when the sun was at its highest point. That is as it was in the whole United States. This was the natural way of things, the natural rhythm of all life.

But change was afoot and people's lives would be forever changed. The most prominent forces in this were industrialization and the railroads. For the railroads to work on a schedule, each town could no longer have it's own local time. Time zones were established and everyone within each time zone set their watches accordingly. So as each town came into contact with the railroads they changed to time of the outside world. Concurrently, the telegraph came to town and the town clock could be set by information coming over the wire. As life became busier and as people in the ever more industrial society had to be at work on time, people became more 'aware' of the clock time rather the 'real' time. There was a great debate in the country about the demise of the natural rhythms of the agrarian life and the encroaching urban lifestyle, where watches and clocks were necessities.

Bellingham is a good example of that change; from the first peoples time here, to its settlement by immigrants, to it's logging boom and industrialization. This is no more obvious than the changes to our own waterfront, from a native fishing village to the dominance of the Georgia Pacific complex. Now we have a rare opportunity to reverse this process in this 'place in time', to reclaim this astonishing spot on the planet and at the same time remind ourselves of the more natural rhythms from which we came.

Aaron Loveitt

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Education

Alfred University School of Art and Design — Alfred, NY
Bachelor of Fine Arts, cum laude, 2001
Sculpture major, art history minor

Pilchuck Glass School, full scholarship, 2001 — Stanwood, WA
Kiln formed glass with Richard Whitely

Professional Experience

2005- Current	Proprietor	
	Altility Art Studio	Bellingham, WA
2014- Current	Board of Directors	
	Block 52 Preservation Trust	Bellingham, WA
2013- Current	Board of Directors	
	Sculpture Northwest	Bellingham WA
2006	Designer/ Fabricator	
	EK Miller Co.	Portland, OR
2004-05	Metalworker & Carpenter	
	Burnt Bearing Studio & Birdseye Building Co.	Richmond, VT
2002-04	Glass Designer/ Lead Fabricator	
	Savoy Studios	Portland, OR
2001	Head Studio Technician	
	Vitroglyph studio	Chimacum, WA
	Kelly McLain Glass Studio	Chimacum, WA
	Public Demonstration	
	"Spring Break", Corning Museum of Glass	Corning, NY

Selected Sculpture Commissions

2016	Doherty Dermotology Clinic	Bellingham, WA
2015	Hegarty Residence	Bellingham, WA
2014	Logos Corperation	Bellingham, WA
2013	Hall Residence	Bellingham, WA
2013	Big Rock Garden Park Memorial Sculpture	Bellingham, WA
2012	Bellingham Parklet	Bellingham, WA
2012	Duddlestrein Residence	Bellingham, WA
2012	Makeshift Art Space	Bellingham, WA
2012	La Fiamma Resturant	Bellingham, WA
2011	Galfer Residence	Bellingham, WA
2010	Salmon Journey Sculpture	Cannon Beach, OR
2008	Welcoming Gate- Conlfuence Project	Vancouver, WA
2007	Portland Triathlon	Portland, OR
2006	Christensen Yacht Co.	Vancouver, WA
2004	Loveitt/Hertzberg Residence	Charlotte, VT
1999	PKC Corporation	Burlington, VT
1997	CVU High School	Hinesburg, VT

Selected Exhibitions

2016	Downtown Sculpture Exhibit	Bellingham, WA
2016	Elemental- Sculpture Northwest Gallery	Bellingham, WA
2015	Emerge- Sculpture Northwest Gallery	Bellingham, WA
2014	Big Rock Sculpture Park	Bellingham, WA
	'Inspire' site-specific sculpture exhibit	
2014	Make.Shift Art Space	Bellingham, WA
	'Metal' sculpture installation	
2013	Nature in Balance Outdoor Sculpture	Bellingham, WA
2013	Tribute to David Marshal Sculpture exhibit	Bellingham, WA
2012	'Dial Transition' at the Georgia Pacific plant	Bellingham, WA
2011	South State Studio Exhibition	Bellingham, WA
2010	Sculpture Without Walls	Cannon Beach, OR
2009	Portland Center for Yoga Arts	Portland, OR
	Mississippi Green Space	Portland, OR
	'Dial'- Public Light Sculpture exhibition	
2008	Mississippi Green Space	Potland, OR
	'Escalade'- Public Light Sculpture exhibition	
2006	Foxfire Tea	Portland, OR
	Benefit show for Portland Peace Allience	
	Glass Art and Design	Portland, OR
2003	Gallery 114	Portland, OR
	Gallery 114	Portland, OR
2002	Street Exhibitions	Portland, OR
2001	Harder Hall	Alfred, NY
	BFA exhibition	
	Museum of Luminous Phenomena	Alfred, NY
	Corning Musem of Glass	Corning, NY
	2B Named Gallery	Columbus, OH
	Pamil Fine Art Gallery	San Juan, Puerto Rico
2000	Fosdick Nelson Gallery	Alfred, NY
	Museum of Luminous Phenomena	Alfred, NY
	Robert Turner Gallery	Alfred, NY
	Outdoor Light Exhibition	Madison, WI

Sasch Stephens Bio.

Sasch Stephens has a BA in Economics and Art from Oakland University, Rochester, MI. and Master's work in Humanistic Psychology from Sonoma State University, Rohnert Park, CA.

Along the way, he has gained expertise in Passive Solar Design, sundial design and fabrication, alternative building techniques and European masonry and ceramic stove (kachelofen) design and construction. His work and study have been in both the US and Europe.

He was co-founder of the Mendocino Solar Energy Association in 1978 and contributed to the solar boom of that era. In 1986 he curated and contributed several works to the exhibition "'Zeit und Sonne' (Time and the Sun), sundials, astro-archaeological and astronomic art" which toured through many cities in Germany. He is a member of NASS (North American Sundial Society) and recently made a presentation to them titled: 'Making sundials from found objects'. He lives on his farm near Birch Bay where there are many things in his garden including sunflowers and sundials.

CURRICULUM VITAE

Woodruff T. Sullivan, III
Professor of Astronomy (Emeritus)
Adjunct Professor of History (Emeritus)

Former Director of UW Astrobiology Graduate Program

Department of Astronomy Box 351580
University of Washington
Seattle, Washington 98195, USA

History:

1944	Born in Colorado, USA
1966	B.S. in Physics, Massachusetts Institute of Technology
1971	Ph.D. in Astronomy (Minor in Physics), University of Maryland.
1969-71	Research Astronomer, Naval Research Laboratory, Washington, DC
1971-73	Postdoctoral Fellow, Kapteyn Lab., Groningen University, The Netherlands
1973-present	Faculty Member (Asst., Assoc., Full Professor), University of Washington
1980-81	Visiting Fellow, Institute of Astronomy, Cambridge University, England
1987-88	Visiting Fellow, Institute of Astronomy, Cambridge University, England
1988 (spring-sum.)	Visiting Professor, University of Paris VII (Observatoire de Meudon)
1997-2006	Director, Project Astro/Seattle & Project AstroBio
2000-11	Chair of Steering Group, UW Astrobiology Graduate Program

Fields of Research: Astrobiology; Search for extraterrestrial intelligence
Galactic and extragalactic astronomy
History of astronomy
Astronomy and culture (especially sundials, eclipses, and religion)

Publications: ~85 scientific articles and five books (see separate list)

Public Art: **- Collaborations with architects, artists, fabricators, and designers on sundials for various buildings and sites (including one on the Mars Rovers); involved in the design of ~20 public sundials**

Grants, Honors: Numerous research grants from NSF, NASA, AAS, Caltech, Univ. Washington; Natl. Acad. of Sci. USSR Exchange Program (1980); NASA Science Working Group (1980-90) and Investigators Working Group (1991-4) on "Search for Extraterrestrial Intelligence"; History Committee of Astron. Soc. Pacific (1982- , Chair: 1986-92); AAS Shapley Lecturer (1975-87); AAS Historical Astronomy Division (Council, 1989-91; Vice-Chair, 1993-5; Chair, 1995-7); Intl. Astronomical Union Commission 50 (Vice-President 1993-6, President 1996-9); **Sawyer Prize of the North American Sundial Soc. (2004); Leroy E. Doggett Prize of the Historical Astronomy Div. of the American Astronomical Soc. (2012)**

Teaching Highlights:

- built and maintained an undergraduate Student Radio Telescope (1976-79 and 2010-present)
- frequently teach in the Honors and (former) College Studies Programs

- innovations in large intro courses: Skywatch exercises, reenacting historical personalities, demonstrations, incorporating all aspects of culture bearing on the astronomy topics
- developed the topic of "life in the cosmos" into the astronomy curriculum
- developed and teach biannually HST 313 / ASTR 313 = "History of Physics and Astronomy, 1800-1940"
- designed and developed for teaching: large wall sundial and Foucault pendulum indicator in new Physcis/Astronomy Bldg.
- mentored two winners of the UW TA Teaching Award (Ingram and Armstrong) and two Huckaby Fellows (Beck and Carney)
- incorporated undergrads and grad students as year-long partners with grades 3-12 teachers in Projects Astro and AstroBio
- one of three who established innovative graduate program in Astrobiology (9 departments participating); developed its curriculum and style; taught core courses
- edited and wrote portions of first-ever graduate-level textbook in astrobiology
- developed Astrobiology (ASTBIO) 101 for non-science majors
- co-taught (with Prof. Rebecca Cummins) studio course Art 350 on "Sundials as Public and Private Art" (Spring 2003)

Related Activities:

Art: - Collaborations with artists on various works of art involving astronomy

Public Art: - Collaborations with architects, artists, fabricators, and designers on sundials for various buildings and sites (including one on the Mars Rovers); involved in the design of ~20 public sundials

Environment: - Series of posters of "Earth at Night", showing humankind's nighttime activities over the entire earth as seen from a mosaic of satellite images

Education: - University teaching (undergrad and grad levels) in several departments (Astronomy, History, Art, Arts & Sciences Honors Program)
- Frequent collaborations with K-12 science teachers; frequent popular talks, regular radio appearances on KUOW-FM (NPR); former Director of Project ASTRO/Seattle (linking astronomers with grades 4-9 teachers)

Books: *Classics in Radio Astronomy* (compiler) (Reidel: 1982)
The Early Years of Radio Astronomy (editor) (Cambridge U. P.: 1984)
Preserving the Astronomical Sky (co-editor) (Astron. Soc. Pac: 2001
Planets & Life (co-editor) (Cambridge U. P.: 2007)
Cosmic Noise: A History of Early Radio Astronomy (2009)