MINATURIZED TWISTING TECHNIQUES IN NON-FERROUS METALS

Significance of the Project:

Forging is the act of plastically deforming metal into desired shapes by hot or cold fabrication methods, utilizing the ductility and malleability of metal by exerting compressive force upon it, mainly through intermittent blows of a hammer (Untracht 236). This method of displacement has been used ever since humans discovered metal ore. Although all metals have properties which allow them to be manipulated through the forging process, ferrous and non-ferrous metals require different techniques which allow the metalsmith to efficiently and effectively shape them. Iron is most successfully shaped when it is heated to red to white hot state (1400-2400 F) while non-ferrous metals are typically worked cold after they have been annealed or softened.

While the processes of working metal has been around for thousands of years, certain motifs have been traditionally associated with either ferrous metals or non-ferrous metals. This is due to the differences in their compositional make-up. I intend to recreate traditional iron forms with small scale non-ferrous materials.

Multiple iron pieces can be forged welded together. When ferrous metal is heated, it softens as the temperature increases and reaches the point at which pieces of metal can be joined together by means of pressure or hammering. This cohesive union is called welding. Iron properly welded in the forge has no visible joints, because of the cohesive bond of the crystals of iron; this bond is the atomic bonding of the atoms of the metal. It is not an adhesive joining, since there is no adhesive material joining the pieces. It is almost as strong (70%) as the parent pieces of metal (Andrews 61).

Non-ferrous metals are typically joined using a process called soldering or brazing. Soldering is joining pieces of metal together with a filler material which has a lower melting temperature than the pieces being joined. This is also a molecular bond resulting in a very strong connection. However, manipulating this connection after soldering has limitations because the solder connecting the two pieces will react differently than the parent material when forged, bent, or twisted.

The advantage of forge-welding is the ability to work the material after it has been bonded. The artist is able to forge or draw out the material without the joined pieces coming apart. Therefore, the fabrication of forge-welded iron gives the artist greater flexibility in creating certain designs.

This project is a natural continuation of my research as a metalsmith. Metalsmithing is based in the understanding of fabricating and manipulating metallic materials in order to achieve a desired form. The field of Metalsmithing covers a diverse range of processes and materials. In order for me to be a complete metalsmith, I must research areas which increase my abilities to successfully work in multiple scales and materials.

Objectives:

My goal is to create jewelry inspired by forms traditionally used as motifs in architectural blacksmithing. *Basket*, *Birdcage*, and *Braided* twists are some examples of motifs commonly used in the center of balusters and finials in architectural iron work. These relatively small, ornamental design elements draw attention by virtue of their intricate detail. I intend to recreate these motifs as individual jewelry forms allowing the twists to be the focal point instead of just a supporting design detail.

The twisting of metal wire and bar for decorative purposes has been in use since ancient times. Twists were used to decorate bronze and precious metals before they became a part of the vocabulary of traditional blacksmithing. They are a simple way of giving a decorative emphasis to part of a bar and can be very expressive of the plasticity of the metal (Parkinson 79). The twisting process is simple. One end of the bar or wire is secured in a vice, while the other end is twisted with a wrench or drill. This is often referred to as a direct twist.

In addition to direct twists and those generally viewed in the jeweler's realm, a few jewelers have miniaturized twisting techniques heretofore only used by the blacksmith. *Reverse Twists, Basket Twists,* and *Incised Rod Twists* are just a few (Evans 76). My interest is to translate the iron twists used by the blacksmith, to a smaller scale in non-ferrous materials; specifically twists which require the use multiple strands, which can be seamlessly bonded only on the ends, and further manipulated.

Through my preliminary research I have found only one example of a scaled down blacksmithing twist motif in sterling silver. This example of a *Basket* motif can be found in *Jewelry: Contemporary Design and Technique* (Evans 77). An interesting fact is it was created by my predecessor, and UW-La Crosse Professor of over forty years, Bill Fiorini. As difficult as this process is, it is in my estimation that the *Basket Twist* is the least difficult of the scaled-down blacksmithing twists to accomplish because multiple wires of the same thickness can be solder when straight. This allows the artist to accurately control the flow and fill of the solder, as well as bonding together a finished mass that has a uniform thickness

throughout. This allows the artist to slightly forge and form the material without compromising the structural integrity of the solder joints.

The fact that Bill Fiorini was able to create this sterling silver pendant leads me to believe that other blacksmithing twist motifs are possible. This research will broaden technical skill and improve my understanding of non-ferrous metals (such as copper, bronze, and sterling silver) through innovative approaches to traditional techniques and processes. In order to improve my understanding of miniaturizing these twist designs, I will invest a tremendous amount of time, energy and problem-solving in the studio.

I will fabricate a minimum of five finished jewelry pieces during the summer of 2014. As these objects materialize, photographic documentation will capture process and technique for the next generation of jewelers and craftpersons who wish to understand and learn new approaches. These works will possess continuity through material and process, yet be individual in terms of specific twisted and forged form.

Research Methods:

My experiences as a Metalsmith/Blacksmith have given me a solid understanding of direct twisting techniques, as well as multiple strand twisting techniques. I also understand the distinct differences between ferrous and non-ferrous metals and the approaches to working with them. Herein lies the challenges of transforming twisting techniques only used by the blacksmith into miniaturized non-ferrous jewelry forms. My intension is to develop and expand this process in terms of technical skill and aesthetic design qualities.

The research begins with an observation of the processes used by the blacksmith. These forms are dissected and translated to small scale non-ferrous wire and bar. The major concern is the inability to forge weld non-ferrous materials. Because the most effective connection of copper, bronze, and silver is solder, many complications may arise. Since solder joints require a very precise fit in order to be structurally sound, the initial setup prior to the physical act of soldering is critical. This will require the design and construction of unique jigs specific to each form being created.

A soldering jig is a device used in soldering to apply pressure upon, fasten, support, or enclose a work piece to make it stationary, or to hold in position the parts being soldered in cases where simple gravity alone cannot be depended upon to do the job (Untracht 398). My craft sensibilities will be fully engaged through this process. I will use my knowledge of jig construction at a large scale and apply it to a small

scale in order to achieve a delicate task. Specific soldering jigs will have to be designed according to each twist motif being constructed and unfortunately will not be interchangeable. A disadvantage to using soldering jigs is they often act as a heat sink. This causes an uneven distribution of heat often resulting in uneven and uncontrolled solder seams. My intention is to use these jigs to accurately position the parts in order to be tack-welded prior to soldering. This process will require the use of a tungsten inert gas (TIG) Welder. TIG welding is a welding procedure which uses a tungsten electrode to create the weld. The area being welded uses an inert shielding gas to protect the weld area from atmospheric contamination.

I will also create a set of specialized twisting tools to accomplish my research. Some of these tools will only work for specific twists and will not be compatible.

Once the materials are bonded, I will push the structural boundaries of manipulating the solder joint. The major issue is the artist has no control over the molecular make-up of the joint. In some cases, the bond may be push beyond its holding capabilities and force the connection to crack or come apart. Possible solutions to this issue could be to use blacksmithing techniques, such as collaring (the use of a flat metal band tightly wrapped adjoining pieces to make a connection) in order to disguise the joint in certain cases.

My goal is to work out technical issues by creating sample forms using copper. The reasons for using copper is it is one of the least expensive of all the non-ferrous metals, as well as being a very forgiving material with extreme malleability. I intend to create 10-20 sample twisted motifs. From here, I will analyze the results and chose the most visual pleasing forms. The chosen samples will them be reworked and fabricated in to 5-7 completed functional jewelry pieces created from sterling silver.

Final Product and Dissemination:

The benefit of this work is to broaden technical skill and deepen understanding of non-ferrous metals through innovative techniques and processes. My understanding of traditional blacksmithing techniques will allow me to experiment with the twisting, forging, and fabrication processes at a small scale. Miniaturizing traditional forms will provide a technical blueprint by offering the opportunity to push the physical characteristics of materials which have been limited by long-standing techniques in the field.

It is anticipated a publishable manuscript will be a result of this research. I will document the research with an in-depth, step-by-step approach to these twisting, forging, and fabrication processes.

Documentation of the process will track progress and explain this process for lectures, demonstrations, articles, and other publications. Each stage of the process will be photographed professionally by *Regan Photography*, Winona, Minnesota. This visual documentation will be accompanied with text to create a technical tutorial for miniaturized twisting techniques in non-ferrous metals.

At the conclusion of this project, I will submit a technical article to *Metalsmith Magazine*, a publication distributed by the *Society of North American Goldsmiths (SNAG)* which supports and advances the professional practice of artists, designers, jewelers and metalsmiths. Through education, innovation and leadership, *SNAG* provides access to a vibrant and passionate community. *SNAG* is the most important professional organization for metal artists in the world and currently has over 3,000 members. I will also submit this technical article to the *Lapidary Journal Jewelry Artists*. Established in 1947, The *Lapidary Journal Jewelry Artist* is a magazine dedicated to lapidary interests such as jewelry design, metalsmithing techniques, as well as stone setting processes.

References Cited:

Untracht, Oppi. *"Jewelry: Concepts and Technology".* New York: Doubleday, 1985. Print.

Andrews, Jack. *"New Edge of the Anvil: A Resource Book for the Blacksmith".* Ocean Pines, MD: SkipJack Press, Inc., 1994. Print.

Parkinson, Peter. *"The Artist Blacksmith: Design and Techniques".*Ramsbury, Marlborough Wiltshire: The Crowood Press Ltd, 2001. Print.

Evans, Chuck. "Jewelry: Contemporary Design and Technique". Worcester, Masssachusetts: Davis Publications, Inc., 1983. Print.

Past Faculty Research Grant Awards:

Nichols, B. (Principal), Faculty Research Grant, "Caricatures in Steel" (Funded), UW-L Grant, $12,181.00. (Date Submitted: October 24, 2011, July 1, 2012 – June 30, 2013).

Vitae Summary:
Education:

1999 MFA, Metalsmithing, Cranbrook Academy of Art, Bloomfield Hills,

1997 BS, Art, University of Wisconsin-La Crosse, La Crosse, Wisconsin

Teaching Experience:

2010 - Present Assistant Professor, University of Wisconsin-La Crosse, La Crosse, WI.

2006-2010 Associate Lecturer, University of Wisconsin-La Crosse, La Crosse, WI.

Selected Workshops:

2010 Instructor, "*Functional Tool Making",* Driftless Folk School, Hillsboro, WI.

2009 Technical Assistant to Gary S Griffin, Haystack Mountain School of Crafts, Deer Isle, Maine**.**

2004 Instructor, Peters Valley Craft Education Center, Layton, New Jersey.

Selected Lectures and Demonstrations:

2012 Guest Lecturer and Demonstrator, Wayne State University, Detroit, MI.

2008 Guest Lecturer and Demonstrator, College of Creative Studies, Detroit, MI.

2006 Guest Lecturer and Demonstrator, University of Northern Iowa, Cedar Falls, Iowa.

2003 Guest Demonstrator at Tenth Annual Northern Minnesota Metalsmiths Conference, Bemidji, MN.

2002 Guest demonstrator, 2002 A.B.A.N.A. Conference "Forging Traditions", La Crosse, Wisconsin.

Selected Grants and Awards:

2012 College of Liberal Studies Small Grant, University of Wisconsin – La Crosse.

2012 University Educational Equipment Grant, University of Wisconsin – La Crosse.

2012 Faculty Research Grant, "*Caricatures in Steel"*, University of Wisconsin – La Crosse.

2012 College of Liberal Studies Technology and Equipment Grant, University of Wisconsin – La Crosse.

2012 College of Liberal Studies Technology and Equipment Grant, University of Wisconsin – La Crosse.

Selected Professional Experience:

2012 Juror – Society of North American Goldsmiths. SNAG Educational Endowment Scholarship and the Hoover and Strong Scholarships.

2011 Juror – Society of North American Goldsmiths. SNAG Educational Endowment Scholarship and the Hoover and Strong Scholarships.

2006 Finalist – Wisconsin Arts Board Percent for Art Program, La Crosse, Wisconsin.

Public Commissions:

2011 "*Memorial Benches".* Galesville square and the First Presbyterian Church, Galesville, WI.

2003 *"Muskie".* Series of wall sculptures for Three Rivers Lodge, Radisson Hotel, LaCrosse, WI.

2001 "Tools of Teaching". Viterbo University, La Crosse, WI.

Selected Exhibitions:

2012 "*The Body Adorned".* The first Society of North American Goldsmiths on-line exhibition which explored "adornment as experience" on the landscape of the body.

2012 *Caricatures in Steel*, Solo Exhibition, The Phipps Center for the Arts, Hudson, WI

2009 Gateway Gallery, Haystack Mountain School of Crafts, Deer Isle, ME

2008 **"***Equal Footing: Materials, Processes, and Concepts*", National Ornamental Metal Museum, Memphis TN.

2006 **"***The Forge: Contemporary Metal Artists Invitational*", The Alden B. Dow Museum of Science and Art of the Midland Center for the Arts, Midland, MI.

2006 "*Critical Mass: Metalsmithing at Cranbrook Under Gary Griffin*", Cranbrook Art Museum, Cranbrook
Academy of Art, Bloomfield Hills, MI.

2005 "*Metalize*" Exhibition, Detroit Artist Market, Detroit, MI.

Selected Publications:

The Body Adorned, Gail M. Brown, The Society of North American Goldsmiths, 2012, pg 64.
Metalize, Giorgio Gikas and Dan Graschuck, The Detroit Artist Market. 2005

La Crosse Magazine, "From Forge to Form", Fall, 2005, 24-29.

Wisconsin Trails, "Needful Things", February, 2004: 35.

Hammer's Blow Vol. 10, No. 3 summer, 2002: Cover, 17-18

Anvils Ring Vol. 30, No. 2 winter, 2002

Anvils Ring Vol. 27, No. 3 winter, 1999/2000: 27

Anvils Ring Vol. 26, No. 4 spring, 1999: 26

Anvils Ring Vol. XXVI, No. 1 summer, 1998: 25

Additional experience can be provided upon request.

GRANT PROGRAM Faculty Research Grant	REFER TO RFP FOR ALLOWABLE CATEGORIES FOR UW-L GRANTS OFFICE USE ONLY			
PROPOSAL TITLE **Minaturized Twisting Techniques in Non-Ferrous Metals**	PROPOSAL NO.	Total Funds Proposed		Granted
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Brad Nichols	Fiscal Year			

A. PI/PD and Co-PIs (List each separately with title) First Name M Last Name Title	Funds Requested By Proposer		Funds Granted
1. Brad J Nichols Assistant Pro	$5,000		
2.			
3.			
4.			
5.			
6.			
OTHER PERSONNEL First Name M Last Name Title			
1.			
2.			
3.			
4.			
TOTAL PI/PD and Co-PIs (1-6) and Other Personnel (1-4)	$5,000		
B. REPLACEMENT COSTS (contact dean's office for current per credit amount)			
1. (0) Credits	$0		
C. STUDENT WORKERS (SHOW NUMBERS IN BRACKETS)			
1. (0) RESEARCH/GRADUATE STUDENTS	$0		
2. (1) UNDERGRADUATE STUDENTS			
TOTAL STUDENT WORKERS	$0		
TOTAL SALARIES AND WAGES (A+B+C)	$5,000		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $1,000)			
1			
2	$0		
3	$0		
TOTAL EQUIPMENT	$0		
E. TRAVEL			
1 DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)			
2 INTERNATIONAL	$0		
TOTAL TRAVEL	$0		
F. OTHER COSTS			
1. MATERIALS, EQUIPMENT LESS THAN $1,000, AND SUPPLIES	$1,550		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION	$0		
3. SERVICES - EXTERNAL	$1,500		
4. SERVICES - INTERNAL	$0		
5. OTHER	$0		
TOTAL OTHER COSTS	$3,050		
G. TOTAL COSTS (A THROUGH F)	$8,050		
H. FUNDS FROM OTHER SOURCES TO SUPPORT THIS PROJECT			
1	$0		
I. AMOUNT OF THIS REQUEST (G) OR (G MINUS H)	$8,050		

Note: Budget justification/narrative must be submitted with this budget sheet.

Budget Justification: My budget request through the faculty research grant involves a stipend, consumable supplies, equipment/tooling costs, as well as professional photography which are critical to the production and documentation of this research project.

Consumable Supplies ($1245.62): The forging and fabrication processes require the use of consumable supplies. Copper and sterling silver are the raw materials used to create my forms. The initial prototypes will be created using a variety of gauges of copper wire and sheet. Using an inexpensive material such as copper provides the freedom to experiment without the fear of losing precious materials. After examining the prototypes and gaining an understanding of their unique construction, forging, and twisting methods, I will recreate the sample forms in sterling silver.

I will be fabricating a variety of gauges of non-ferrous metal wire and sheet. In order to join these materials, I will require solder and TIG welding supplies. Silver solder wire and sheet, TIG welding rod, and tungsten electrodes are necessities to fabricate the prototypes and final forms.

Equipment/Tooling ($304.25): Most of the equipment needed for the completion of this project is available to me. It will be essential for me to design and construct specialized twisting tools and soldering jigs in order to accomplish my research since they do not exist. Some of these tools will only work for specific twists and will not be compatible. Once the twisted motifs are complete, I will attempt to further form a variety of the objects. This will require the purchase of tooling for the *Bonny Doon* Electric Press in the UW-L Metalsmithing studio. By using forming dies into urethane, it is my belief that I will be able to accurately bend and form the completed twists without disrupting the continuous patterns they possess. Therefore I am requesting a 4” mushroom former, 4” form box, 4” round urethane plug, and a 6” x 6” urethane sheet.

Professional Photography ($1500.00): Visual documentation is a crucial aspect of this research project. To document the research with an in depth, step by step approach to this unique process, I will seek the professional expertise of *Regan Photography* of Winona, Minnesota. Each stage of the process will be professionally photographed by *Regan Photography*.