ANTOINETTE WESTPHAL
COLLEGE OF MEDIA ARTS & DESIGN

Collaboration to Explore Hybrid Processes in Bio-Derived Innovations

A Career Development Proposal:

Mike Glaser Program Director Product Design
AWCoMAD

Career Development Plan

Preamble:

As a Program Director and Assistant Professor of Product Design at the Antoinette Westphal College of Media Arts and Design, I, like many of my colleagues, am besieged with an array of challenges that conspire against the sustained momentum towards the production of recognizable tenure work. A designer that chooses an academic career must navigate the shifting intersection of practice, theory, applied arts, technology, innovation, creativity, pedagogy and capitalism. An academic designer accepts that Product Design does not benefit from a long tradition of scholarly work to build on, and this challenge is compounded by a relatively small audience of practitioners that can appreciate or utilize scholarly work, opting instead to make versus theorize. I their profession, designers are valued in industry for being generalists, not specialists, and prized for their ability to bring a breadth of experience to a wide range of solutions. The best designers are a conglomeration of evangelist, salesman, pop psychologist, facilitator, collaborator, motivator, humanist and futurist. Ultimately, design is a vocation that is judged by one's ability to visually represent solutions to others through the skill of sketching and modeling, and achievement is measured in the number of mass produced items created to satisfy unmet needs.

Design, it seems, is an odd bedfellow for an academic institution. Yet "design thinking", an inherent side effect of using a design process, represents one key competency that universities will need to have to compete and survive in the future. Moving forward, institutions will need to adapt from a model of scientific research as an individualistic and introverted enterprise, to an openly business-like model of translational research in an applied world where the value of academic work is represented by the breadth of its multi-disciplinary collaboration, not from the depth of its specialists. Universities will attract the best and brightest by selling innovation, not knowledge. Fortunately, Drexel has already to started to make this shift, and now, more than in the past has opened the door for design to bring our unique ability to create meaning in a complex world to the research table.

With the preamble as a backdrop and with the launch of the Product Design program complete, attention can now be directed to reinvigorating tenure research. I am pleased to submit the following proposal for your consideration.

Development Plan

Application for the Career Development Award is being sought to aid Professor Glaser in steering his current research initiatives in the development of methodologies to enhance idea generation within the ranks of non-designers, on a new trajectory that will focus the body his of work towards a suitable target to achieve tenure. Funding will support the start of a collaboration with Dr. James Tangorra on a specific and unique research initiative that will lead to both Dr. Tangorra and Professor Glaser to being recognized experts in the application of transformative design thinking to biologically inspired design.

By initiating a focus on bio-inspired design, Dr. Tangorra and Professor Glaser have an opportunity to create a new line of interdisciplinary product development research that is not only necessary, but will bridge that gap between theory and practice, providing meaningful value to Drexel, Product Design and Engineering communities. The potential impact of this work will move product design towards new discoveries and fuel the formation of a biological engineering discipline. Below is a timeline of milestones that will be used to guide and assess Professor Glaser's progress to this aim.

Career Road Map

Academic year: 2010-2011	2011-2012	2012-2013	2013-2014	2014-2015
Start collaboration with David Bramston & James Tangorra	Application for NSA/NSF funding for bio-derived product development and education	Start intensive in applying research	Co-write Book on bio-derived product design with David Bramston	Continue refinement of Hybrid Bio-derived design process
Create rubrics and assessment plans	Publish in journal of design Launch	Start assessment	Create minor in bio-derived design	Apply to new field of biological engineering discipline
Develop special topic course	Submit papers to design conference | Present	matriculate special topics courses	Seek funding for new bio-derived design lab Analysis of findings - Refinement of hybrid design methodology	Launch bio-derived lab

To help Professor Glaser assess the milestones and progress towards tenure, he has asked Dave Bramston to become a mentor to review and guide tenure activities as well as provide a network of opportunities to publish and present joint work on bio-derived product development. It is anticipated that one outcome of this mentorship will be to co-write a book for product developers on utilizing a bio-derived design process. A portion of the Career Development funds will be used to bring Professor Bramston to Drexel to collaborate and participate with Dr. Tangorra. It is expected that Professor Bramston will become an integral part of the success of this project. While at Drexel, Professor Bramston would be invited to help create a comprehensive 5-year career development plan that will augment the aforementioned roadmap. Bellow is a short bio on Professor Bramston:

Dave Bramston is the Subject Leader for Product Design at the University of Lincoln. A founder of the Redmatter RG research group at the University, he is also the author of ‘Idea Searching’, ‘Material Thoughts’ and ‘Visual Conversations’. Dave studied at Wolverhampton Polytechnic and Manchester Polytechnic obtaining an MA in Industrial Design before working in the design industry. Dave has presented work in Europe, US and the Far East and is an International Member of the IDSA. Current research work on textures combines the disciplines of industrial design and microbiology.

Proposal

Introduction

"*Humbling also are the hordes of organisms casually performing feats we can only dream about. Bioluminescent algae splash chemicals together to light their body lanterns. Arctic fish and frogs freeze solid and then spring to life, having protected their organs from ice damage. Black bears hibernate all winter without poisoning themselves on their urea. While bees, turtles, and birds navigate without maps. How do they do it?"*
- **Janine M. Benyus**, American natural sciences writer, innovation consultant, and author

With the appearance of complex life on earth over a billion years ago, evolution has slowly tinkered with nature to create a staggering number of independent and unique biological adaptations for survival on this planet. Human curiosity and the desire to emulate or to take inspiration from the pool of nature's diversity is understandably obvious. From velcro to self-cleaning surfaces it is easy to find an abundant array of case studies directly attributing innovations in science, technology and product development to the study and application of knowledge derived from nature. While most recently, industry and entrepreneurs have turned to bio-related research in an attempt to create sustainable solutions to global needs, the overall field of bio-derived design remains untapped, exploratory and relatively exclusive to university research. Why?

In the broad field of bio-applied development two basic camps or philosophies exist:

1. Bio-mimicry - A process typically employed by research scientists and engineers to directly apply discoveries from a biological organism or system to specific design problems.
2. Bio-inspired - A process typically employed by artists and designers where observation and/or basic insight of a biological organism or system is used as inspiration to create novel solutions to a need.

Both approaches have demonstrated innovative results from the application of their methodologies. Yet, as can be expected, both have distinct strengths and weaknesses inherent their processes. Critics of bio-mimicry complain that finding solutions to copy nature directly are too slow, as biological organisms are hopelessly complex, uniquely specific to their habitat, and work under the "just good enough principle." In the case of bio-inspired design, critics point to a lack of the scientific rigor that leads to a deep understanding of biology and biological context, such that solutions derived from inspirations are too abstract to be considered "biologically applied". Oddly, The two camps remain relatively isolated with both pointing to each other's shortcomings as a validation to support their methodology rather than adopt a spirit of collegiality creating a hybrid approach which blends each other's strengths to mitigate weaknesses.

Biologist Robert Full speculates that unlocking design secrets from nature requires a curiosity-based methodology to discover the general principles of nature-based analogies to use when advantageous. His belief is that like nature, biologically derived solutions should be distributed, tuned, integrated, and made of a hybrid of attributes where multiple novel principles are combined with the best engineering to create something better than nature.

What is undisputed is that bio-applied development by whatever name it is given, affords an infinite source of untapped knowledge to help people create solutions for our well being, quality of life and survival on earth. Thus, if we assume direct value to human enterprise exists in bio-derived design, why is it not more widely supported by industry? A question that could help answered this short-coming is: can a cross-disciplinary approach to bio-derived design improve the efficiency and effectiveness of applied biological research into the development of valuable and novel solutions?

Proposal: Collaboration to Explore Hybrid Processes in Bio-Derived Innovation

This proposal seeks funding to initiate a collaboration between:

James Tangorra, Assistant Professor of Mechanical Engineering, Laboratory for Biological Systems Analysis - Drexel University

David Bramston, Programme Leader Product Design - University of Lincoln, UK

Michael Glaser, Program Director Product Design - Drexel University

If funded, this collaboration will support Assistant Professor Glaser in his expressed career development goal of becoming internationally recognized for contributions to bio-inspired design. Support from the Career Development Awards will directly increase his exposure to colleagues in Mechanical Engineering & Mechanics as well as make it possible to bring Design Scholar and practitioner David Bramston from the University of Lincoln, UK to Drexel to collaborate with colleagues, undergraduate and doctoral students.

The value of this collaboration is in the exchange of collective wisdom and insight each collaborator brings to the project including: experience of product development, research methodologies, working styles, creative approaches, and processes that are characteristic of our professions. The proposal seeks to develop a collegial relationship between participants focusing on each collaborator's unique approach to applying specific biological knowledge in the production of novel ideas. Most interesting to the exchange of knowledge will be the sharing of two specific processes; for Dr. Tangorra it will be the introduction of design thinking to research, for Professor Bramston and Professor Glaser it will be the introduction of curiosity-based research to design.

The working theory for this proposal is: a multi-disciplinary collaboration combining product design and research engineering to create novel solutions to specific biological discoveries that will produce hybrid processes between Bio-inspired design and Bio-mimicry. Refinement of these hybrid processes will lead to a defined bio-development process that can be measured for efficiency and repeatability.

If the effectiveness of a hybrid approach to bio-derived design can be demonstrated, it would provide a valuable tool in the advancement of a biological engineering discipline. The intended audience of the initial collaboration is researchers, engineers, product designers and educators. With the expectation that initial work will lead to funding from secondary sources, the continued development of a documentable bio-development process would be effective at reaching a larger audience, including industry partners, business development initiatives and education.

The collaboration will utilize work that Dr. Tangorra is currently conducting in the Laboratory for Biological Systems Analysis, in the department of Mechanical Engineering & Mechanics. Specifically, research into achieving a greater understanding of the hierarchical organization and structure of the sensory, muscular, and control systems of bluegill sunfish, and to develop advanced biologically-derived material systems having distributed sensing, actuation, and intelligent control. There research programs are being conducted with the assistance of with PhD. students Christopher J. Esposito, Jonah Gottlieb and Chris Phelan.

Funding Goal:

Funding of the Collaboration to Explore Hybrid Processes in Bio-Derived Innovation will address three specific aims:

1. Develop a cross-disciplinary collaboration to examine the effect of introducing a design thinking process to traditional biological research methodologies.
2. Gain valuable knowledge and expertise in the development of a hybrid design/research process for bio-derived innovation.
3. Joint development of a cross-disciplinary special topics course to introduce principles and processes of bio-derived innovation to be offered to students at both Drexel and University of Lincoln.

Proposal Plan:

To achieve the three stated aims of this collaboration the above plan is being proposed. With funding, a more detailed plan will be submitted, describing the participation of all three collaborators, and marking a deadline in June to set final details and dates. If awarded, the collaboration will fund three activities:

1: A 4-day workshop located at Drexel University, including travel for Professor Bramston. Focused on sharing and structuring the groundwork to achieve the three aims listed in the funding goal section. Bramston to help Glaser create a 5-year career development plan.

2: Travel to University of Lincoln for Dr. Tangorra and Professor Glaser to present to faculty and the student body on the state of bio-derived product development. Continue to build collaborative work, Development of assessment rubrics, Review of Glaser's progress on career plan.

3: Travel to Drexel University for Professor Bramston to collaborate on review project progress, target publication, journals and conferences to submit for publications and presentations, as well as grant proposal submissions. Aid PhD students Jonah Gottlieb and Chris Phelan in the development of paper for submission to design journals.

The collaboration is expected to kick-off in October of 2010 with a final report created approximately June 15th 2011. With funding, a more accurate timeline will be created.

Use of Career Development Outcomes / Plan Assessment

1. The funding of this initiative will aid in Professor Glaser's development of a tenure line of research into transformative design thinking in the development of hybrid development processes for bio-derived design innovation.

2. Development of a comprehensive 5-year career development plan and mentorship to track progress.

3. Use outcomes of the three aims listed in the above funding goals to seek NSF funding in biologically based design research and interdisciplinary education and collaboration.

4. Launch cross-disciplinary special topics course to introduce principles and processes of bio-derived innovation.

5. Use outcomes to develop dialog with key universities and organizations in and bio-development arena: Specifically the Georgia Institute of Technology's Center for Biologically Inspired Design and the The Bio-mimicry Institute headed by Janine Benyus.

6. Create appropriate assessment measures to quantify four specific values and effectiveness of each process:
   a. Literature and case study reviews on bio-mimicry and bio-inspired deign to create baseline of expectations
   b. Assess the change in efficiency of bio-derived development using a design process / hybrid processes
   c. Assess the number of ideas created utilizing a hybrid design thinking process
   d. Assess the amount of biological content in each idea

7. Development of assessment tools will follow standard educational assessment methodology using rubrics to rate effectiveness. Principles and expected outcomes will be ranked from "exceeds expected outcome" to "does not demonstrate expected outcome".

Purposed Budget:

Professor Glaser is asking for an award of $7,000 be granted. The award will be used in the following ways:

4-day workshop		
Travel:	Professor Bramston	$1,300.00
lodging:	*Funded by AWCoMAD $850*	
food	*Funded by AWCoMAD $500*	
workshop materials	*Funded by AWCoMAD $400*	
Travel to University of Lincoln, UK		
travel and lodging	Dr. Tangorra	$2,200.00
travel and lodging	Professor Glaser	$2,200.00
Travel to Drexel University		
Travel:	Professor Bramston	$1,300.00
lodging:	*Funded by AWCoMAD $550*	
food	*Funded by AWCoMAD $400*	
	Career Development Award total:	$7,000.00
AWCoMAD Contribution:	$2,500.00	

Secondary funding of and cost sharing of approximately $2,500 will be obtained from the The Department the Dean AWCoMAD and the PROD Budget.

Thank you for this unique and generous funding opportunity to invest in the future of Drexel's life blood: the pre-tenured professor. I appreciate the panel's time and sincere review of this proposal.

Mike Glaser,
Program Director Product Design AWCoMAD