

**(NEW GRADUATE INITIATIVES)****PROPOSAL PROCEDURES CHECKLIST**

Academic units should adhere to the following procedures when requesting new curricular initiatives (degrees, concentrations or certificates).

**Obtain the required approval from the Office of the Provost to move the initiative forward for internal ASU governance reviews/approvals.**

- Establishment of new curricular initiative requests; degrees, concentrations, or certificates
- Rename requests; existing degrees, concentrations or certificates
- Disestablishment requests; existing degrees, concentrations or certificates

**Submit any new courses that will be required for the new curricular program to the Curriculum ChangeMaker online course approval system for review and approval.**

- Additional information can be found at the Provost's Office Curriculum Development website: [Courses link](#)
- For questions regarding proposing new courses, send an email to: [courses@asu.edu](mailto:courses@asu.edu)

**Prepare the applicable proposal template and operational appendix for the proposed initiative.**

- New degree, concentration and certificate templates (contain proposal template and operational appendix) can be found at the Provost's Office Curriculum Development website: [Academic Programs link](#)

**Obtain letters or memos of support or collaboration. (if applicable)**

- When resources (faculty or courses) from another academic unit will be utilized
- When other academic units may be impacted by the proposed program request

**Obtain the internal reviews/approvals of the academic unit.**

- Internal faculty governance review committee(s)
- Academic unit head (e.g. Department Chair or School Director)
- Academic unit Dean (will submit approved proposal to the [curriculumplanning@asu.edu](mailto:curriculumplanning@asu.edu) email account for further ASU internal governance reviews (as applicable, University Graduate Council, CAPC and Senate)

**Additional Recommendations** - All new graduate programs require specific processes and procedures to maintain a successful degree program. Below are items that Graduate Education strongly recommends that academic units establish after the program is approved for implementation.

**Set-up a Graduate Faculty Roster for new PhD Programs** – This roster will include the faculty eligible to mentor, co-chair or chair dissertations. For more information, please go to [http://graduate.asu.edu/graduate\\_faculty\\_initiative](http://graduate.asu.edu/graduate_faculty_initiative).

**Establish Satisfactory Academic Progress Policies, Processes and Guidelines** – Check within the proposing academic unit and/or college to see if there are existing academic progress policies and processes in place. If none have been established, please go to [http://graduate.asu.edu/faculty\\_staff/policies](http://graduate.asu.edu/faculty_staff/policies) and scroll down to the **academic progress review and remediation processes** (for faculty and staff) section to locate the reference tool and samples for establishing these procedures.

**Establish a Graduate Student Handbook for the New Degree Program** – Students need to know the specific requirements and milestones they must meet throughout their degree program. A Graduate Student Handbook provided to students when they are admitted to the degree program and published on the website for the new degree gives students this information. Include in the handbook the unit/college satisfactory academic progress policies, current degree program requirements (outlined in the approved proposal) and provide a link to the Graduate Policies and Procedures website. Please go to [http://graduate.asu.edu/faculty\\_staff/policies](http://graduate.asu.edu/faculty_staff/policies) to access Graduate Policies and Procedures.

**Check Box Directions** – To place an "X" in the check box, place the cursor on the left-side of the box, right click to open the drop down menu, select **Properties**, under **Default value**, select **Checked** and then select **Ok**.



ARIZONA STATE UNIVERSITY  
PROPOSAL TO ESTABLISH A NEW GRADUATE DEGREE

This template is to be used only by programs that have received specific written approval from the University Provost's Office to proceed with internal proposal development and review. A separate proposal must be submitted for each individual new degree program.

**DEGREE PROGRAM**

**College/School(s) offering this degree:** College of Liberal Arts and Science (CLAS)

**Unit(s) within college/school responsible for program:** School of Life Sciences (SOLS)

**If this is for an official joint degree program, list all units and colleges/schools that will be involved in offering the degree program and providing the necessary resources:** N/A

**Proposed Degree Name:** Master of Science (MS) in Biomimicry

**Master's Degree Type:** Master of Science

**Proposed title of major:** Biomimicry

**Is a program fee required?** Yes  No

**Requested effective term:** Spring and year: 2015  
(The first semester and year for which students may begin applying to the program)

**PROPOSAL CONTACT INFORMATION**

(Person to contact regarding this proposal)

**Name:** Juergen Gadau/Dayna Baumeister

**Title:** Professor/ Adjunct Professor

**Phone:** 480-965-2349  
406-543-4108 x204

**email:** [jgadau@asu.edu](mailto:jgadau@asu.edu);  
[Dayna.Baumeister@asu.edu](mailto:Dayna.Baumeister@asu.edu)

**DEAN APPROVAL**

This proposal has been approved by all necessary unit and College/School levels of review, and the College/School(s) has the resources to offer this degree program. I recommend implementation of the proposed degree program. (Note: An electronic signature, an email from the dean or dean's designee, or a PDF of the signed signature page is acceptable.)

**College Dean name:** Kenro Kusumi, Associate Dean of Graduate Programs, College of Liberal Arts & Sciences

**College Dean Signature**  **Date:** 9/18/14

**ARIZONA STATE UNIVERSITY  
PROPOSAL TO ESTABLISH A NEW GRADUATE DEGREE**

This proposal template should be completed in full and submitted to the University Provost's Office [mail to: [curriculumplanning@asu.edu](mailto:curriculumplanning@asu.edu)]. It must undergo all internal university review and approval steps including those at the unit, college, and university levels. A program **may not** be implemented until the Provost's Office notifies the academic unit that the program may be offered.

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**DEGREE PROGRAM INFORMATION**

**Master's Type:** MS

**Proposed title of major:** Biomimicry

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**1. PURPOSE AND NATURE OF PROGRAM:**

**A. Brief program description –**

Biomimicry is an emerging discipline that seeks to emulate life's strategies for human design with a particular emphasis on sustainability. The Master of Science in Biomimicry delivered completely online, is designed to empower change-agents from a wide variety of disciplines who are passionate about learning from the world of biology and its applications to human design and want to bring the field of biomimicry into their discipline. Graduates from the program will work toward innovative and sustainable solutions to the most pressing global challenges, from the way we conduct business, design buildings and products, run governments, provide healthcare, manufacture our goods, to how we educate future generations, drawing upon time-tested sustainable solutions of the last 3.8 billion years. They will be enabled to integrate biomimicry principles and tools into their current or planned professions, and serve as leaders in the emerging network of biomimicry researchers and practitioners.

The program is designed to address the growing global demand for biomimicry training that can match the logistical and training needs of professionals. The only currently existing program of its kind, the Certified Biomimicry Professional Program, led by Biomimicry 3.8, a social enterprise and the globally recognized leader in the field of biomimicry, is being converted into this degree at ASU through the emerging biomimicry center at ASU (a joint effort between ASU and Biomimicry 3.8). A master's degree in Biomimicry will be attractive to students from multiple disciplines, but at the same time is unique and does not overlap with currently offered programs or courses. In fact, with the exception of a research oriented PhD offered at the University of Akron, there is no US based institution currently offering graduate degrees in biomimicry. Additionally, because this program is offered through ASU Online, it will be available to a global audience of working professionals seeking graduate training who are unable to come to the campus, due to logistical or professional reasons.

**B. Will concentrations be established under this degree program?**  Yes  No

**2. PROGRAM NEED - Explain why the university should offer this program (include data and discussion of the target audience and market).**

This program is an adaptation of an existing Master's level program currently on its third cohort offered by Biomimicry 3.8. It is a highly competitive and globally renowned non-accredited program, and the only one of its kind in the world. Because of its success, the program is uniquely situated for integrating ASU faculty expertise. Upon adoption by ASU, Biomimicry 3.8 will offer a complementary in-person program to a select group of the MS on-line students that requires participation in the MS program at ASU Online, but will no longer offer the on-line portions of the course of study as part of a complete program. This select group will be eligible through Biomimicry 3.8 to also earn the title of Certified Biomimicry Professional (the title of the current program with Biomimicry 3.8) upon completion of the in-person work AND the ASU Online MS.

Faculty from several academic units at ASU, the newly established Center for Biomimicry at ASU and instructors from Biomimicry 3.8 (who are also adjunct faculty at ASU) will collaborate in teaching the MS in Biomimicry online at ASU. This collaborative approach to a biomimicry graduate education will increase interest globally in the program.

Global biomimicry expert, ASU Professor of Practice, Dr. Dayna Baumeister designs and leads the program and is newly named co-director of the Biomimicry 3.8 Center that is under development at ASU. Several universities have expressed interest in hosting this program for accreditation, but Biomimicry 3.8 chose ASU because of its innovative approach to education and its emphasis on sustainability and entrepreneurship- key aspects of the program content.

The program is targeted towards working professionals in the fields of biology, design, business, and engineering whom want to learn how to facilitate the implementation of biomimicry across a wide-variety of applications. Appealing to a global audience, the program when hosted by ASU will increase the global brand of ASU as a leading innovator in sustainability. Additionally, there is a rapidly growing demand for biomimicry practitioners in industry following research pointing to the economic potential of biomimetic solutions [Point Loma Nazarene University's Fermian Business and Economic Institute "The Global Biomimicry Efforts: An Economic Game Changer" (2010). The program taught by Biomimicry 3.8 has run three cohorts, each time receiving 3-4x the number of applicants as slots, with the lack of an MS being the number one reason additional interested individuals did not apply.

As this program is one of a series of initiatives associated with the newly formed Biomimicry Center, the context for the establishment of the Center is attached for reference in Appendix C.

3. **IMPACT ON OTHER PROGRAMS** - Attach any letters of collaboration/support from impacted programs. (see Checklist coversheet) (See Appendix B)
- **SOLS** – Bertram Jacobs
  - **W.P. Carey School of Business** – Amy Hilman
  - **Herberger Institutes for Design and the Arts** – Craig Barton
  - **SOS** - Christopher Boone
  - **Fulton Schools of Engineering**- Brian Skromme
  - **ASU Online**- Phil Regier (letter of support on file in Graduate Education office)

The MS degree is an extension of the Certificate in Biomimicry, designed intentionally so that students who complete the Certificate and wish to continue their studies can apply for the MS and take the additional coursework beyond the Certificate courses. It is anticipated, that students from both programs will be enrolled simultaneously in those courses that overlap. The MS complements the newly approved graduate certificate in Biomimicry, and some of the coursework associated with the certificate can be shared with the proposed MS. We expect applicants for the MS will include individuals who have completed the certificate and wish to continue their studies, as well as students who are committed from the beginning to receive the full amount of training. The relative proportions of each are unknown at this time, but it would be reasonable to expect about a 50:50 split.

The ASU Online degree will be complemented eventually by an on-campus degree that will far more significantly involve current faculty across the schools. The on-line program offers an opportunity for ASU faculty to jointly teach courses with trained biomimicry practitioners and take those learnings forward into the campus-based program.

Additionally, individual courses will ultimately be available to students currently enrolled in other graduate programs as electives, thereby enhancing the offerings of existing graduate programs on campus.

Because this MS is truly a transdisciplinary degree, it will attract students from a variety of disciplines, although the primary emphasis will be on biology, design, engineering, sustainability, and business. Applicants for this program are those who likely would not be interested in pursuing additional graduate work in their undergraduate discipline, but rather wish to apply that discipline specifically to the practice and advancement of biomimicry.

The online MS is part of a collection of biomimicry-oriented initiatives being spearheaded by the newly formed Biomimicry Center. These include the approved graduate online certificate, as well as a future campus based program (proposed to launch in Fall 2018), and complementary program for undergraduates through a certificate based process (proposed to begin no earlier than fall 2017). To this end, the Center has received support from the following schools for the educational initiatives: School of Life Sciences, Engineering, Design (Herberger), Business, and Sustainability. Additionally, Faculty from various schools interested in teaching in the programs have been identified, with more likely to emerge.

An in-person MS will be developed over the next five years and will be taught exclusively by ASU faculty. This degree will draw on existing courses, as well as coursework newly developed by ASU faculty in cooperation with the Center for Biomimicry.

4. **PROJECTED ENROLLMENT** - How many new students do you anticipate enrolling in this program each year for the next five years? Please note, The Arizona Board of Regents (ABOR) requires nine masters and six doctoral degrees be awarded every three years. Thus, the projected enrollment numbers must account for this ABOR requirement.

<b>5-YEAR PROJECTED ANNUAL ENROLLMENT</b>					
<b>Please utilize the following tabular format.</b>	<b>1<sup>st</sup> Year</b>	<b>2<sup>nd</sup> Year</b> (Yr 1 continuing + new entering)	<b>3<sup>rd</sup> Year</b> (Yr 1 & 2 continuing + new entering)	<b>4<sup>th</sup> Year</b> (Yrs 1, 2, 3 continuing + new entering)	<b>5<sup>th</sup> Year</b> (Yrs 1, 2, 3, 4 continuing + new entering)
Number of Students Majoring (Headcount)	20	30	40	40	40

5. **STUDENT LEARNING OUTCOMES AND ASSESMENT:**

- A. **List the knowledge, competencies, and skills** students should have attained by graduation from the proposed degree program. (You can find examples of program Learning Outcomes at <http://www.asu.edu/oue/assessment.html>).

Learning Objectives (footnotes indicate assessment outcomes below)

- Represent the field of biomimicry in the world through demonstrated thought leadership<sup>1</sup>
- Build a network of collaborators in biomimicry from various disciplines<sup>2</sup>
- Integrate biomimicry thinking into any opportunity resulting in biomimetic outcomes<sup>1</sup>
- Summarize the fundamentals of the fields of biology, design, engineering and business and their relevance to biomimicry<sup>2</sup>
- Integrate Life's Principles into a wide array of applications<sup>1</sup>
- Facilitate the integration of biology into design using biomimicry thinking<sup>1</sup>
- Guide design and engineering processes towards sustainability<sup>1</sup>
- Apply systems thinking to challenges and opportunities
- Communicate and work across disciplines to facilitate the practice of biomimicry<sup>2</sup>
- Interpret observations in nature with a functional lens<sup>1</sup>
- Create and perform outstanding biomimicry presentations<sup>2</sup>
- Create and execute meaningful learning experiences on biomimicry<sup>2</sup>

Possible outcomes for graduates

- Obtain meaningful and gainful employment in the rapidly emerging global market for biomimics and Biologists at the Design Table; and/or
- Initiate or transform your own consulting practice into the field of biomimicry; and/or
- Engage and lead others within your current company/organization to begin practicing and demonstrating world-class case studies in biomimicry; and/or
- Incorporate biomimicry into existing or new education endeavors to help bring forth the next generation of biomimics.

Examples of graduate successes from first two cohorts through the program with Biomimicry 3.8:

- Chris Allen, MBA. Former CEO of Biomimicry Group, working full-time on applying biomimicry to the built environment with projects globally.
- Karen Allen, MS. Faculty with Biomimicry 3.8. Freelance consultant biologist/biomimic full-time.
- Melina Angel. Founder of Biomimicry Quebec and Biomimicry Columbia. Representing Canada in ISO process for biomimetic standards.
- Zeynep Arhon, MBA. Faculty with Biomimicry 3.8. Founder of biomimicry oriented marketing firm. Works internationally.
- Alessandro Bianciardi, MS. Founder of Biomimicry Italy. Bringing biomimicry to UNEP. Pursuing PhD in biomimicry in Italy.
- Jamie Dwyer, MA, MS. Full-time biomimic with Biomimicry 3.8.
- Marsha Forthofer, MEng. Director of Biomimicry Research for Kimberly-Clark Worldwide.
- Clarie Janisch, MEng. Founder of Biomimicry South Africa. Full-time work with government agencies implementing biomimicry.

- Lindsay James, MBA. Co-founder of Biomimicry Chicago, VP of Restorative Enterprise (based on biomimicry) for Interface, Inc.
- Erin Leitch, Faculty and full-time biomimic with Biomimicry 3.8.
- Theresa Millard, MA. Founder of Biomimicry Iberia. Brings biomimicry projects to her former company Kohler, and works in Spain and Morocco on place-based bio-inspiration.
- Saskia van den Muijensberg, MBA. Co-founder of Biomimicry Netherlands, landed major Green Deal project with Dutch govt to establish biomimicry in NL
- Doug Paige, MA. 2012 Launched a new biomimicry PhD program with the University of Akron & Cleveland Institute of Art. 2012 Awarded a grant to run a student project on the Cuyahoga river bulkheads using biomimicry.
- Amy Coffman Phillips, MA. Co-founder of Biomimicry Chicago, initiating the "Prairie Project" based on biomimicry, started her own biomimicry company called 'B-Collaborative', co-designing a resilience workshop for organizations.
- Sara el Sayed, MS. Started her own company Dayma which leads youth biomimicry expeditions in Egypt
- Marie Zanowick. Faculty with Biomimicry 3.8. Works full-time for EPA to bring biomimicry to EPA, Forest Service, and Park Service.

**B. Describe the plans and methods to assess** whether students have achieved the knowledge, competencies and skills identified in the Learning Outcomes.

In addition to the specific assessment plans outlined below, indirect measures will include feedback surveys at the conclusion of each course, and follow-up activities documented in the Biomimicry Practitioner's Reef, whose membership is limited to graduates of the certificate program or the Master's degree.

<b>Assessment Plan</b>	
<b>Outcome 1:</b>	Graduates of MS in Biomimicry program will be able to apply Biomimicry Thinking from BMY504 (the methodology and framework of biomimicry) to human design challenges.
Measure 1.1	Presentation of research into biological strategies relevant to design as part of BioBrainstorm BMY580 deliverable.
Performance Criterion 1.1	At least 80% of the students will receive a passing score for BioBrainstorm BMY580.
Measure 1.2	Performance across multiple courses demonstrating competence in the four phases of Biomimicry Thinking: scoping, discovering, creating, and evaluating.
Performance Criterion 1.2	At least 80% of the students will be rated 1, 2, or 3 on a scale of 5 (1=highest) for this skill based on the average of all program faculty for each student using a survey at the completion of the MS coursework.
<b>Outcome 2:</b>	Graduates of MS in Biomimicry program will be able to communicate biomimicry across disciplines.
Measure 2.1	Public lecture or feature length article on biomimicry.
Performance Criterion 2.1	At least 80% of the students will receive satisfactory to outstanding feedback on presentation to an audience >250 at a conference OR will have an article published in a medium with at least 25,000 person readership, such as Fast Company, Forbes, Inhabitat.
Measure 2.2	Demonstrated collaboration skills across disciplines within the practice of biomimicry.
Performance Criterion 2.2	At least 80% of the students will be rated 1, 2, or 3 on a scale of 5 (1=highest) on average by their peers, colleagues and faculty incorporated into the assessment for courses BMY511, BMY512, BMY 516, BMY 530, BMY 580.

6. **ACCREDITATION OR LICENSING REQUIREMENTS (if applicable):** Provide the names of the external agencies for accreditation, professional licensing, etc. that guide your curriculum for this program, if any. Describe any requirements for accreditation or licensing.

Biomimicry 3.8 has designed and implemented the Master's level program to date and graduates of the program currently earn the title of Certified Biomimicry Professional. Biomimicry 3.8 is the only globally recognized institution offering recognition for education in biomimicry. Graduates of the proposed Master of Science in Biomimicry at ASU that successfully complete the program requirements of Biomimicry 3.8 in conjunction with the Master's requirements, will also earn the title of Certified Biomimicry Professional from Biomimicry 3.8.

7. **FACULTY, STAFF, AND RESOURCE REQUIREMENTS:**

A. **Faculty**

- i. **Current Faculty** - List the name, rank, highest degree, area of specialization/expertise and estimate of the level of involvement of all current faculty members who will teach in the program.

The teaching faculty for this program will change gradually over time as ASU faculty become more involved and available, but for the next five years will include both ASU faculty and qualified lecturers vetted by ASU (center, departments and schools, Biomimicry 3.8.) The current faculty listed as instructors for the online MS have a *minimum* of five years experience working full time in the field of biomimicry and at least two years experience teaching biomimicry.

Faculty listed as participating in teaching in specific courses have provided approval for listing in the proposal regarding their interest, but will still need to confirm with their Deans as to their involvement during the semester that the course is offered. Involvement could range from providing guest lectures at first to eventually playing a lead role in the courses depending on the expertise, commitment, and availability of the faculty member relative to the learning objectives of each course. This will need to be determined on a case-by-case basis.

As part of the process to integrate ASU faculty into the program and coursework, several initiatives are underway or in development through the Center:

- 1) Interested ASU faculty need to become familiar with the discipline of biomimicry as it's currently recognized by society and industry and explore the overlaps and connections with their own work. The Center's activities are directed towards identifying and supporting these opportunities.
- 2) Faculties from across the campus interested in teaching in the programs need to receive biomimicry training. This December, the first three faculty members (Engineering, SoLS, and SoS) will participate in an immersion program for a week offered by Biomimicry 3.8 and supported by the Center. Additionally, we anticipated a "learn by doing" component for those faculty that are co-teaching or participating as guest lecturers in the classes that will be offered through the certificate program over the next couple of years.
- 3) Faculty interested in teaching in the programs need to have time and permission to teach, and the Center currently has budgeted money for faculty education, e.g. funding for workshops, teaching release, etc.
- 4) Interested faculty need to coordinate with the current adjunct faculty on the syllabus and course execution. The first courses where this need arise are scheduled to be offered in Spring of 2016. Eventually, interested faculty will need to develop their own syllabi, or adopt the existing syllabi for the on-line MS if they want to teach in that format.

Name	rank	highest degree	area of specialization/expertise	level of involvement of all current faculty members who will teach in the program
Dayna Baumeister	Professor of Practice	PhD	biomimicry; organismic biology and ecology	lead instructor, program manager
Juergen Gadau	Professor	Dr. rer. Nat; Dr. habil.	evolution, entomology, behavioral ecology, genomics	participating in teaching Biology taught functionally; practicum advisor
Prasad Boradkar	Professor	PhD	Industrial Design, Master of Science in Design	participating in teaching Biomimicry & Design; practicum advisor
Mitzi Montoya	Professor	PhD	marketing; product development	participating in teaching Biomimicry & Business; practicum advisor

Stephen Pratt	Associate Professor	PhD	behavioral ecology, robotics, decision making	participating in teaching Biology taught functionally; practicum advisor
Ted Pavlic	Research Scientist	PhD	Electrical engineering, autonomous systems, bio-inspired decision-making	participating in teaching Biomimicry & Engineering, practicum advisor
Ximin He	Assistant Professor	PhD	bio-inspired materials	participating in teaching Biomimicry & Engineering, practicum advisor
Laurel Anderson	Associate Professor	PhD	Culture (cross cultural and organization); consumer behavior; design, creativity innovation/ entrepreneurship	participating in teaching Biomimicry & Business, practicum advisor
Nancy Gray	Instructor	MS (PhD Dec 2014)	Consumer Behavior; Marketing Communications; Creativity Innovation; Design Methodology	participating in teaching Biomimicry & Business, practicum advisor
Tirupalavanam Ganesh	Associate Research Professor	PhD	Engineering education	Participating in teaching Teaching Biomimicry and Biomimicry & Engineering
Erin Leitch	adjunct Professor (SOLS)	BEnvD, Certified Biomimicry Professional	biomimicry; environmental design, architecture	instructor for Biomimicry & Design, and iSites, practicum advisor, and instructor in Essentials of Biomimicry
Marie Zanowick	adjunct Professor (SOLS)	MS, Certified Biomimicry Professional	biomimicry; environmental engineering	instructor for Biomimicry & Engineering and Genius of Biome, practicum advisor
Karen Allen	adjunct Professor (SOLS)	MS, Certified Biomimicry Professional	biomimicry; restoration ecology	instructor for Biology Taught Functionally and BioBrainstorm, practicum advisor
Thomas Baumeister	Professor of Practice	PhD	human-nature connection; wildlife biology	instructor for Human-Nature Connection and instructor in Essentials of Biomimicry
Zeynep Arhon	adjunct Professor (SOLS)	MBA, Certified Biomimicry Professional	biomimicry; business, marketing	instructor for Biomimicry & Business and Biomimicry Case Studies, practicum advisor

- ii. **New Faculty** - Describe the new faculty hiring needed during the next three years to sustain the program. List the anticipated hiring schedule and financial sources for supporting the addition of these faculty members.

It is currently anticipated that teaching demands can be met through currently available existing and adjunct faculty.

- iii. **Administration of the Program** - Explain how the program will be administered for the purposes of admissions, advising, course offerings, etc. Discuss the available staff support.

SOLS will administer this program through his graduate office, which has two fulltime and one 25% staff members (student administration). Further administration will be provided by Dayna Baumeister and the Center for Biomimicry at ASU. Biomimicry 3.8 will provide additional administrative support as needed.

Due to this arrangement, the program is not dependent on the success or failure of the Center, although both the Center and the program benefit from the success of each other (as noted elsewhere in this proposal).

**B. Resource requirements needed to launch and sustain the program:**

No additional resources are required.



**8. COURSES:**

**A. Course Prefix(es):** Provide the following information for the proposed graduate program.

- i. Will a new course prefix(es) be required for this degree program?  
Yes  No

**B. New Courses Required for Proposed Degree Program:** Provide course prefix, number, title, and credit hours and description for any new courses required for this degree program.

The newly proposed courses have been adapted from courses taught previously in the context of a certificate from Biomimicry 3.8. Those materials have been modified to fit the more traditional academic setting and the requirements of an MS program (e.g. adding additional material, extending requirements, etc.). By using these materials, which are proven and tested by two cohorts through Biomimicry 3.8, the MS program is able to build on the existing successes and create an even more impressive program through ASU Online. Approximately 80% of the coursework has previously been taught through Biomimicry 3.8.

The additional 20% of the content and material will be developed primarily by the lead instructor, but depending on the course and the availability of current ASU faculty additional content and expertise will be incorporated as appropriate for the learning objectives. By way of example, the current Biomimicry 3.8 "Life's Principles" course is a 12-week course and will need to add three additional weeks of content to fulfill the 15 week semester requirements. Some of this additional content will consist of guest lectures by current ASU faculty initially. As faculty become more familiar with the topic, courses, and learning objectives through co-teaching opportunities in initial offerings and training offered by ASU's Biomimicry Center, as well as feedback from the first offerings through ASU Online, the content and courses will evolve and incorporate more and more material and instructors from ASU faculty.

Lastly, following the successful launch of the online MS, an on-campus MS will be proposed and developed using primarily ASU faculty, building on the successes to date of all the previous biomimicry educational endeavors through Biomimicry 3.8, The Biomimicry Center, and the online MS through ASU Online.

To provide some measure of comparability, following the list of courses are three testimonials from current students who have already earned graduate degrees elsewhere who were asked to assess these courses relative to their previous graduate work. Additionally, sample weeks from several of the courses are provided.

**List of Courses –**

**BMY 501 Essentials of Biomimicry (1)**

Essentials of Biomimicry is a 7.5 week course offered as a sampler of the various topics (discipline, emulate, ethos, (re)connect & iSites, human-nature connection, Biomimicry Thinking, and Life's Principles) within the discipline of biomimicry. Each week is devoted to a specific topic and is led by a different instructor. The course is intended to provide a basic overview of each aspect of the discipline with ample opportunity for conversation and dialogue around the specific components, with an understanding that greater depth into each topic can be learned by taking the advanced BMY courses.

**BMY 502 Life's Principles (4)**

Life's Principles are nature's universal design guidelines based on 3.8 billion years of successful strategies across all life. This 15-week course on-line takes participants on a deep dive of Life's Principles. It includes the review and study of life's operating conditions, the six primary principles, and their related sub-principles. This course gives participants the experience necessary to bring these design guidelines into practice.

**BMY 503 Biology Taught Functionally (4)**

Biomimicry teaches biology through the lens of function, thereby providing a core understanding in biology for all students, no matter their background. This course explores how biologists gather and research information and how that knowledge can inform other disciplines. It also introduces the art of translating biological concepts into strategies for application, which is then carried throughout all the courses. Students will learn how to work with biologists on a biomimicry team and how to weave biology and biomimicry together. The biologists in the class will not only learn to look at nature through the function lens, but also act as subject matter experts for their interdisciplinary teams and teaching assistants.

**BMY 504 Biomimicry Thinking (4)**

Biomimicry Thinking is the practice of biomimicry from a methodology-based approach. This 15-week intensive in the methodology of biomimicry reviews how biology and biomimicry can be incorporated into the four major phases of any design process: scoping, discovering, creating, and evaluating. It covers the art of translating biological concepts into strategies for application and building a taxonomy of design principles.

**BMY 511 Biomimicry and Design (3)**

The Biomimicry and Design course will prepare participants to design sustainable innovations using the biomimicry philosophy and methodology. Participants will complete a 15-week series of lectures and assignments to demystify the design thinking process, understand how to harness the potential of approaching challenges with a design mind, distill a design challenge, understand user needs, build a bridge between biology and design, use a methodology for discovering models from nature, abstract design principles from bio-inspired strategies, and translate those principles into sustainable innovations. Participants both with a design background and without will equally experience a deep immersion into the world of biomimetic design. The course is not designed to teach one how to be a designer per se, but rather how the discipline works in order to facilitate involvement of designers into the practice of biomimicry.

**BMY 512 Biomimicry and Engineering (3)**

Biomimicry & Engineering will prepare participants to understand the field of engineering, identify the types of engineers and what each one does, what constrains engineers work under, materials selected by engineers, how to present biological ideas to engineers and how to integrate ideas from their discipline into sustainable engineering designs using biomimicry principles. The course is not designed to teach one how to be an engineer, but rather how the discipline works in order to facilitate involvement of engineers in the practice of biomimicry. A final team project designed to put these ideas into practice is required.

**BMY 516 Biomimicry and Business (3)**

Biomimicry and Business Course is a three credit course that resides at the overlap of the two disciplines. The course addresses business topics from the biomimicry point of view - it explains mechanisms and tools for comparing and contrasting business and nature. As part of the course, participants are challenged to question conventional ways of conducting business and come up with new approaches based on a different point of view. The course is not designed to teach one how to run a business, but rather how the discipline works in order to facilitate involvement of business in the practice of biomimicry.

**BMY 517 Human-Nature Connection (2)**

This course seeks to ground the emerging discipline of biomimicry as a continuation of our ancestral connection with nature. Human-Nature Connection (HNC) engages participants in an exploration of the meaning and value of connecting with nature. Topics include defining humans, nature, and our connection with nature; establishing the evolutionary, personal, and socio-cultural influences on the different expressions of this connection; and illustrating the relevance of biomimicry to the human-nature connection.

**BMY 598 Topic: iSites (1)**

The iSites: Biomimetic Nature Journaling course offers a kick-start to the lifelong practice of nature journaling with a biomimetic intention. Tutorials for becoming a biomimetic nature journalist include drawing techniques, materials selection, and development of observation skills. A series of nature journaling assignments are designed to offer a variety of approaches to nature journaling while also requiring that getting outside and into the natural world becomes a very comfortable experience and a source of inspiration. It is important to understand that this course will require going outside for 30 minutes on a daily basis for the eight weeks of the course – participants should plan accordingly.

**BMY 598 Topic: Communicating Biomimicry (1)**

The ability to articulate the practice and potential of biomimicry to a wide variety of audiences across many disciplines, venues, and situations is a critical skill for a Biomimicry Professional. The Communication Biomimicry course develops this skill through a wide variety of exercises, trainings, and feedback. Students will learn how to develop visual, written, and auditory presentations and how to customize those for different kinds of audiences and situations, including cross-disciplinary applications and public and organization specific settings. Students will learn how to communicate biomimicry in the field, in the boardroom, with media, and in labs. Students will assemble course deliverables into a portfolio demonstrating their communication skills.

**BMY 598 Topic: Teaching Biomimicry (1)**

The ability to teach the practice of biomimicry to a wide variety of audiences across many disciplines, venues, and situations is a critical skill set for a Biomimicry Professional. The Teaching Biomimicry course develops these skills through a wide variety of exercises, trainings, and feedback. Students will learn how to create and execute meaningful learning experiences in biomimicry. Students will assemble course deliverables into a portfolio demonstrating their teaching skills.

**BMY 598 Topic: Facilitating Biomimicry (1)**

The ability to facilitate the practice of biomimicry to a wide variety of audiences across many disciplines, venues, and situations is a critical skill set for a Biomimicry Professional. The Facilitating Biomimicry course develops these skills through a wide variety of exercises, trainings, and feedback. Students will learn how to facilitate the implementation of biomimicry within organizations. Students will assemble course deliverables into a portfolio demonstrating their facilitating skills.

**BMY 530 Virtual Design Lab Practicum (2)**

This practicum is designed to allow participants to dive deep into the biomimicry tools and resources presented during the program and to apply them selectively to a specific and unique opportunity of the students choosing. Projects should have a meaningful outcome achievable within the semester, and should engage the scoping, discovering, creating and evaluating phases of Biomimicry Thinking. Deliverables are milestone based, and the final deliverable should have application in a real-world setting.

**BMY 580 Topic: Biomimicry Case Study Practicum (2)**

This practicum is designed to allow participants to dive deep into the business case for biomimicry, by doing an in-depth case study analysis of a specific biomimicry example. During the 15 week semester, each individual will identify, research, and write up a case study from the business perspective. At the conclusion of the practicum and the receipt of everyone's final and polished version, we will compile these case studies for a specific release in a format TBD.

**BMY 580 Topic: BioBrainstorm Practicum (2)**

This practicum is designed to allow participants to dive deep into the specific biomimicry tools and techniques of a BioBrainstorm. Working in teams, each team will identify a challenge, discover relevant strategies from the biological literature, interpret and translate the scientific information including creating illustrative graphics, summarize the findings, build a taxonomy, and learn how to present the information in a biomimicry context so that it is relevant to design.

**BMY580 Topic: Biomimicry Genius of Biome Practicum (2)**

This practicum is designed to allow participants to dive deep into the specific biomimicry tools and techniques of a Genius of Place. During the 15 week period, each team will identify a biome of interest, research place-specific strategies from the biological literature for that biome, interpret and translate the scientific information including creating illustrative graphics, summarize the findings, build a taxonomy, and learn how to present the information in a biomimicry context so that it is relevant to place-based design.

**TESTIMONIALS:****Michael Dupee, MBA, JD**

I hold a joint Master of Business Administration and Juris Doctor (cum laude) degree from the McDonough School of Business at Georgetown University and Georgetown University Law Center. The Biomimicry Professional curriculum is on a par with the graduate programs I have experienced in terms of workload, substance, and rigor, and fully deserving of a Master of Science degree. For a typical course, I spend between 6-10 hours per week fulfilling requirements, which include viewing lectures online, required readings, weekly conference calls, and completing assignments. When there is more than one course in session, the time investment ramps up accordingly. For example, over the last month, we have been completing the second module of our Biomimicry and Design course, while simultaneously completing a Biomimicry and Business case study assignment and conducting biological research for a Practicum assignment. At times like these, the time commitment is closer to 20-30 hours per week. Additionally, the coursework is designed to aggressively, thoughtfully, and effectively develop our abilities across a range of professional skills that, in my experience, are rarely addressed as well in one educational program: reading, writing, scientific research, analytical reasoning, innovative thinking, design, presentation, and written/verbal communications.

**Tamsin Woolsey-Barker, PhD**

I have taken extensive graduate coursework in a variety of fields (physical anthropology, biology, and genetics), at New York University, Columbia University, and University of California San Diego. I can absolutely attest that the coursework within the Biomimicry Professional Program is graduate level, comparable to courses I have taken at these institutions, and fully worthy of a masters in science degree. The material requires extensive in-depth preparation (approximately 10 hours a week on average, often more), with significant and personally-directed research requirements, and rigorous standards for practicum milestones and assessments.

**Katherine Miller, JD, PhD**

I hold a bachelors degree in Biological Sciences from the University of Chicago, with specializations in the fields of immunology, cell, and molecular biology. Subsequently, I earned a Ph.D. in Neurobiology from Yale University. After a postdoctoral fellowship at Yale, I transitioned from a career as a scientific researcher to a career as a biotech patent attorney. As part of this transition, I earned my J.D. from Suffolk University in

Boston at night while working full time at a law firm in the city. I am a patent agent registered with the U.S. Patent and Trademark Office and an attorney licensed to practice in Massachusetts. Currently, I am an associate in the biotech practice group of Wolf Greenfield, a law firm specializing in Intellectual Property based in Boston.

Based upon my past experiences, I can confidently state that the BPro program is a rigorous experience characteristic of a graduate level program. In my past, I have been a full time biology student (BA and Ph.D.) and a part-time law student (J.D.) working during the day and attending classes at night. I am working full time as an attorney and completing my course work for the BPro course on nights and weekends on a schedule reminiscent of law school. However, the BPro program feels more demanding than my law school experience for a number of reasons.

The course work for BPro is more diverse than course work required for either of my past graduate programs. In my past, I studied either biology or law, but in my present, as a BPro student, I study biology, design, business, and engineering in the context of biomimicry. The BPro program demands scientific rigor, making me feel fortunate that I have a strong biology background. The BPro program also demands rapid acquisition of skills in the areas of business, engineering, and design. Students who enter the program without formal biology training have even more work as a large number of them are buying college-level biology textbooks and following additional biology courses to ramp up for the BPro courses. In addition to learning design, which is the field that stretches my capacities the most, we are expected to be creative, constantly, and often rise to the challenge. Many of the jokes told about lawyers that make fun of a population who can amazingly, and often mind-numbingly, recite statutes word for word are true on some level because most law school programs teach memorization for passing bar exams. Excellent law programs teach critical reasoning and inspire creativity, but that is more of an exception than the rule. Similar to those excellent law programs, BPro requires constant mindfulness of the world to develop diverse sources of inspiration for conceiving and developing novel ideas and paradigm-shifting solutions to long-felt problems. Because this program stretches the existing skills of every student and requires full-integration of the courses into daily life, the time dedicated to this program by the students is significant.

As part of the course requirements for the BPro program, I spend 6-10 hours a week listening to the lectures, reading the required material, and submitting our assignment for the week. In addition, we are also involved in practicum projects that are either accomplished alone, or in the context of a group. For these practicum projects that span 6-12 months each, there are deliverables due along the way towards a final product. Although the average number of hours varies from week to week, these projects require significant research and contact with companies in the relevant space to obtain interviews. These projects culminate in the generation of a sophisticated work product of publishable quality, or in the context of the BioBrainstorm Practicum, for example, a report suitable for submission to a client. On average, the practicum projects require another 6-10 hours per week. The iSites course continues throughout the two years and requires weekly projects that get students outside and develop drawing and visual communication skills. Because the iSites course requires exploring nature, those projects require at least a half-day per week, particularly for those of us who dwell in urban settings. At some point in our two years, we are expected to dedicate a day each to shadowing three professionals as well as time dedicated to arranging these days. We are required to give 5 talks to audiences of varying sizes, which requires significant work to find an audience and prepare the talk. Each BPro student must give an hour long talk at an in-person session to develop teaching and facilitating skills – for this requirement, I spent over 20 hours assembling, disassembling, revising and practicing my talk.

## Sample Curricula: Biomimicry and Design, Week 2

March 31 - April 6, 2014

- Working as a creative professional as individuals and in teams
- How to give and receive a design critique
- Getting attuned to good design
- Visual thinking and expression

Your progress ?

### Your assignment for this week is:

#### - Watch the lecture



Video: B&D Week 2 Creative Confidence (31:27)



Slides: B&D Week 2 Creative Confidence 829.9KB PDF document

#### - Reading assignment

Chapter 4: Exploration, Design: Creation of Artifacts in Society by Karl Ulrich



Chapter 7: Aesthetics in Design, Design: Creation of Artifacts in Society by Karl Ulrich



Design Criticism and the Creative Process by Cassie McDaniel 129.1KB PDF document



A great, general, well-written synopsis on how to deal with and give a useful critique as part of the creative process.

#### - Complete the homework assignment



Biomimicry expressed through visual thinking + critique



#### - Attend the live discussion



Live discussion - April 3, 8:00 am GMT-6



Recorded Live Discussion B&D Wk 2 Creative Confidence

#### - Review additional resources at your leisure



Overview of Visual Thinking by Patricia Kambitsch 1.5MB Image (PNG)



Video: Ted Talk, How to build your creative confidence by David Kelley

"Creativity is not the domain of only a chosen few." David Kelly, founder of IDEO, describes his mission of creative confidence.



Video: Ted talk, Your elusive creative genius by Elizabeth Gilbert



How to Respond Effectively to Design Criticism by Andrew Follett 361.6KB PDF document



4 Essentials of a Design Critique by Tom Biederbeck 212.6KB PDF document

While written for a graphic design audience, the approach described here for both receiving and giving a design critique will be relevant to designers of all kinds.



Video: Discussing Design, the art of critique by Adam Connor of mad\*pow

Discussing a helpful and productive approach to critique and critical thinking as an important aspect of the design process. Developed for a User Experience (UX) audience, but is relevant to everyone.



Design Review: Practice and Principles by Design Council (2013) 1MB PDF document



Amazon.com - The Sketchnote Handbook

## Sample Curricula: Life's Principles

◀ OCTOBER 27 - NOVEMBER 2

NOVEMBER 3 - NOVEMBER 10

NOVEMBER 11 - NOVEMBER 17 ▶

### WEEK #5














#### Integrate growth with development

- self-organize
- build from the bottom-up
- combine modular and nested components

Your assignment for this week is as follows:

- 1) Listen to the individual recordings for each of the principles. Each recording is about 7-11 minutes long.
- 2) After reviewing each principle recording, find that principle in your RH:Life's Principles:Definitions and Examples and review the content for that principle.
- 3) For each principle, restate the definition for that principle in a way relevant to your intended audience. You will add this definition to the notes section of your slide deck.
- 4) For each principle, create a slide in your slide deck that includes either a biological example or a human derived example with the background information in the notes section *per the template instructions*. See the [Biological or Human assignment list](#) to see which example type you are assigned to this week.
- 5) Complete this weeks additional assignment, [Sculpting Life's Principles](#)- its all hands on!
- 6) Attend the [live discussion](#) or review the recording of the discussion.

Your progress ?

 Integrate development with growth PDF of PPT	<input type="checkbox"/>
 Sculpting Life's Principles	<input type="checkbox"/>
<hr/>	
 Integrate development with growth LECTURE (10 min)	
 Upload PDF of PPT slide + notes for this LP	<input type="checkbox"/>
 Combine modular and nested components LECTURE (8 min)	
 Upload PDF of PPT slide + notes for this LP	<input type="checkbox"/>
 Build from the bottom-up LECTURE (7 min)	
 Upload PDF of PPT slide + notes for this LP	<input type="checkbox"/>
 Self-organize LECTURE (11 min)	
 Upload PDF of PPT slide + notes for this LP	<input type="checkbox"/>
<hr/>	
 OPTIONAL LECTURE - Integrate Development with Growth (70 min)	
 Join the BPro Live Weekly Discussion	
 Weekly Discussion Forum	

◀ OCTOBER 27 - NOVEMBER 2

[Return to main course page](#)

NOVEMBER 11 - NOVEMBER 17 ▶

## Sample Curricula: Biomimicry & Business, week #2

**Week #2: May 24-30, 2014**













### Transformation of Business

- Macro versus micro environment in business
- Definition of a 'macro force' and why we should care
- Overview of the key macro forces that business professionals consider and what they mean for us: digitalization, urbanization, hyper-life, growing and aging population, etc.

#### Your assignment for this week is:

1. Watch the lecture
2. Read and/or watch required resources
3. Complete the assignment
4. Actively participate in the discussion on Thursday, May 29

Review optional resources at your leisure.

 Lecture recording	<input type="checkbox"/>
 Lecture PDF 1022.3KB PDF document	<input type="checkbox"/>
 Amy Larkin on Environmental Debt	<input type="checkbox"/>
 Environmental Externalities Report 1.2MB PDF document	<input type="checkbox"/>
 Strategic Principles for Competing in The Digital Age 398.3KB PDF document	
 Need Speed? Slow Down (HBR)	
 Ways to Fight Short-Term Thinking (CoDesign)	
 Business Challenges of The Future (The Futures Company) 4.3MB PDF document	
 How Would Nature Design an Organization?	
 Assignment (choice 1): Should Business Plan?	<input type="checkbox"/>
 Assignment (choice 2): What Do Macro Forces Mean For You?	<input type="checkbox"/>
 Recorded Live Discussion: Mod 1 Week 2	

**APPENDIX A**  
**OPERATIONAL INFORMATION FOR GRADUATE PROGRAMS**  
(This information is used to populate the [Graduate Programs Search](#)/catalog website.)

**1. Provide a brief** (catalog type - no more than 150 words) **program description.**

ASU in conjunction with Biomimicry 3.8, has developed a master's program designed to empower change-agents passionate about a world mentored by life's genius. Graduates work toward innovative and sustainable solutions to the most pressing global challenges, from the way we conduct business, design buildings and products, run governments, provide healthcare, manufacture our goods, to how we educate future generations, drawing upon time-tested sustainable solutions of the last 3.8 billion years. The MS in Biomimicry is designed to prepare students to facilitate the practice of biomimicry across corporate, government, education, and non-government organization sectors. Through the combination of on-line learning, and a portfolio culminating experience, students will gain biomimicry experience in biome-based applications, business case studies, biological strategy research, and a self-designed biomimicry project in one's chosen career field.

**2. Campus(es) where program will be offered:**

*(Please note that Office of the Provost approval is needed for ASU Online campus options.)*

**ASU Online only (all courses online)**

**All other campus options (please select all that apply):**

Downtown                       Polytechnic  
 Tempe                               West

**Both on-campus and**  **ASU Online (\*)** - (Check applicable campus from options listed.)

(\*) Please note: Once students elect a campus option, students will not be able to move back and forth between the on-campus (in-person) or hybrid options and the ASU Online campus option.

**3. Admission Requirements:**

**Degree:** Minimum of a Bachelor's or master's degree or equivalent in the fields of biology, design, business, engineering or sustainability, or a closely related field (e.g. healthcare, communications) from a regionally accredited College or University or equivalent organization.

**GPA:** Minimum of a 3.00 cumulative GPA (scale is 4.0=A), or equivalent, in the last 60 hours of a student's first bachelor's degree program.

**English Proficiency Requirement for International Applicants:** The English proficiency requirements are the same as the Graduate Education requirement. (see Graduate Education requirement [http://graduate.asu.edu/admissions/international/english\\_proficiency](http://graduate.asu.edu/admissions/international/english_proficiency)):  **Yes**                       **No**

**Foreign Language Exam:**

Foreign Language Examination(s) required?  Yes  No

**Required Admission Examinations:**  GRE  GMAT  Millers Analogies  **None required**  
(Select all that apply.)

**Letters of Recommendation:**  Yes  No

**4. Application Review Terms (if applicable Session):** Indicate all terms for which applications for Admissions are accepted and the corresponding application deadline dates, if any:

Fall (regular)                      Deadline (month/year): 4/2015

Spring (regular)                      Deadline (month/year): 11/2015



5. Curricular Requirements:

5A. Will concentrations be established under this degree program?  Yes  No  
 i. If "Yes" is selected, please select the appropriate box:

5B. Curricular Structure:

**Note:** while these are new courses for ASU they have all been taught at least twice in the context of a certificate program at Biomimicry 3.8.

<u>Required Core Courses for the Degree</u>			<u>Credit Hours</u>
(Prefix & Number)	(Course Title)	(New Course) Yes or No?	(Insert Section Sub-total)
			13
<b>BMY 501</b>	Essentials of Biomimicry	<b>Yes</b>	1
<b>BMY 502</b>	Life's Principles	<b>Yes</b>	4
<b>BMY 503</b>	Biology Taught Functionally	<b>Yes</b>	4
<b>BMY 504</b>	Biomimicry Thinking	<b>Yes</b>	4
<u>Elective or Research Courses</u> <i>(as deemed necessary by supervisory committee)</i> <i>Students choose 11 credit hours from the list below.</i>			<u>Credit Hours</u>
(Prefix & Number)	(Course Title)	(New Course) Yes or No?	(Insert Section Sub-total)
			11
<b>BMY 511</b>	Biomimicry and Design	<b>yes</b>	3
<b>BMY 512</b>	Biomimicry and Engineering	<b>yes</b>	3
<b>BMY 516</b>	Biomimicry and Business	<b>yes</b>	3
<b>BMY 517</b>	Human-Nature Connection	<b>Yes</b>	2
<b>BMY 598</b>	ST:iSites	<b>Yes</b>	1
<b>BMY 598</b>	Topic: Communicating Biomimicry	<b>Yes</b>	1
<b>BMY 598</b>	Topic: Teaching Biomimicry	<b>Yes</b>	1
<b>BMY 598</b>	Topic: Facilitating Biomimicry	<b>Yes</b>	1

<u>Culminating Experience</u>	<u>Credit Hours</u> (Insert Section Sub-total) <u>0</u>
<p>Students will use project outcomes from the courses listed under Other Requirements to assemble a portfolio of their work. At least three projects must be included in their portfolio. The portfolio will be submitted to a committee consisting of their advisors for each practicum and at least one of the Biomimicry Center directors for evaluation against program learning objectives. If the student completes the Certificate in Biomimicry prior to enrolling in the MS, they may not use their previous BMY 530 project as part of this requirement.</p> <p>The intention of the portfolio to represent the culminating experience is to assess the breadth and depth of the students working in an inherently transdisciplinary field. Graduates of the MS will become <i>facilitators</i> of the practice of biomimicry, and as such, need experience in a wide array of applications of biomimicry. The MS provides the option for four unique practicums. Students have to take at least three and the portfolio will be used to assess the success of the student. Each practicum takes a full semester to complete, directs application of the knowledge toward a real-world challenge, builds on and assesses specific skills necessary for a biomimic (e.g. identifying relevant biological strategies, translates the biological knowledge for a design/engineering audience, develops bio-inspired concepts, identifies the business case for biomimicry as an innovation tool, etc.) and has a research-driven, synthesized report as the outcome.</p>	
<u>Other Requirements</u>	<u>Credit Hours</u> (Insert Section Sub-total) <u>6</u>
Students must complete three of the four BMY 530 or BMY 580 classes and use the practicum outcomes for their culminating portfolio requirements.	
<b>BMY 580 Topic: Biomimicry Case Study Practicum</b>	<b>2</b>
<b>BMY 580 Topic: BioBrainstorm Practicum</b>	<b>2</b>
<b>BMY 580 Topic: Biomimicry Genius of Place Practicum</b>	<b>2</b>
<b>BMY 530 Virtual Design Lab Practicum</b>	<b>2</b>
<b>Total required credit hours</b>	<b>30</b>

6. **Comprehensive Exams:**

Master's Comprehensive Exam (when applicable), please select the appropriate box.

(Written comprehensive exam is required): N/A

- Oral comprehensive exam is required – in addition to written exam
- No oral comprehensive exam required - only written exam is required

NOTE: All students will complete a final portfolio using applied projects from 3 practicums that will be reviewed by a Committee of three faculty including chair or co-chairs. See above for more detail.

7. **Allow 400-level courses:**  Yes  No (No more than 6-credit hours of 400-level coursework can be included on a graduate student plan of study.)

8. **Committee:** Required Number of Thesis or Dissertation Committee Members (must be at least 3 including chair or co-chairs): 3

9. **Keywords** (List all keywords that could be used to search for this program. Keywords should be specific to the proposed program.)

biomimicry, sustainability, sustainable design, bio-inspired design, professional master's, applied biology, environmental, entrepreneurship, innovation, leadership, sustainable business, triple-bottom line, systems thinking,

10. **Area(s) of Interest**

- A. Select **one (1)** primary area of interest from the list below that applies to this program.

- |                          |   |                                     |  |
|--------------------------|---|-------------------------------------|--|
| <input type="checkbox"/> | <a href="#">Architecture &amp; Construction</a> | <input type="checkbox"/>            | <a href="#">Interdisciplinary Studies</a>      |
| <input type="checkbox"/> | <a href="#">Arts</a>                            | <input type="checkbox"/>            | <a href="#">Law &amp; Justice</a>              |
| <input type="checkbox"/> | <a href="#">Business</a>                        | <input type="checkbox"/>            | <a href="#">Mathematics</a>                    |
| <input type="checkbox"/> | <a href="#">Communication &amp; Media</a>       | <input type="checkbox"/>            | <a href="#">Psychology</a>                     |
| <input type="checkbox"/> | <a href="#">Education &amp; Teaching</a>        | <input type="checkbox"/>            | <a href="#">STEM</a>                           |
| <input type="checkbox"/> | <a href="#">Engineering &amp; Technology</a>    | <input type="checkbox"/>            | <a href="#">Science</a>                        |
| <input type="checkbox"/> | <a href="#">Entrepreneurship</a>                | <input type="checkbox"/>            | <a href="#">Social and Behavioral Sciences</a> |
| <input type="checkbox"/> | <a href="#">Health &amp; Wellness</a>           | <input checked="" type="checkbox"/> | <a href="#">Sustainability</a>                 |
| <input type="checkbox"/> | <a href="#">Humanities</a>                      |                                     |  |

- B. Select **one (1)** secondary area of interest from the list below that applies to this program.

- |                          |   |                                     |  |
|--------------------------|---|-------------------------------------|--|
| <input type="checkbox"/> | <a href="#">Architecture &amp; Construction</a> | <input checked="" type="checkbox"/> | <a href="#">Interdisciplinary Studies</a>      |
| <input type="checkbox"/> | <a href="#">Arts</a>                            | <input type="checkbox"/>            | <a href="#">Law &amp; Justice</a>              |
| <input type="checkbox"/> | <a href="#">Business</a>                        | <input type="checkbox"/>            | <a href="#">Mathematics</a>                    |
| <input type="checkbox"/> | <a href="#">Communications &amp; Media</a>      | <input type="checkbox"/>            | <a href="#">Psychology</a>                     |
| <input type="checkbox"/> | <a href="#">Education &amp; Teaching</a>        | <input type="checkbox"/>            | <a href="#">STEM</a>                           |
| <input type="checkbox"/> | <a href="#">Engineering &amp; Technology</a>    | <input type="checkbox"/>            | <a href="#">Science</a>                        |
| <input type="checkbox"/> | <a href="#">Entrepreneurship</a>                | <input type="checkbox"/>            | <a href="#">Social and Behavioral Sciences</a> |
| <input type="checkbox"/> | <a href="#">Health &amp; Wellness</a>           | <input type="checkbox"/>            | <a href="#">Sustainability</a>                 |
| <input type="checkbox"/> | <a href="#">Humanities</a>                      |                                     |  |

**Appendix B: Letters of Support**

**College of Liberal Arts and Sciences  
Official Submission**

**From:** Paul LePore [<mailto:Paul.Lepore@asu.edu>]  
**Sent:** Friday, September 19, 2014 9:29 AM  
**To:** [curriculumplanning@asu.edu](mailto:curriculumplanning@asu.edu)  
**Cc:** Paul LePore; Kenro Kusumi; Kacie Cannon; Jenny Smith  
**Subject:** MS in Biomimicry  
**Importance:** High

Please accept the attached proposal for a new MS in Biomimicry.

Thank you.

PL

**PAUL C. LEPORE, Ph.D.**

Associate Dean

**College of Liberal Arts and Sciences**

Foundation Building, Suite 110

Arizona State University | P.O. Box 876605 | Tempe, Arizona 85287-6605

480.965.6506 | Fax: 480.965.2110 | e-mail: [paul.lepore@asu.edu](mailto:paul.lepore@asu.edu)

**ASU College of Liberal Arts and Sciences** — *Transforming learning, discovery and lives*

**Ira A Fulton Schools of Engineering  
Support Statement**

**Brian Skromme**

July 31, 2014 2:32 PM

To: Dayna Baumeister

[Hide Details](#)

Cc: Prasad Boradkar, Jürgen Gadau

1

RE: Follow-up from today's call re: Biomimicry Certificate and Master's

---

Hi Dayna:

I enjoyed speaking with you today and learning more about your programs. I forgot to ask you if you had had any discussions with Hao Yan, his work seems to overlap this area as well.

Regarding the impact of your proposed programs (the Graduate Certificate and MS degree in Biomimicry) on engineering, I do not foresee any negative impacts of your programs on any engineering programs or courses as they tend to serve different student populations.

Regards,

Brian Skromme

Brian J. Skromme, Professor and Assistant Dean  
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Arizona State University, 699 S. Mill Ave.  
PO Box 878109  
Tempe, AZ 85287-8109  
Phone (480) 965-5151 (M, W, F morning)  
Alternate phone: (480) 965-8592 (T,Th, F afternoon)  
FAX: (480) 965-8095  
Front Desk: 965-1726  
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**School of Sustainability  
Support Statement**



February 14, 2014

Juergen Gadau  
Professor  
Associate Director of Graduate Studies SOLS  
Arizona State University

Dear Juergen,

This letter is to express the School of Sustainability's support for the Professional Science Master in Biomimicry proposed by the School of Life Sciences in the College of Liberal Arts and Sciences. On behalf of SOS, I am very pleased to see this going forward as part of a broader commitment to biomimicry research, teaching, and practice at ASU and I am happy to provide any support towards these efforts.

Sincerely,

A handwritten signature in black ink, appearing to read "C Boone".

Christopher Boone  
Dean and Professor

**W. P. Carey School of Business  
Support Statement**

**From:** Amy Hillman <[AMY.HILLMAN@asu.edu](mailto:AMY.HILLMAN@asu.edu)>  
**Date:** Monday, September 15, 2014 12:36 PM  
**To:** Prasad Boradkar <[Prasad.Boradkar@asu.edu](mailto:Prasad.Boradkar@asu.edu)>, Dorothy Galvez <[Dorothy.Galvez@asu.edu](mailto:Dorothy.Galvez@asu.edu)>  
**Subject:** Re: Thank you and Question

The W. P. Carey School of Business has no objections to the proposed MS in Biomimicry.

Amy

\*\*\*\*\*

Amy Hillman  
Rusty Lyon Chair of Strategy  
Dean, W. P. Carey School of Business  
Arizona State University

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[amy.hillman@asu.edu](mailto:amy.hillman@asu.edu)

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**School of Life Sciences  
Support Statement**

**From:** Bertram Jacobs  
**Sent:** Sunday, September 14, 2014 8:48 PM  
**To:** Dayna Baumeister; Juergen Gadau  
**Subject:** Support for Biomimicry MS degree.

Dear Dayna,

I am emailing to confirm the support of the School of Life Sciences for the MS degree in Biomimicry. I am confident that this will be a quality degree that will provide an important opportunity for our students. As Interim Director of the School of Life Sciences I fully support implementation of this degree program.

Bert Jacobs, Professor  
Interim Director, School of Life Sciences  
Center for Infectious Diseases and Vaccinology  
Biodesign Institute  
Arizona State University  
Tempe, AZ 85287-5401



The Design School  
Support Statement



19 September 2014

Prof. Prasad Boradkar  
The Design School

Re: Proposed Certificate in Bio mimicry

Dear Prasad,

I have reviewed the proposal for the new on-line graduate degree program in Biomimicry, (M.S. Biomimicry) and am confident that this will be a strong program. I am happy to offer my support to the M.S. Biomimicry Program.

Warm regards,

A handwritten signature in black ink, appearing to read "Craig Barton".

Craig Evan Barton,  
Director

## Appendix C

(Extracted from the signed LOI between Biomimicry 3.8 and ASU)

### Background:

The Biomimicry 3.8 Institute has a long-standing relationship with Arizona State University through the INNOVATIONSPACE® program and ASU's status as a Biomimicry 3.8 Institute affiliate institution. Heidi Fischer (ASU Herberger Institute for Design and the Arts) is an accomplished local Biomimicry Fellow on campus, and she and Prasad Boradkar have a long-standing relationship with the Biomimicry 3.8 Institute and Biomimicry 3.8. In the past three years, the Biomimicry 3.8 Institute has worked closely with the faculty of ASU's INNOVATIONSPACE® to demonstrate the school's commitment to creating biomimicry education opportunities on campus.

In addition, Michael Crow, ASU President, has had a connection with the concept of biomimicry since he first read *Biomimicry: Innovation Inspired by Nature*, written by Biomimicry 3.8 co-founder, Janine Benyus. Janine has given several lectures at ASU and received an honorary doctorate from ASU in 2013.

Based on the historical relationship between ASU and Biomimicry 3.8, and most importantly the significant impacts that biomimicry can make in helping solve the world's greatest sustainability challenges, the parties agree there are a number of new endeavors that collectively could create a co-branded ASU Biomimicry 3.8 Center.

### Current Commitments:

After a series of meetings in May of 2013 surrounding ASU's commencement coupled with meetings between the parties in August and September of 2013, Michael Crow affirmed ASU's commitment to creating the ASU Biomimicry 3.8 Center on ASU's Tempe campus.

Robert Page, University Provost, will serve as the key point of contact and will work closely with Sethuraman Panchanathan (Panch), Senior Vice President of Knowledge Enterprise Development; Gary Dirks, Director of the Global Institute for Sustainability; Chris Boone, Dean of the School of Sustainability; and Prasad Brodkar, Co-director of Innovation Space to achieve this goal.

ASU will have ultimate control over the ASU Biomimicry 3.8 Center and its curriculum, even though the Center will be co-branded, and will hold co-directors, Dayna Baumeister from Biomimicry 3.8 and Prasad Boradkar from ASU.

### Framing of the Center

While some researchers look at nature and then try to find a human application (a strategy referred to as "Biology to Challenge"), the key differentiator of the ASU Biomimicry 3.8 Center is that it will identify key global challenges and seek out strategies in nature that may inspire innovative solutions (or "Challenge to Biology"). Marrying core research with practical design applications and a student-centered educational approach, this Center will produce sustainable solutions to the world's grand challenges.

By framing outcomes in research and academics around key global challenges/opportunities where biomimicry has the greatest potential to contribute to positive sustainability outcomes, the Center will focus the efforts of faculty and students through various opportunities to address key global issues in sustainability. This purpose-built collaboration will work to advance solutions for pressing issues where biomimicry can offer a unique and sustainable solution.

The following broad areas/themes have been identified as initial starting points of focus:

- Resilient Cities

Includes a wide variety of needs and opportunities including, but not limited to, energy and water infrastructure, Ecological Performance Standards as place-based metrics for sustainable built environments, Genius of Place as place-based design guidelines for adapting to climate change, urban planning and land use challenges, adaptive buildings and infrastructure, and related realms

- Additive Manufacturing

Includes everything from the chemistry of the polymers used in 3-D printing and the biological blueprints that could be printed to the circular economy of production, use and distribution of goods in the distributed

manufacturing of the 21st century (See National Geographic, "[Improving 3D Printing by Copying Nature](#)" for more details on the opportunities in this realm)

- Bio-inspired functional molecules and materials

Development of bio-inspired molecules and materials to replace a wide array of existing products including flame retardants, plasticizers, non-degradable packaging, endocrine disrupters, foams, resins, insecticides/fungicides, etc.

The biomimetic designs and products emerging from the [ASU Biomimicry 3.8 Center](#) in these key topic areas will be leapfrog technologies and strategies for next generation sustainability solutions. We recognize that many opportunities not yet identified may arise and we seek to be adaptive to the dynamic landscape. The Center will likely evolve over time to include new ones and/or adapt existing ones. To create a co-branded [ASU Biomimicry 3.8 Center](#) on campus, we will focus our work in three key areas: Academics, Research and Outreach, with many opportunities holding the potential to lie in more than one area.