Jun 6th, 12:00 AM - Jun 8th, 12:00 AM

Materials Collection Creation and Administration: A New Role for Libraries (White Paper)

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Materials Collection Creation and Administration: A New Role for Libraries
IMLS-Funded Symposium

A White Paper

The Problem/Opportunity: To define, identify, and guide design-based materials collections in academic settings and foster community among those with existing collections and/or those considering creating and supporting one.

Contents and topics:

"We live in a time of unprecedented material innovations that are affecting our lives."

I. WHAT IS A MATERIALS COLLECTION?

A materials collection is a body of physical items and samples acquired across various industries to be utilized as objects for inspiration and in project specification by architects, designers, artists, and researchers in the practice of those and allied fields.

Contemporary materials collections exist primarily in architecture and interior design firms as well as in related manufacturing but are increasingly being created in educational institutions that support the curriculum of those fields and the training of future practitioners.

While once confined to a specific department or program at a school, such as architecture, materials collections in this second decade of the 21st century offer ever-widening appeal and near-universal application to all art and design fields.

To best address the needs of audiences that materials collections in art, architecture, and design field target, these will (and should) differ slightly or even significantly than the approach to meeting user needs in the areas of applied construction and engineering as well as material science. Through universities, government laboratories, professional organizations and societies in partnership with industry, those fields have established their own standards and measures to achieve their professional mission. The sphere of a design-based materials collection is likely to approach those cognate areas but not assume their authority.

"It has become a widely held belief that more new products have been developed in the last twenty years than in the prior history of materials science."

II. WHY HAVE A MATERIALS COLLECTION?

Industry-based collections serve a mission to connect in-house designers and architects with materials for projects both realized and conceptual. While inspirational, they are essentially

sourcing collections with priority based on market currency. Materials that go off market are usually de-accessioned from the collection.

Academic-based collections usually function in the inverse. Students are expected to attain foundational understanding and appreciation for basic materials as well as gain insight from exposure to advanced and innovative materials. A materials collection will function to educate and inspire design-based students. Real-time sourcing for a project is the last step, if a step at all.

A literacy with materials will enable students as future professionals to make appropriate and smart choices to achieve their goals while being mindful of the global impact of their selections. A successful student will have the ability to defend her or his choices and selections during critique and later in a design-based career.

The current generation of students are highly aware of the problems that face society: increased demand for products and services, natural resource depletion, and failed systems of the past that are no longer sustainable. They embrace technology as a potent tool (though not as an end), disrupt and reinvent economic models as non-hierarchies, and persist through initial failures with the ability to apply learned lessons and experiences toward adjusted outcomes. A materials collection supports this experiment-based mindset of creative criticality.

Employers identify problem-solving and critical-thinking as highly desirable skills and university programs realize they must promote this type of learning, which is increasingly common language in reconfigured curricula and strategic planning. Topics such as biomimetics and developments such as nanoparticles are no longer owned by a single discipline in regard to their application or their feasibility for use. A materials collection will support these objectives by serving to complement the studio and function as a laboratory for training in those areas for designers and architects.

"Our everyday lives are dominated by materials, even though our world is frequently qualified as 'virtual', [with] things that distance us from the physical dimension of our existence while simultaneously emphasizing our desire for that same materiality."

III. ACQUIRING A MATERIALS COLLECTION

The materials collection must serve the curricular and programmatic needs of the department, school, or institution in art, architecture, and design fields while engaging faculty and students simultaneously. Like any collection, it requires a commitment of curation and programming.

There are three approaches to building a materials collection, each with its own benefits and drawbacks: purchase one from a consultancy, build your own through direct solicitation, or a combination of the two. A consultancy-provided collection can be prohibitively expensive and may not be a perfect complement to the needs of your program, but is guaranteed to represent innovation and offer materials via direct connections to industry not otherwise available to a librarian; building your own is labor intensive and time-consuming (though a valuable set of tasks for a graduate student) but does offer a direct connection to faculty needs and student interests; a hybrid of the two is probably the most realistic and suitable.

Decide whether your materials collection should have a specific scope or focus—properties such as sustainability, applications such as the built environment, or processes that form textiles, or a basic approach based on composition types, for example. This will also mean recognizing areas that you will not collect. The breadth of your audience will likely determine the scope of your collection.

Direct solicitation of manufacturers and distributors for material samples is nearly always fruitful. Many companies are already in the habit of doing this, with one portal of their website dedicated to sample requests, either at low or no cost, or perhaps requiring shipping charges to be covered. Some companies will simply not see this as a tangential aspect of their business, either because the sample is worth so little (not worth staff time, etc. to process requests) or so much (space-based materials or those based on nano-tech will simply be too expensive to give away in any quantity) and politely refuse the request.

Gifts and donations will likely also play a role in collection development but can be challenging to manage due to programmatic mismatch and sheer quantity. There are many uses for unwanted materials, such as allowing students to take materials for direct use and alteration in projects. Recycling and repurposing offices at your school or in your community may also be interested in unwanted materials. Do not presume to know all the material uses that your patrons will have in mind; they will surprise you with inquiries, purposes, and projects that a librarian should welcome, if not always with the ability to accommodate.

Non-sample resources to supplement the materials collection will include among the following: reference works, materials-related book publications that are rapidly growing in number and variety, electronic publications including PDF-based articles and journals, blogs, etc. Subscription databases will also provide essential research-level information to patrons of a materials collection. Please see the Resources appendix for details.

Any of the above approaches will have a definite impact on library staffing and space. Perhaps the materials collection can be swapped into the library for a collection that was dis-used as libraries acquire more electronic resources and, in the process, solving the problem of new space needs. Keep in mind that a complete collection for your programmatic needs may amount to just a few hundred samples (or thousands, or tens of thousands).

A materials collection follows a library in microcosm with the essential operations of selecting, ordering, acquiring, describing, labeling, circulating, etc.; similar to a library at large, some of these can be shared among other units but perhaps not. WIth the reality of limited library resources, it is likely that your materials collection will not result in new lines of staffing. In that case, existing staff must take on these duties. When possible, graduate-level student employees can provide essential assistance, especially if they are in the curricular programs/ stakeholder departments best served by the materials collection; plus they will find the research aspects of acquisition to be in line with their studies. Undergraduate students can be utilized for less sophisticated tasks or those you are comfortable to assign with appropriate supervision. Because these collections will consist of new and fascinating holdings that tie directly to the curriculum of the school, there ought not to be a shortage of interested potential student employees at the graduate and/or undergraduate levels.

“The technical terms used by engineers are not the normal language of industrial designers—indeed they may find them meaningless. Industrial designers, on the other hand, express their ideas and describe materials in ways that, to the engineer, sometimes seem bewilderingly vague and qualitative.”

IV. ORGANIZING A MATERIALS COLLECTION

There is no established metadata schema or data vocabulary for a design-based materials collection. An increasing number of authors and researchers have published books

that propose certain organizational schemes, with the expected amount of overlap among them. Most are based traditionally on the composition of the material (wood, metal, etc.), whereas a few propose organization based on properties (luminescence, conductivity, etc.) or even a novel approach such as material "personality" given the development of User Experience Design (UX) that stresses pleasurability and emotion in product design.

Material collections with a focus on architecture and the built environment have utilized the Construction Specification Institute number for their holdings. Incorporating an organizational scheme that relates to the industry supported by the collection and the curriculum being taught is a satisfactory approach, though it may not work well for users outside that program or if acquisitions stray outside the scope of that schema.

Similarly, material science offers organizational options but those have yet to take hold in design-based materials collections.

The catalog record for a material may reference these other standards without necessarily incorporating them. Regardless of whether the catalog record does look outside to these related standards, the importance of consistency when establishing a vocabulary for description is extremely important. Since these collections are likely to fall outside any one librarian's subject expertise, that consistency of classification can become vital.

"Materials Behaving Badly: Beyond Materials Libraries"

V. PROGRAMMING A MATERIALS COLLECTION

The provocative presentation title above by design researcher and author Chris Lefteri—the adjoinder reads "Or, why you don't need a materials library"—underscores the critical point that a materials collection needs to be an active and activated one. Simply collecting materials and placing them on a shelf or in storage bins will produce static results. While a materials collection both invites and reinforces the discovery strategy of browsing, additional display options will go far to provoking interest.

Many such activities already exist in the library world: exhibitions, a discrete section for new acquisitions, displays that pull supplemental material and content from other library collections, etc. Staging part of the collection based on a different organizational scheme will help patrons understand the many different characteristics and properties of materials. Exhibits that display material source or manufacturing locations can communicate what is happening in your region and create a greater awareness and understanding of material ecologies, environmental impact, lifecycle, etc. Calling attention to innovative and disruptive materials will not only educate patrons but show that the collection is following important design trends.

Sponsored lectures in or about the space by designers or representatives from industry will draw an audience of interested and engaged students and faculty.

Interactive exercises with classes, student groups, and even outside groups will help those faculty and students to experience the materials more fully and will also go far to show the potential of what can happen in and to a materials collection. A film screening program of architecture- and design-related titles will offer viewers a wider context for a materials collection.

Appendix A. Summary of Symposium, “Materials Education and Research in Art and Design: A New Role for Libraries”

Keynote Blast (60 attendees)

Former RISD President John Maeda welcomed the audience to the school and provided context for the event, the role of the new materials collection in the library, and how that was a perfect fit for design approaches to solving 21st-century challenges.

RISD Provost Rosanne Somerson continued on that theme, citing her own arc as a RISD alumna, head of Academic Affairs, and most important for this symposium, a successful furniture designer. RISD provided her the materially immersive education to become a designer with a keen and central understanding of materials and process. Those traits continue to form the foundation of what RISD calls critical making.

Design researcher Billie Faircloth discussed the wide trajectory of and impacts on material economies during the sourcing, distribution, use, and discarding of products. She urged that responsible material selection and use must happen with these awarenesses. She concluded by advocating approaches that disrupt any process that does not abide by a more thoughtful and critical process of material use.

Landscape architect and material researcher Liat Margolis described her rich history in creating and building material collections in both the for-profit and education environments. Her recent work as a landscape architect points to the difficulty in representing that field in a traditional materials collection and to the importance of sustainability as a central concern and motivation regarding material selection and use.

Leading materials researcher Chris Lefteri urged the audience to take novel approaches to programming a materials collections, that the mere acquisition and arrangement of materials was not enough. He presented examples of materials that disrupt traditional modes of product design and of materials collections that encourage this sort of “bad behavior.” Chris ended the evening by underscoring the need for material inquiry and experience in art, design, and architecture programs.

Session Programming (90 attendees)

Session 1. Librarians

Mark Pompelia, Rhode Island School of Design Fleet Library

The library’s collection is an outgrowth of previous collecting in individual departments across the school. The handsome and generous allocation of space is the result of a renovation of a former 35mm slide collection space now dedicated to a materials collection of 25,000 items in 2,500 square feet that includes an open teaching space with wi-fi, video, and AirPlay technology. The collection is used by students and faculty across the school for inspiration, sourcing, technical knowledge, projects, and discussion on the responsible use and economic

impacts of materials. The renovated space also serves as a host for school events that range from student group meetings to alumni events to events organized by the offices of the president and academic affairs, including the new faculty orientation. This multitude of campus audiences ensures that the collection receives maximum exposure and becomes increasingly incorporated into course curricula, which also feeds targeted collection development. The next project is the development of a materials database in partnership with Harvard University's Loeb Library in the Graduate School of Design.

Sydney Mainster, UT-Austin MATLAB

The University of Texas-Austin School of Architecture's Materials Lab has a main focus of building a critically large collection, plus activities such as preservation, classroom use, galleries, and receptions. The custom online database is publicly accessible as both a catalog and also serves to circulate the 26,000-item collection. It functions as an incubator within the School of Architecture for materials-based design research and investigation by both integrating into and influencing the pedagogy of the school. Other features include a monthly newsletter (material highlight, case studies, etc.), use of space (collection use, exhibit, studio review, class in space, or just walk-through), in-house projects and research, and hands-on workshops. Usage measures include tracking of visitors and purpose and the number of transactions in catalog. The system also gauges material interest through classification activity.

Alix Reiskind, Harvard Loeb Library

The Harvard collection was created in 2004 by faculty member, along with a student-created database and object photography and other operations. The collection of 500 materials merged with Loeb Library Visual Resources in 2011 with all the infrastructure support provided by the central library location and staff, along with a faculty advisor playing an important role. A seminar-sized teaching space was created from former VR slide collection. There were many challenges involved with the merger: acquisition, assessment, and deaccession all had to be reconsidered. An aging database needs to be replaced and is now the focus of a collaborative project with RISD. The Material Classification Protocol was authored by faculty advisor with database schema derived by project staff.

Carolyn Schaeberle, Pratt Institute, CSDS

The CSDS functions as a physical and virtual hub to educate environmentally responsible users and designers, links to a campus-wide program as a living laboratory, with the collection serving as a means to integrate sustainability into users' academic and professional lives. CSDS is also home to Sustainable Design Incubator for sustainable business start-ups. It functions as both work and project spaces. It offers a certificate program in design entrepreneurship and was started by former chair of Industrial Design. They host workshops to aid faculty to integrate sustainability strategies. The main function is to provide life-cycle assessment of products with a level of critical thinking applicable to all materials and featuring a complex system of

infographics to educate upon wider lifecycle issues. Initial material requests by students become opportunities for much wider inquiries. CSDS teaches that designers design consequences.

Shira Shoval, Holon Design Museum

The materials library hosts one thousand materials. It asks the questions, what is a material? and what is a product? The Mediatheque Center at Holon also hosts a public library, children's theatre, cartoon museum, and city-funded Design Museum Holon that opened in March 2010. Users are design students and professionals as well as industry. The collections advocates an expansive and subjection definition of materials, such as woven metals serving as textiles and features an active exhibition area. A multi-language website and open-access search engine are promoted. The resource satisfies criteria of local accessibility, language barriers, local manufacturers and suppliers, local development and research, strong academic ties, and a hands-on approach. A daunting challenge is to get materials to Israel. The collection inspires designers to rethink existing materials. It also works as an inspiration collection tied to museum exhibitions. It is a hub for designers and industry, including lectures, especially in the area of innovation. Designers, manufacturers, exhibitions, and educators all become a collaborative programming loop where materials drive some of the exhibitions.

Session 2. Educators

Peter Yeadon, Industrial Design, RISD

Peter noted three ways of material interaction: material products that designers consume to make other products; collaboration via engagement between students with material scientists and industry; developing materials from scratch--discovery facilitates new knowledge. He emphasized that material description matters especially when describing smart materials that change properties when prompted by an external factor; nanomaterials that change properties based on chemical composition; and where material DNA and synthetic biology interact (bioproducts as materials).

Martin Bechtold, Graduate School of Design, Harvard

Martin illustrated a user case study with the instructor and students actual use of the materials library where materials function as a systemic network, with an inference of the material itself as well as other considerations: economic, ecologic, etc. His Lifecycle Design course teaches material consumption; useful first life of material and when that ends; reuse. He urges designers to break through a one-way stream of material use and instead create an enclosed loop. The first meeting of the class takes place in the materials collection using case study with actual materials from the collection, provides student with fast-forward experience of material selection and life-cycle analysis. Students are then inspired by actual samples. There are too many issues to cover but try to confirm as much data during exposure to entire

complexity of material systems. He then targets new product ideas that challenge the ideas of life-cycle design.

Patrick Mather, Biomaterials Institute, Syracuse University

Patrick first notes that disciplines beget interdisciplinarity: engineering, biology, physics, chemistry, forestry, and medical school--then adding industrial design and architecture to his laboratory associations. The Institute's environment is structured to be naturally collaborative with combined research groups, no ownership, with the face of the team defined by its function. He himself focuses on shape memory polymers, wrinkles, biologically synthesized polymers; deployable materials and actuators. He researches sustainability via self-healing materials. He provided illustrations using color-changing shape memory. Patrick asked the question, How does a materials library show property dynamics? He concluded by advocating that manufacturers of innovative materials should send out quantities appropriate to materials collections for further inquiry and use.

Session 3. RISD Faculty

Mary-Ann Agresti, Interior Architecture, RISD

Mary-Ann provides students with an exploration of building materials. The tools of the design process are introduced at the start of department curricula. Adaptive reuse projects must address the many layers of meaning in a project. Students come with assumptions about materials that must be dispelled regarding material associations through site visits, material sketches, and precedent studies. She urges collaborating all along the material supply chain. Materials have intrinsic and extrinsic properties--where those coincide results in the material selection. She wants students to be sensitive to materials across different cultures having different meanings and values. Students must gain an understanding of material systems in order to design solutions.

Charlie Cannon, Industrial Design, RISD

Materials play central role in socially responsible design. The Waste for Life project focuses on reuse not for ecological reasons but for economic ones: to benefit those on the margins of society. Commodity prices change dramatically and unknowably. Waste for Life purposefully found reuse of materials not normally used in the recycling movement, such as plastic bags going through a press to become a sheet material. What can such a press do? Can such a press offer new types of treating and new modes of production? In seeing to create value through the design of beautiful things that could be sold, the question arose: not just what is the product but what are the transferable skills? The skills can then become more important than the product. Techniques and research samples proved beyond the original conception, allowing for a scavenger economy to shift to a producing economy. The business model moved from a simple transaction level to a more stable municipal contract level. Materials research and

innovation are not unusual for the academic, science, or corporate realms, but when brought to the common street, those kinds of explorations can become a tool for social or economic transformation.

Mary Anne Friel, Textiles, RISD

Mary Anne focused on the relationship that artists and designers form with materials in which the materials tease forth and enflesh ideas. She provided many visual examples of how that relationship is a dynamic one between process, materials, and ideas--especially in the area of textiles where work ranges from fine arts to applied design. It is a groping step-by-step process where material qualities inform the ultimate decisions, so that a piece that looks to be quite finished was continuously taking shape until that moment. Germs of ideas plus engagement with materials become the final work.

Session 4. Designers

Mike Taylor, Steelcase

Disseminate material technology from the academics and design community to the state economy. User-centered method for design research with materials for consumer goods, led by insight. Which comes first: the design or the material? Essential approach to design involves material selection and materiality (the human factors). Lean manufacturing drives out the waste where everything that remains has a purpose. Take a need or a want and get to a solution with known resources and known dollars. Materials libraries are a node for design solutions, not a destination but a journey.

Nader Tehrani, NADAA

Architecture was focused on meaning but not materiality. Building and the theorizing of it through materials knowledge had no outlet. Building was achieved through experimentation, experience and knowledge were gained through engagement. Good design could not happen without an understanding of material behavior. Materials are precursors to architectural action--a logic of construction and material behavior that work in tandem with each other. The speaker underscored the importance for material insight and exploration to happen as much as possible during the education phase (before the start of a professional career).

Stephen Lane, Ximedica

Medical materials are approved by FDA so materials in these applications cannot be innovative necessarily, so medical companies have to become application innovators. Before medical products, they used material and process to drive development of consumer products. The material library functions as a think tank and as a poor man’s nature lab to allow for development of biomimetic properties.

Librarians' Workshop (38 attendees)

The workshop for librarians covered broad topics with qualified discussion leaders. Carolyn Schaeberle of Pratt CSDS and Sydney Mainster of UT-Austin, representing very small and very large collections, both spoke about the need to collect materials in areas both specific and broad depending upon the target audience for the collection. Jane Hutton, faculty advisor to the materials collection at Harvard GSD, led the discussion of a materials taxonomy: why there is no single, universally adopted schema for design materials description; why materials are still organized by composition and why that needs to change to allow for different user motivations and experiences and multiple points of access; and the challenges of a taxonomy to cover materials that are being constantly innovated at a rapidly increasing rate. Laura Bartolo from Kent State University discussed the option for the materials collection to form the basis for collaborative research between schools/departments of art, architecture, engineering, and material science, and even reaching out to industry and government. That led into the topic of funding solutions for materials collections by Ann Whiteside at Harvard GSD. Ann discussed approaches that ranged from repurposing existing staff and space within a visual resources department as well as grant funding both inside a school as well as grants submitted to external agencies such as IMLS. All attendees shared a common experience of learning much from each other and from the number and variety of speakers, vocalizing the need for continued conversation, community building, and resource development.

Appendix B. Resources

1. Subject headings
    1.1. LCSH: materials, http://id.loc.gov/authorities/subjects/sh85082065
    1.2. LCSH: manufacturing processes, http://id.loc.gov/authorities/subjects/sh85080664
    1.3. LCSH: machining, http://id.loc.gov/authorities/subjects/sh85079399
    1.4. USDA: materials, http://lod.nal.usda.gov/nalt/560
2. Research-level authorities and databases
    2.1. ARLIS/NA material|resource, http://materialresource.wordpress.com/
    2.2. Material ConneXion, http://www.materialconnexion.com/Home/Services/ForSchoolsUniversities/tabid/117/Default.aspx
    2.3. Building Green, http://www2.buildinggreen.com/
    2.4. CSI, http://www.csinet.org/
    2.5. Granta, http://www.grantadesign.com/
    2.6. MatWeb, http://www.matweb.com/
    2.7. ASM International, http://www.asminternational.org/materials-resources
3. Consultancy and sourcing sites and blogs of interest
    3.1. Archello, http://www.archello.com/en/materials
    3.2. Core77, http://www.core77.com/
    3.3. Crib Candy, http://www.cribcandy.com/materials
    3.4. Ecolect, http://ecolect.net/
    3.5. Hello Materials, http://hellomaterialsblog.ddc.dk/
    3.6. Inhabitat, http://www.inhabitat.com/
    3.7. Inventables, https://www.inventables.com/
    3.8. Kobakant DIY, http://www.kobakant.at/DIY/
    3.9. Materia, http://www.materia.nl/
    3.10. Material ConneXion, http://www.materialconnexion.com/
    3.11. Material Project, http://www.materialproject.org/wiki/MaterialProject
    3.12. Materialsnooze, http://materialsnooze.blogspot.com/
    3.13. SCIN, http://www.scin.co.uk/
    3.14. Style Park, http://www.stylepark.com/en/material
    3.15. Transmaterial, http://transmaterial.net/
    3.16. TreeHugger, http://www.treehugger.com/
    3.17. ULIKO, http://uliko.squarespace.com/
4. Academic collections of note
    4.1. Art Center College of Design (Pasadena, CA): Color, Materials and Trends Exploration Laboratory, http://www.artcenter.edu/cmtel/
    4.2. Auburn University (Auburn, AL): Materials Lab, http://www.lib.auburn.edu/ladc
    4.3. California College of the Arts (San Francsico, CA): Materials Library, http://libraries.cca.edu/new-materials-lib
    4.4. Columbus College of Art and Design (Columbus, OH): Materials Library, http://ccad.libguides.com/MaterialsLibrary
    4.5. Design Museum of Holon (Holon, Israel): Materials Library.
    4.6. Harvard University (Cambridge, MA): GSD Materials Collection, http://materials.gsd.harvard.edu/materials/matlaunch.htm

4.7. London Metropolitan University: Materials and Products Collection, https://metranet.londonmet.ac.uk/services/sas/library-services/commercial/materials-products.cfm
4.8. Pratt Institute (Brooklyn, NY): Center for Sustainable Design Strategies, http://csds.pratt.edu/
4.9. Rhode Island School of Design (Providence, RI): Fleet Library Material Resource Center, http://library.risd.edu/materialslibrary.html
4.10. Syracuse University (Syracuse, NY): Architecture Reading Room, http://library.syr.edu/about/locations/arr/index.php
4.11. University of the Arts London: CSM Special Collections, http://www.arts.ac.uk/study-at-ual/library-services/collections-and-archives/central-saint-martins/
4.12. University College (London, UK): Institute of Making Materials Library, http://www.instituteofmaking.org.uk/materials-library
4.13. University of Houston (Houston, TX): School of Architecture Materials Research Collaborative, http://uh.edu/archmrc/about.php
4.14. University of Michigan (Ann Arbor, MI): Materials Collection, http://www.lib.umich.edu/art-architecture-engineering-library
4.15. University of Texas (Austin, TX): School of Architecture Materials Lab, http://soa.utexas.edu/resources/matlab
4.16. University of Virginia (Charlottesville, VA): Materials Collection, https://pages.shanti.virginia.edu/Fine_Arts_Library_News/current-projects/

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