VIIa. The Project

the object *• mold making • size • materials testing • top-shape selection • the zine and polluting the fablab • adding components • reflections on being a domestic manufacturer •* ***the application*** *• revisiting the goals • initial screen designs • developing the data views • screen-by-screen • the code • reflections on being a developer*

The Object

Creating and Testing the Object

Development for the project began with manufacturing a placebo object. The current vogue for at-home fabrication — captured in Gershenfeld's *Fab*, articles with titles like "Desktop Milling Machines on the Rise," and pages of Kickstarter projects — meant a number of desktop digital manufacturing tools were available, often with beginner-friendly interfaces and tutorials.

I chose to use the Fab Lab's Othermill, a desktop CNC milling machine. Subtractive technology, unlike additive machines like 3D printers, allow us to work with a wider variety of materials, particularly non-plastic materials, since they just have to carve it, not melt and print it. Because I wanted the tactile interface to feel more human and less manufactured, I wanted the object to be made of anything other than plastic. I adapted a chocolate mold-making kit from Othermill's project section to create talisman molds. This process combined some of our newest computer-

aided technology with some of our oldest art-making processes — single mold casting.

I used the mill to carve positives of the talisman, created silicone negatives from these, and then used the silicone molds to cast final objects. The materials testing took place in my kitchen, completing the movement from factory to lab to the home. Echoing other kitchen experiences I have had, I found the baking-like tasks of mixing compounds, pouring and waiting more suited to my temperament than finer, heat driven work, like soldering.

The first mold followed the Othermill's chocolate medallion sizing and produced four talismans, each with a diameter of 2 cm. I cast these in plaster and resin. (See Figure XXX) Though I had wanted to avoid plastic, clear resin presented the possibility of being literally invested with other materials: glitter, soil, grass. Plaster and resin also presented different ways of taking and showing age and different hand-feels; the resin was smoother and less susceptible to outside forces. It also picked up finer detail than the plaster. Unfortunately, it aged worse, taking on a yellow tint rapidly and coming to seem dirty. (See Figure XXX)

Each set of talismans included four different designs on the top. Two were literal representations pulled from the icon sets I used in early design documents (see §5) and two were different shapes I thought might be pleasing to touch, one corrugated and one smooth and blobby. The icons were drawn so finely that the plaster did not pick them up. (See Figure XXX) I thought the corrugation, styled to look like water, might give more tactile interested to touching the object and the blob not enough. In fact, even the corrugation was too sharp, too like the spiky frustration objects in Isbister et al.'s SEI study. (320–21)

In terms of the “sculptural dimensions of interest” outlined in the same study:

- rounded vs. spiky (positive to negative valence),
- smooth vs. bubbly or protruding surface (low vs. high

  arousal),
- symmetrical vs. asymmetrical (calmer or more directed/

  resolved vs. confused/chaotic)

  (Isbister et al. 327)

the sharp objects, though symmetrical and perhaps calmer for being so, were high-arousal objects. Their narrow, discrete protrusions added a sense of an interrupted surface and spikiness. By contrast, only the blob, with its seemingly lower surface protrusion and its relative smoothness would be associated with lower arousal. Its asymmetric shape reflected a bit of the confusion one might feel when reaching out to the object, and thereby kept a sense of emotional reflection while also being calming. This shape was also reminiscent of the test object Isbister et al. called a *barbapapa*, which American participants associated with humor.

And so I chose plaster and the blob to move forward with into a test of a larger object. I knew eventually I would need to put electronics into the object and the small item would not be suitable. Also, the size of the initial batch made the objects easy to lose. Later, too, I found larger objects worked better as worry stones / thinking objects. The broader top gave the fingers space to play, space to draw my mind along. The blob was the only form left standing from the first test and though I had intended to

explore other related shapes, I fell in love with its look and feel; it was just right for me. It was also the one design I had drawn freehand, without adapting. As with test talismans, which I cannot throw away, even when they are broken, the more effort I put into making the thing, the more it means to me. The handmade object becomes personal.

I was not able, however, to escape fully the confines of the industrial. The sizes of the next test pieces were predicated on the sizes of precut wax available. I tested both thin and thicker options, with objects going up to 4 cm. diameters and a depth of 0.5 and 1 cm. The hefty 1 cm object became my favorite test object and I created a silicon case for it as well. (See Figures XXX–XXX) This object travelled with me all summer, to California and Colorado, and it shows its trip. Plaster, like leather, can take age and make it beautiful. It also has great “durability in the ground” as Gaimster puts it. (59) A plaster object endeavors to be around in the future and once there can communicate its intimate relationship with its previous owner.

To test the balance between creating a patina and strengthening the material for even greater durability over time, I experimented with two further materials: wood glue–plaster mixes and concrete. The former mixes were based on advice I found online for creating strong magnets. (Bechtel) These wound up too plasticky, like the resin, and were even more finicky, being liable to separate. (See Figure XXX) They also did not take on any patina.

Concrete is beautiful and does take on some signs of wear. It can be cured rough or smooth and, as I discovered in my visit to the Material Connexion library, takes glass and metal objects into its mix, opening up some of the ideas I had around resin. Sadly, in testing it did not stand up

to wear and tear in my pockets or bag. (See Figure XXX) The talisman shape did not play to the material's strengths.

The last failed test was mixing scents into plaster, to activate the olfactory recall that memory is associated with. I mixed nontraditional perfumes that I had user in an earlier project into plaster mix and let it set. The scents began as overwhelming and quickly dissipated.

A Zine of One's Own

At this point, the pleasure of engaging with maker culture on art terms became apparent — as did the lack of obvious venues for that type of engagement. Without the theoretical structure that had gotten me into the fabrication room with a weird plan already up my sleeve, the projects available to the unlearned were robots or domestic crafts: chocolate and jewelry.

The joy was, as Gershenfeld discovered, in fulfilling idiosyncratic desires. But first I had to get into the lab. And so, as a small research project, I created a zine as the first element in a speculative design for a kit that could be used to encourage some of the artsier to get in front of a desktop mill. (Figure XXX) The work uses the vernacular of feminist punk zines, which are associated most prominently with 1990s riot grrl culture, though they remained popular with indie rockers and DIY enthusiasts through the first decade of the 21st century — including a younger version of the Sarah typing this.

Though this path remains undeveloped in terms of the current project, the reception of the zine among my peers validates for me its approachability and ability to generate excitement. In informal presentations and show

and tells, everyone who has seen the zine has read and loved it. Most asked when I was making the kit. An invested object that came with a DIY talisman kit would get excited weirdoes into makerspaces at least once and add a tiny pollutant to the stream.

Taking the Object Electric

Once the external form of the object was set, it was time to take it electric. As shown in the second storyboards (see Figure 5XX), the object works as a non-screen interface to the application, which means it needs to do two things: send a signal when asked to by the human and receive a signal to alert the human from the application. It also needed to be able to be attached to a bag or pocketless skirt or dress.

I began by testing basic components in plaster to be sure they survived. These were vibrating motors and LEDs. I also embedded magnets in the test objects. These were all successful. (See Figures XXX)

To connect the components to the app, of course, I also needed a microcontroller. After researching various options, I chose the Light Blue Bean from Punchthrough. The Bean has an integrated BLE chip and an Arduino, plus a Software Development Kit for creating apps on the iPhone. It was the smallest option I could find: 4 x 2 cm with the full prototyping board, 3 x 2 cm with the extra board removed. Its biggest drawback is its price, so I tested embedding a cheaper BLE microcontroller in plaster while developing with the Bean. This too was successful. (See Figure XXX)

The final hurdle in embedding the microcontroller unit in the talisman, though, was power. Since I needed to test a version of the system for at

least a month leading up to this paper, I chose to create an object that embedded the motor and button in plaster while keeping the microcontroller free. For this, I used the Othermill to create a circuit board to hold the elements and embedded this in plaster. (See Figures XXX) This is the object that was tested with the system.

[[power issue unresovled at this time; will be filled in]]

[[final object to be described here]]

Reflections on Being a Domestic Manufacturer

The most outstanding outcome of my experience as a domestic manufacturer has been an increased interest in the materiality of the objects that populate my life, a curiosity into the circumstances of their production, and a demystification of everyday electronics.

One evening I was in the lab milling a new wax positive. This process takes a while, as the machine cuts the facing, the blob, and the pedestal in separate passes. I had also made a mistake on the maximum cutting depth setting — leaving it at the incredibly shallow default — which means I was sitting there for quite a while.

I was reading Dunne & Raby's *Speculative Everything* to pass time, flipping though the book and studying photographs of speculative industrial design projects. As I listened to the machine grind its way through the wax, I was struck by the incredibly obvious fact that everything in this book was *made*. These school projects, these speculative chairs and Herzian boxes, what did their fabrication rooms look like? Were they a kitchen, a studio, a workshop? Where did the materials come

from? How were they paid for? Did they, like the Goldsmith's team, have shops they could hire to take this block of expertise on for them? Where did these atom blocks come from and who had the expertise to fold them like this?

I knew someone made everything we have, someone is inside those factories. But in my domestic manufacture it became real.

My visit to the Material Connexion library, unfortunately, underscored the gatekeeping that still exists one step beyond the open culture of desktop machines and fabrication labs. The space is called the materials library, and it makes samples available to be browsed and inspected. (See Figs XXX) The breadth of materials available was invigorating. We could be filling our homes and recording studios with tiles of sound-dampening moss right now. Or having bacteria secrete plastic replacement from fruit juice.

But then, unlike at other libraries, the knowledge ends. The database is limited to where these materials can be purchased. The gate closes.

Instead, materials could be more like DIY electronics — a demystifying process. Time and materials go in and computers and machines go out. The motor in my phone works like these little motors I am soldering in. Circuits are circuits, and they have a history. The other elements are small and complex but I am capable of knowing them and their principles. To make is to find out.

The Application

The application is object's antipode in the investment-playback-reflection loop. (see Figure 5.XXX) The goal of the application is to facilitate stereoptic memory by creating various concordances of moments and presenting a platform for reflecting on these.

Roger Shattuck summarizes the working of depth in pursuit of understanding in *A la recherche*,

> Within the limits of the novel Proust creates a form of double consciousness, which I have examined at length as stereologic or binocular vision in time. As our two pupils, when properly functioning, form one three-dimensional image in the mind, so the experience of two related events separated and connected by the proper interval of *oubli* [that is, forgetting] forms one four-dimensional image in the consciousness — a *moment bienhereux* when it occurs fleetingly and without lasting effect on our life pattern, a self-recognition and piercing of the veil of illusion when we are able to sustain our consciousness at this level. (131)

Through repeated engagement, each of us can encounter our own topology of time and thereby our own autopoeitic self. Creating an application to facilitate this serves as an experiment into engaging with more contextual information, information that holds traces of its origin and requires its context to be fully understood.

To imagine what this would look like in terms of screens, I put together four mockups that covered the essential screens as I saw them. (see Figs XXX–XXX) These remained mostly unchanged through implementation, although the augmented view screen fell victim to scope reductions.

Screen-by-Screen

Rather than spend more time on design documents, I moved into coding the application and working out design details as I went. Though the development process was integrated and iterative, it is perhaps easiest to review the application screen-by-screen. The full architecture can be seen in Figure XXX.

Home Screen, Figure XXX

Using a gentle seafoam background, the home screen establishes the feminine aesthetic that pervades the work. The combination of a geometric sans serif and serif letter in the Oublié/trouvé logo honors the modern and Victorian ideas that underlie the project. In inner screens, the monospace-inspired typeface brings in an aestheticized-tech feel.

This screen is essentially as it was in the first screen designs; however, tapping the main logo does not bring up the save moment form — only the main form button does so. This is to deemphasize the application as a quick moment-saving interface; that is the role of the object. At the same time, the Record Form button remains available on every page, should I be inspired while using the app.

Record Moment Form, Figure XXX

The form auto-populates the title with the date and time. In testing, I rarely used the app to save a moment. This is a victory for the value of a tactile interface, though it did cause problems with annotating moments.

Bean Screen, Figure XXX

Accessed from the button to the left of the Record Form button on the home screen, the Bean screen provides administrative functions for the object, including the ability to test the motor buzz.

All Moments List, Figure XXX

Moment Details, Figure XXX

The list of all saved moments allows me to access each moment without going through a concordance group. They are arranged chronologically.

The moment screen itself presents the smallest information view available in the system. It contains the moment's title, its data representation, and any notes I have added.

Figure XXX shows a moment captured via the object and left unannotated. I have forgotten what some of these moments represent, and therefore why they were saved. In an informal critique, one viewer suggested using voice notes in the object to send data to the application without typing.

Another interpretation of this event is to consider it evidence of a moment that just didn't make it over the threshold; it is a type of false positive that did not rise to the requirement for sustained intellectual effort that Shattuck identified as necessary for veil-piercing recognition.

It may be the detritus of an effort to develop a habit, to make the system into a friend. When testing, especially early on, I struggled to remember to take the object with me; I was afraid of breaking it; I forgot to charge its

batteries. Then time turned work into care, the object was a pet. The same may happen with moments themselves over a longer testing period.

Figures XXX–XXX show the moments that were originally captured in the paper test. The group's data representations give an idea of what kinds of similarities and variations are produced by moments collected in one location at one time of year. These are as I hoped.

However, the interaction with them is still lacking. I sometimes found myself wanting to — in a calm moment — browse the series of moments. In this mode, toggling back and forth from the moment to the list becomes disruptive and interferes with the ability to consider moments in relation to one another. One of the first post-presentation upgrades will be to make it possible to swipe from moment-to-moment directly. As a designer and developer, I made the mistake of allowing the hierarchy of the data to interfere with the rhizomatic experience I sought.

Concordance List, Figure XXX

Concordance Image, Figure XXX

Concordance Moments, Figure XXX

Of course, it is the concordance creation and view that gives the application its idiosyncratic character. Concordances are formed by matching a complex of metadata among moments. This may include the weather, the distance from home, or the elevation associated with the moment.

The images are meant to be objects of meditation, a focal point when considering the grouped moments, which are accessed from a list similar to all moments list. The list-detail relationship in this section suffers from the same flaw as above.

The list makes available all concordances, without naming them. In the first round of tests, the concordances were simple groups, based on a single type of data, like temperature. Knowing the grouping principle made it difficult to engage with the grouping as a topography deserving exploration and consideration, so for the second half of testing, when the complex concordances were generated, I removed the group names.

When a concordance is detected and the object is notified, the application opens to the related concordance image. When this occurred during testing — and the timing was right, which to say, I wasn't distracted or cranky — it was exciting to discover the associated image and representative moments. One unseasonably warm October day gave me my best set of memories, a set of nostalgic intensities around dry warmth that I have experienced before but still am working to understand. It begins in the type of childhood memories that are only identified by a location and fleeting images — the YMCA, dry leaves, a wild rabbit — and then layers on days until I have an image of myself as a child of the West, just as surely as I am when I read Joan Didion. While I cannot claim a complete recognition, the system is capable of delivering concordances that are worth considering repeatedly, each time clarifying the reality at the core of this selection.

Developing the Data Views

The data views are not just objects of meditation or spurs to investigation. They exist to give depth to the text and the moments as a whole, providing context aesthetically instead of explicitly.

In developing the approach to information, I drew on Gaver et al.'s concept of *ambiguity of information*. He argues for ambiguity as a tool in human–computer interaction that is counter to traditional, cybernetic-descended interactional design, but valuable for its expressive, rich qualities.

> Ambiguity can be frustrating, to be sure. But it can also be intriguing, mysterious, and delightful. By impelling people to interpret situations for themselves, it encourages them to start grappling conceptually with systems and their contexts, and thus to establish deeper and more personal relations with the meanings offered by those systems.
>
> The ability for ambiguity to evoke personal relationships with technologies is particularly relevant as digital technologies are designed to support activities outside of work. Traditional concerns for clarity and precision are superseded in such systems by the need to provide rich resources for experience that can be appropriated by users. (233)

They identify three types of ambiguity: ambiguity of information, ambiguity of context, and ambiguity of relationship. The first, which we are concerned with, pertains to ambiguities that arise based on how information is presented. The simplest example given is the Mona Lisa's smile: what does it mean? There is no way to actually know. Or a GPS system may not have resolution to the level that the screen can display it.

The information is ambiguous. This is the type of ambiguity that data visualization normally works against.

Gaver et al. give suggestions for enhancing ambiguity of information. “These focus on creating or reflecting uncertainties about information that are in some way significant,” they write. “The purpose may be merely to make the system seem mysterious and thus attractive, but more importantly it can also compel people to join in the work of making sense of a system and its context.”

> Use imprecise representations to emphasise uncertainty. …
>
> Over-interpret data to encourage speculation. …
>
> Expose inconsistencies to create a space of interpretation. …
>
> Cast doubt on sources to provoke independent assessment. … (237–38)

For the data view in this application, I chose the first tactic.

> Imprecise displays such as these are often described as ‘ambient’, but they are ambiguous as well. This ambiguity, we believe, is crucial for understanding their appeal: they may be perceptually undemanding, but they require users to fill in the gaps in information that is purposefully imprecise. (238)

I decided to create concordance representations that were driven by the metadata on which the concordance was based but which were unable to be read directly. This way different groupings would *feel* different but

would not lose their magic. For moments, the goal would be the same, and it was important they be recognizable as a group.

Various treatment explorations can be found in Figures XXX–XXX. Based on feedback from a number of design friends that the organic bean moments were more legible as data, I chose the big texture treatment for moments, since my goal was to obscure. For the concordances, the hardest choice was between the wash effects and the big texture effects. The washes are far more ambient feeling and undemanding, but I chose the big texture to keep a tighter relationship between the moments and their groupings.

Code & Reflections on the Developer Role

To evaluate the success of this approach to personal information and to maximize possibility polluting potential, it was important Oublié/trouvé be a working application and not simply a design prototype.

The iPhone app was built using React Native. This allowed me to code primarily in Javascript, though I did have to write bridging code in Swift and Objective C. The data is stored on the phone only — not in a remote database. This is to keep the information private. Likewise, actual locations are never stored; only the distance from home, which has my home location hardcoded.

The code for the project is available on Github. Figure XXX shows a diagram of the system.

Although most of the development straightforward, trying to work ambiguity into a system predicated on a total lack of it definitely felt as

though I was working against the grain. In order to keep from generating too many concordances or from generating them too consistently, for instance, the code uses two different randomizers: one to select whether to look at all and another that generates possibly concordances from raw categories without filtering for populated categories first. While the code for this is not difficult, I did wish for an ambiguous data type or event.

More generally, as I was a kitchen-table hardware manufacturer, so I was for software. In both cases, the experience of small-scale making was one of integration and pride. I made the thing and I made it exactly how I wanted. I was powerful and brought change to bear on the world.

The biggest disjunction between the roles was the experience of time and iteration. In hardware development, time refuses to be malleable; there is no collapse, no annihilation, no bricolage or juxtaposition, just long, grinding unified time. You wait the time it takes to grind away at a block of wax and when you make a mistake, you must wait to start again. Software can be tweaked quickly and the change is effected instantly.

Despite the improvisatory freedom, though, the role of developer is a site of anxiety. The process of writing code and testing it can can feel like supplication to a compiler, even if you are equipped with unending offerings, a new one every second. A culture of presumed expertise and unfriendly documentation often left me feeling fretful when working. Like most developers, I did sometimes lose track of time when coding. The creation experience of software — worry and absorption — brackets the intense but open self creation experience that the application provides for.