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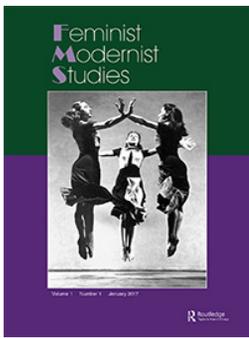Follow this and additional works at: https://digitalcommons.odu.edu/english_fac_pubs

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Prototyping Mina Loy's alphabet

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ABSTRACT

An important branch of digital humanities involves prototyping the past. This entails approaching material forms of knowledge as sites within which epistemological and ontological problems may be evaluated as physical embodied practices. This essay discusses the interpretive and methodological implications of using 3D printing technologies to prototype the archival diagrams of a proposed but never constructed plastic segmental alphabet letter kit – a game designed by Mina Loy for F.A.O. Schwarz. Although it is intended as a toy for young children, "The Alphabet that Builds Itself," is also a work of object typography which articulates a theory of language as kinetic, geometric, recombinant, and open to mutation. Alphabetic segments extend into the x, y, and z coordinates in exponential iterations and conjoin according to polarities established with magnets. Combining elements of contemporaneous typefaces derived from Bauhaus principles of simplicity and the liberatory Futurist typographic fantasy of pure graphemes – free of history – these recombinant three-dimensional letters realize Loy's unpublished modernist poem; an articulation of language as a physical substance which infers its own morphology.

In August 1940, Mina Loy submitted a design for an alphabet game to F.A.O. Schwarz. Her package included an introductory letter, a hand-painted scripted dialogue demonstrating play between a young child and an older sibling or parent, diagrams of two letter sets of the game – one for "Build Your Own Alphabet" and another for "The Alphabet that Builds Itself" – and a prototype letter "B" from the third version "An Alphabet Toy" / "Jack in the Box Alphabet."[1] Evidently, the toy company did not take an interest, as there is no further correspondence, nor did her game move from an initial proposal into manufacture. The Alphabet Game, in its three iterations, has remained as diagram, an as-yet-unrealized-modernist artifact.

An important branch of digital humanities involves prototyping the past using digital and analog components. This entails engaging with material forms of knowledge in order to explore how epistemological and ontological problems have been worked through in physical embodied practices. By engaging the object of critique through the methods and materials of the object itself, which is to say, by prototyping the alphabet letters of "The Alphabet that Builds Itself" using 3D printing technology, this essay proposes that these three games, especially the second iteration of the game, "The Alphabet that

Builds Itself," which consists of segmental plastic letters, represents Loy's articulation of a theory of language as kinetic, geometric, recombinant, and open to mutation. The letters resemble, in their simple sans serif, angular geometric form, Bauhaus-inspired democratic ideals about simplicity and function. In addition, the segmental portions of each alphabetic letter articulate a liberatory futurist typographic fantasy of pure graphemes – free of history. These recombinant three-dimensional letters instantiate Loy's unpublished modernist poem, an articulation of language as a physical substance which infers its own morphology.

The Alphabet Game is catalogued at the Beinecke Rare Book and Manuscript Library with Loy's designs and inventions.[2] It is within this context primarily that it has been discussed. Yet even discussions that center on its place in her commercial ventures assert, as Susan Gilmore argues, the importance of these letters as an extension of Loy's "radical feminist poetics."[3] Notably, Loy used substance in all her signifying practices. The mobility of her invention across categories – as game and toy, as expression of her poetics, and as money-making venture – which is to say from two-dimensional letters as signifiers, to dimensional plastic letters, to money – the most abstract of all signifiers – points to the complex ways in which Loy engages physical substance as semantic material.

Loy used the words "game" and "toy" interchangeably in explaining "The Alphabet Game," indicating the relationship between the first game "Build Your Own Alphabet," which offers a prescriptive – literally scripted – set of directives for play, and the second game, "The Alphabet that Builds Itself." The second game is presented as a toy – an object ungoverned by explicit rules and meant to be engaged through inductive, even intuitive, experiment. Indeed, there is no script for play for the second game. In lieu of a script, a detailed diagram specifies the segmentation of each letter. Whereas games have rules, incentives, and ways of measuring success and failure, a toy, with no explicit ruleset, is an object that invites play through acts of full creativity. The second game's nature as "toy," without didactic direction, contains what Roland Barthes praises in woodblock toys, that which enables a child to be a creator, not a user: to make rather than simply to play at imitation.[4] The activity of play sets the pieces in dynamic flux as letters form themselves into familiar icons as well as newly invented shapes, making play an act of writing that is part imitation and part invention. This toy is a poem, writing itself through play, and, as a poem, it is also a toy, playfully signaling the malleability of its most basic signifying elements.

To read this poem/toy as a complex theory of language requires familiarity with Loy's poetics. Of course, Loy's remarks about poetic language are distributed in allusive ways across her oeuvre. However, one of Loy's most sustained discussions of poetic language is expressed in a letter to Ford Madox Ford which ran in *The Transatlantic Review* (1924).[5] In this letter, Loy praises the *belle matière* Stein achieves in "Galeries Lafayette." Describing the "intervaried" recombinations of Stein's language, Loy declares that Stein "achiev[es] in words what Picasso has done with form."[6] One cannot help but hear Loy's approving analysis of Stein as an articulation of much of Loy's own philosophy of language. Loy emphasizes the materiality of Stein's words by comparing it to the "modelling of early Egyptian sculpture"[7] as well as to "polished stone" which is yet "not of polished surface" but of "polished nucleus."[8] The slippage between the analogies to both mineral and to living organic matter reflects Loy's working through of two competing ideas of language – one as physical fossil and another as living, organic, fluctuating, and

developmental in nature. Loy sees language, not simply as a repository of the past, but as "verbal construction like animated sculpture" which abounds with possibilities for invention.[9] In her poem "Gertrude Stein," she compares Stein to Madame Curie's experiments with radium, describing her language experiments as "crush[ing] / the tonnage / of consciousness" to "extract / a radium of the word" – which belies a sense of energy pent up in language which, when pushed syntactically to a semantic edge, exposes language as material ordered on the page.[10]

Loy's toy-poem has affinities with Stein's interest in language's materiality and Poundian ideas about the sculptural properties of language, but unlike their philosophies of language, Loy's philosophy realizes its meaning in the solid opacity of physical individual letters. In this way, her letters reflect her futurist period and her exposure to Bauhaus typography. Marinetti advocated "words in freedom," which is to say words released from the burden of history.[11] Marinetti's *Zum Taum Taum* offered visual arrangements of words unmoored from the regimented linearity of the page; and in his preponderant use of onomatopoeia, emphasized the pre-semantic elements of language. As Carolyn Burke elaborates, during Loy's Berlin period (1921–23) Loy was at the center of exciting cultural shifts, including the activities of German expatriates associated with the Bauhaus. In apposition to the Futurist conceit of words in freedom, Bauhaus artist Herbert Bayer (who would marry Mina Loy's daughter Joella in 1944) was engaged in creating a typeface that carried the democratic political spirit and social philosophy of the Weimar Republic. Typography experiments such as Universal, a fully lower-case sans serif font, and Futura, another sans serif font associated with the Bauhaus, expressed the modern condition by emphasizing that form follows function. From Futurism and Bauhaus, Loy would have adduced that typeface is semantic, which is to say, typeface is part of the form or meaning-making functions that constitute a poem. Her request to Carl Van Vechten for "a large round in the middle of the blank reverse of each page" for the printing of "Songs to Joannes" and her typographic experiments in "Aphorisms on Futurism" and "The Feminist Manifesto" offer evidence of her sophisticated use of typography and layout.[12] "Aphorisms" and "Feminist Manifesto" represent important 2D precursors to the typographic object "The Alphabet that Builds Itself."

Marketplace creativity

DH advocates critical making as a scholarly practice – an assertion that recognizes the cultural artifact as embedded in complex systems of labor, exchange, and waste.[13] Regarding her inventions in this light, Loy's consistent engagement with physical substances as semantic material is ever more comprehensible. Of course, modernism has always been perceived as a complex entanglement between radical experimentation, mass culture, and the commercial marketplace.[14] In this regard, Loy was a quintessential modernist. Loy wrote poetry, painted, built assemblages, and created designs for fabrics, games, dolls that cried, clothing, and household implements. Loy was an inventor by disposition, but also by economic necessity. After her family allowances dwindled, much of Loy's psychic life was preoccupied with the seemingly intractable problem of raising money to support herself and her children. In a 3 July 1923 letter to Mabel Dodge Luhan, Loy confesses, "Wasted the summer on a scheme to invest in a cider business."[15] In another letter to Dodge, Loy speaks plainly: "I have only one idea in my mind make money I

can turn my hand to anything that comes along I do it quickly."[16] In 1936, fleeing the rise of fascism, Loy, returned to New York City for the third time. Strained by the necessarily hasty liquidation of her possessions in Paris, and newly motivated to break into the commercial market, she created a series of designs for objects. Loy's 3D projects – which included hats, plastic lampshades, domestic tools, Christmas lighting, posture-correcting corsets, perfume bottles, and tchotchkes, were money-making ventures. These endeavors were, as Jessica Burstein has discussed, complex expressions of Loy's never-full-embrace of the mass-market commodity. For Loy, creative design, invention, poetry, and painting were objects of handcraft; yet she was "perennially aware of the economy supporting [these] enterprise[s]."[17]

Like the inventions, these poems engage physical substance as semantic material. After a writing hiatus, the early 1940s represented a productive period of designs and inventions and marked Loy's return to writing and publishing poetry – indicating that her inventions, art, and poetry belong to the same creative wellspring. Poems of this period register her New York surroundings, incorporating the flux of midtown Manhattan and the shabby beauty of the Bowery. During the Second World War pressures on textile production, particularly parachute supplies, led in 1937 to the introduction of nylon as a substitute for silk. "Mass Production on 42nd Street" (1942) marvels at the spectacle of masses of garment workers, with legs like "rosy scissors," clad (likely) in synthetic hosiery, make their way to work.[18] The influx of imitation materials explicitly surfaces in Loy's "Chiffon Velours" (1944). The final arresting image is of an old woman's skirt made of cotton, which serves as a cypher for a mixture of immaterial lost relationships (a department store has replaced a corner-store) and the physical grit of the modern world, beautiful, and diminished – – "a yard of chiffon velours."[19] The form of the poem contours the flocculent composition of old and new.

Plastic

Loy's poems register New York as a sensuous place of synthetic, industrial, and social change. So too, Loy's inventions of the 1940s play with the properties of new synthetic substances. For instance, a 1941 design pitches a valentine that puns on the figurative expression "My heart beats for you" by connecting a placard to a spring to be mounted on a "cheap watch."[20] These designs are made possible by newly available materials. As early as 1927 Loy had been experimenting with Crystal Lux, a cellophane material, and using Rhodoid for ornamental flowers which she sold to, among others, Macy's and Wannamaker's.[21] A 1940s design diagram for a Christmas light involves rods made of Lucite, an acrylic glass-like plastic, which Loy specified would be painted with a frost-like finish.[22] The deliberate choice of Lucite, a plastic material, is indicated by the notes she makes in the margins of the diagram – copying the address of two possible suppliers, Dreamlive Plastic Company at 175 Prince Street and Majestic Inc at 445 W32 LA 45106.

Plastic represented an important meaning-making material for Loy and she devised her own recipe for a substance made partially of plastic, for which she proposed the name Chatoyant.[23] In manufacture, plastic refers to a wide class of polymers that in Loy's era had only recently been consolidated under this single term. Naming conventions for these new substances followed three protocols: a substance might be given a name

referring to the polymers from which it is composed, a name indicating what it replaced, or finally, a name describing the substance's aesthetic effect. Preferring the latter option, she introduces "Chatoyant" and cites the Webster's definition: "changeable lustre or colour like that of a changeable silk or cat's-eye in the dark".[24] The diagram, which adopts the style of definitional elaboration, includes a sample of the substance, captioned "wax and foil-paper," stuck to the top left corner of the page and an explanation of the substance as "a new structural combination of materials for use in the manufacture of commercial objects. Explaining that Chatoyant is made of "varicoloured or natural coloured metal, metal foil or foil paper combined with transparent plastics or glass, white or coloured," Loy demonstrates her knowledge of contemporary manufacture processes by further specifying that the fusion of these substances is to be rendered by "electrical process, moulding [sic], pressure, heating surface fusion or cementation or any suitable process."[25] Her enthusiasm for innovations surfaces in a letter to her son-in-law Julien in which she praises Henry Ford, who had at one point hoped to create a fully plastic car – – the plastic to be manufactured from soybeans (Figure 1).[26]

For Loy, substance is semantic. In her 2D and 3D projects of the 1940s, Loy demonstrates an interest in the relationship of matter and material to content and meaning. Not only was Loy attempting to create a mixed substance out of metal, plastic, and glass (Chatoyant), but in addition to this shimmering hybrid plastic, she was also experimenting with the implementation of Lucite, a polymer substance, for her Christmas light project. For The Alphabet Game, she turned yet again to plastic as a signifying material. Notably, she proposed "inexpensive plastic" and "brightly lacquered cardboard" (lacquer is a mixture of plastic and oil).[27] In a meditation on plastics, Barthes describes plastic as nature transmuted: "it is no longer the Idea, the pure Substance to be regained or imitated: an artificial Matter"; plastic is going "to determine the very invention of forms."[28] Loy's game demonstrates that her experiments with poetic form extended to the very matter out of which form is made.

With the letter kit, Loy's experiments in poetry, a plastic art, become experiments with matter. Aesthetic theory from Pater to Coleridge to Schiller to Hegel variously deploys "plastic" as a modifier for "art" to indicate that art is the manipulation of material to create form. In 1903 the United States Patent Office borrowed from aesthetic theory to create "plastic" as a classification for a particular kind of manufacturing process using compression to create "articles of definite shape."[29] The first iterations of plastic were meant to imitate more expensive materials like ivory, tortoiseshell, and shellac. By the 1930s the early versions of plastics which included pressed cord and leather (and Loy's amalgamation) had been superceded by chemically manufactured substances like phenolic (Bakelite), cellulose acetate, acrylic, polymethyl methacrylate, polystyrene, and urea formaldehyde. Each of these substances possessed remarkably different properties. In 1939, near the year Loy devised "Chatoyant," the journal *Plastic Molding* published a "Directory of Trade Names," a list that included 250 differently named substances.[30] Out of all these many polymers, only a few like nylon and vinyl gained recognized names in their own right. But a wide array of these materials was showcased at the New York World's Fair in 1939. Importantly, common household tools and ornaments – even children's toys, began to be made of polystyrene.

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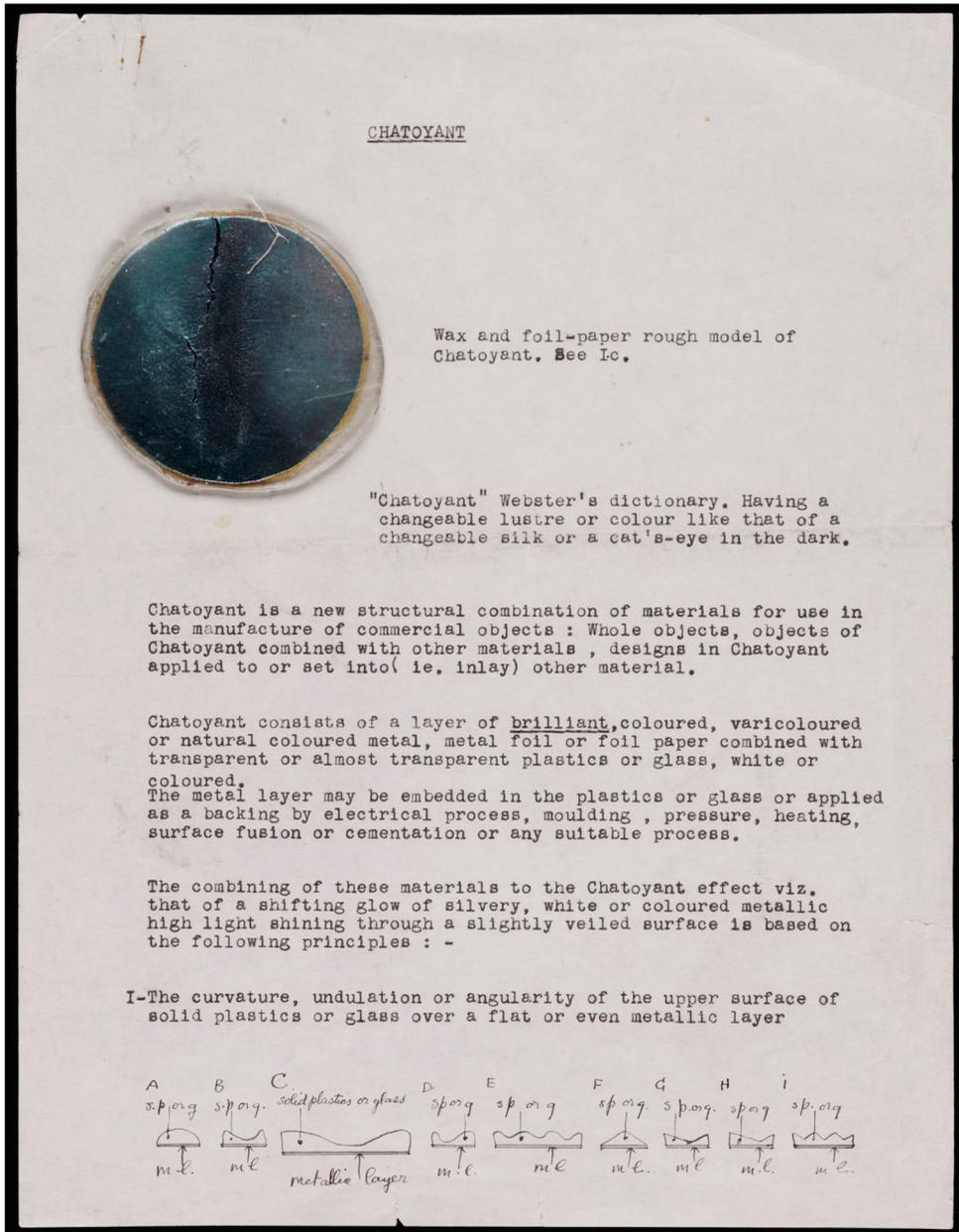Beinecke Rare Book and Manuscript Library

CHATOYANT

Wax and foil-paper rough model of
Chatoyant. See Ic.

"Chatoyant" Webster's dictionary. Having a
changeable lustre or colour like that of a
changeable silk or a cat's-eye in the dark.

Chatoyant is a new structural combination of materials for use in
the manufacture of commercial objects : Whole objects, objects of
Chatoyant combined with other materials , designs in Chatoyant
applied to or set into(ie. inlay) other material.

Chatoyant consists of a layer of brilliant,coloured, varicoloured
or natural coloured metal, metal foil or foil paper combined with
transparent or almost transparent plastics or glass, white or
coloured.
The metal layer may be embedded in the plastics or glass or applied
as a backing by electrical process, moulding , pressure, heating,
surface fusion or cementation or any suitable process.

The combining of these materials to the Chatoyant effect viz.
that of a shifting glow of silvery, white or coloured metallic
high light shining through a slightly veiled surface is based on
the following principles : -

I-The curvature, undulation or angularity of the upper surface of
solid plastics or glass over a flat or even metallic layer

p. [1]

Figure 1. "Chatoyant" Diagrams, letters, Box 7 Folder, 186. YCAL MSS 6. Beinecke Rare Book and Manuscript Library. Permission to reproduce this image granted by Roger Conover, Mina Loy's editor and literary executor.

Around 1939, F.A.O. Schwarz manufactured its first plastic toys. A December 1940 article in *Fortune* explains that "Altogether [Stroebel] buys from 750 different "manufacturers," some of them one-man or one-woman enterprises."[31] There is no evidence that

Charles Stroebel, CEO of F.A.O. Schwarz, responded to Loy. Yet, it was a perfectly reasonable plan on Loy's part to pitch the letters project to the company. In the early 1940s, the boundaries between amateurs and corporations were somewhat fluid. The *Fortune* article adds that

> Schwarz scored a notable victory this year when it added to its list the magnetic doll, invented by Mrs. Alice Crawford of New York, who put a small magnet into a doll's palm, thus causing metal-bound objects, such as a bouquet of paper flowers, to stick to the hand. The doll manufacturers rejected the innovation. Mr. Stroebel approved of it, and the store's production department perfected the device so that the magnet is now imbedded in the doll's palm and is nicely painted over.

This doll sounds eerily similar to a cry baby doll that Loy had also envisioned sometime in 1939 or 1940.[32] That Loy made duplicates for herself of her diagrams and explanatory letter before sending them to the toy company reflects her well-founded anxiety about intellectual property theft.

To protect her inventions, Loy made a practice of mailing copies of her invention schematics to herself through registered mail and sometimes sought out a notary public to date stamp her diagrams and descriptions.[33] In her August 7th diary entry, Loy mentions a "cellophane package of letter-parts was included in Schwarz's package but not in this one" presumably because the labor of making the letters was considerable.[34] They are presumed to have been sent to the company and likely discarded. As Judith Brown has discussed, the use of cellophane in the dramatizations of Stein's *Four Saints in Three Acts* connoted the "slickly modern" to audiences.[35] Material selection is a deliberate meaning-making act. Cellophane was associated with glamour, and, as a thin moisture-proof layer, it offered the additional benefit of protecting the alphabet letters while they traveled through the post. Fittingly enough, the industrial designer Paul Frankl exclaimed that industrial plastics heralded "a new language of industrial design," a "new idiom," and a "new alphabet."[36] This emphasis upon signifier and signified, words and matter, complements the careful appellations that Loy devised for her inventions.

Loy's missive to Charles Stroebl of F.A.O. Schwarz is comprehensive and formal – involving typescript, diagrams, and painted embellishments. The tone of the letter is formal, "Dear Sir," suggesting no prior correspondence or familiarity:

> I am submitting to you the rough drafts of the two Alphabet games in case they might interest you. They consist of two variations of the same theme. No 1: A box containing, in separate compartments the different pieces with which to form letters, and a board having slightly raised ridges at intervals to hold the letters in line.

> This educational game is titled:

BUILD YOUR OWN ALPHABET

> The pieces of letters [sic] to be put together should be manufactured of attractive inexpensive plastics, or brightly lacquered cardboard. These are laid on the board of a contrasting colour during the process of Alphabet Construction.
> This method of constructing the ABC grips the child's interest, and the rapidity with which he learns his letters is surprising. It stimulates his observation of form, construction and similarities. He enjoys it as a good game.

Attached to this letter is a description of how the alphabet is put together, to give an idea of how the "teacher" or elder playfellow present the letter-building to the little one. It may at first glance appear repetitive and over abundant in detail, but it is this repetition and detail that, I found in my own experience, fixes the letters so easily and firmly in the budding mentality.

A child's attention wanders if each letter is introduced with the same preamble. The occasional "jolt" of "Now let us make a magic and turn – into –" has proved to be most inspiring.

Also attached please find explanations of a second game. Also a third: an Alphabet Toy
Believe as Yours
most truly
Mina Lloyd
Under separate cover I send herewith: rough MODEL of Alphabet Toy
 (signed Mina Lloyd)

Figure 2 is an image of the first game which Loy envisioned as a set of two-dimensional squares with a fixed set of simple curved and straight pieces, constructed of lacquered cardboard.
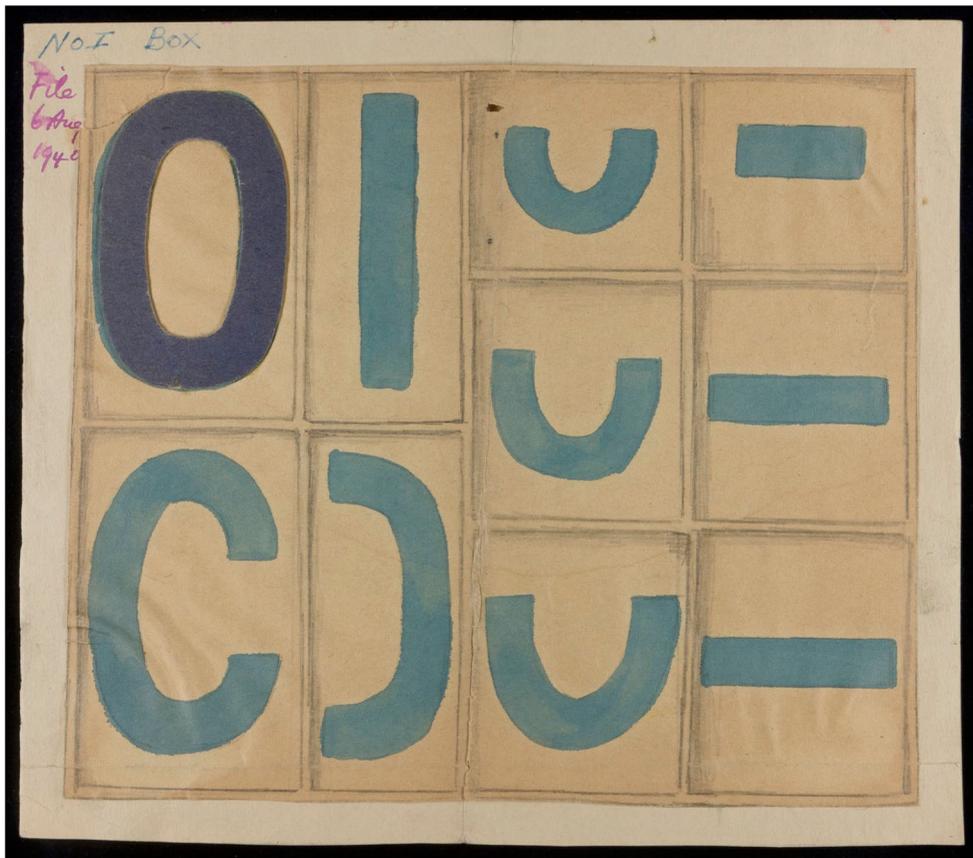

Figure 2. "Build Your Own Alphabet" Paint on paper. "Alphabet, No I" Diagrams, letters, Box 7 Folder, 186. YCAL MSS 6. Beinecke Rare Book and Manuscript Library. Permission to reproduce this image granted by Roger Conover, Mina Loy's editor and literary executor.

Loy here describes the second game (Figure 3):

This second game is on the same principle as the first with the difference that the letters' parts are made of thick upstanding blocks.
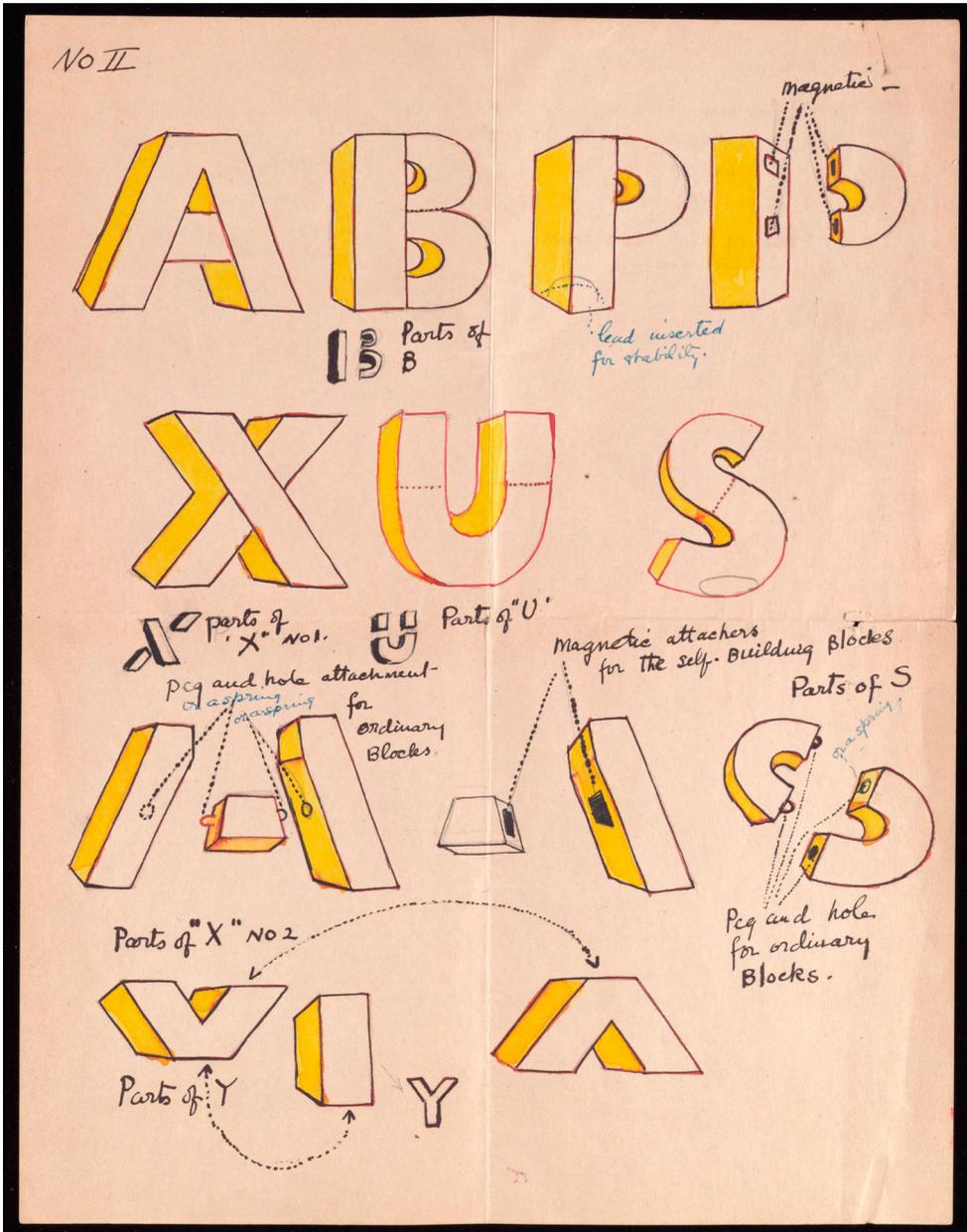
It is titled: -

Figure 3. "The Alphabet That Builds Itself." "Alphabet, No II" Diagrams, letters, Box 7 Folder, 186. YCAL MSS 6. Beinecke Rare Book and Manuscript Library. Permission to reproduce this image granted by Roger Conover, Mina Loy's editor and literary executor.

THE ALPHABET THAT BUILDS ITSELF

> The surfaces of the sides that meet, (that is, sides of the blocks,) in the formation of the letters, have small pieces of magnetic metal fitted into them. Consequently when the child is about to bring the block "parts" together the magnetic pull causes them to spring together, which highly delighted the small student.

> NB. Should magnetic connectors be too expensive the few "parts" which cannot be supported by the mere building of the blocks, viz : SUCH AS OCCUR IN E F H K P (R- perhaps (indistinguishable letter) S and Z, can be held in place with small protuberances (pegs) fitting into holes. Or with some sort of spring. Should such letters over-balance, small pieces of lead must be inserted into the base or upright block in the letter.

> Enclosed please find rough draft of six letters showing both magnetic and peg and spring connectors; also lead inserted for stability. (written in hand--- Also bag of letter-parts.)

> The six letters show both magnet, peg, and spring connectors.

Diagrams as models for inquiry

Loy refers to these drawings as "rough drafts" to indicate their provisional quality and their ontological secondariness to an as-yet-unmanufactured object. As drawings of figures which emphasize geometrical relations between parts, these "rough drafts" qualify as diagrams. A diagram is a type of model that describes through pictorial and figural means relations between objects. Although the diagram has been of marginal importance to literary criticism, as humanistic inquiry increasingly incorporates computational approaches, a once strictly text-based analytic method is able to include more play-filled, i.e. speculative or inferential forms of investigation. These enable Loy's design/invention diagrams to be seen both as co-extensive with her other creative compositions and to be studied on their own terms.

The diagram's unfashioned state can be transformed through critical making/prototyping into a more lisible object. What value is a prototype – why model what was sketched in a diagram? As Margaret Morrison and Mary Morgan write, "models may be physical objects, mathematical structures, diagrams, computer programmes or whatever, but they all act as a form of instrument for investigating the world, our theories, or even other models."[37] Models are tools, specifically, instruments which "represent either some aspect of the world, or some aspect of our theories about the world, or both at once."[38] Morrison and Morgan counsel that "we do not learn much from looking at a model – we learn more from building the model and from manipulating it."[39] Therefore, prototyping or modeling is an inherently speculative exploratory practice. Along these lines, McCarty distinguishes between mimetic and proleptic modeling. A mimetic model describes what already exists, but a proleptic model represents a prototype for something that has not yet been created or that which has yet to happen. McCarty points out that "a model is by nature a simplified and therefore fictional or idealized representation, often taking quite a rough-and-ready form: hence the term "tinker toy" model from physics, accurately suggesting play, relative crudity, and heuristic purpose."[40] A model is inherently playful. It offers a plenitude of play or malleability and exploration through nonconsequential tests. Indeed, in physics, a tool that enables play is called a "toy." In this way the use-value of a toy goes beyond the stage of childhood – indeed, it is a necessary element in heuristic i.e. meaning-making processes.

On the one hand, DH concepts of modeling have their roots in economics and science. On the other hand, imaginative writing, be it poetry or fiction, is already a form of modeling possible worlds, outcomes, and dimensions. The visual or physical model, as a borrowed form of knowledge production, expands or rather clarifies that the material of humanistic inquiry is dimension data. Jentery Sayers has called on humanities practitioners to "remake technologies that no longer function, no longer exist, or may have only existed as fictions, illustrations, or one-offs."[41] So too, as an alternative to digital humanities' predilection for text mining, Devon Elliot, Robert MacDougall, and William Turkel have encouraged the field of digital humanities more generally to use computer software to explore "matter as a new medium for historical research."[42] In this spirit, I have conducted an analysis of "The Alphabet That Builds Itself" through 3D fabrication and what follows is a discussion of the meanings that emerge from this process. I agree with Sayers that "prototyping the past is deeply intertwined with hermeneutics and close reading."[43] Just as we teach students to close read a sonnet by assigning them to write one of their own, the process of transforming the diagrams into physical material objects requires working through, as Loy did herself, the geometries of possibility.

Methods of prototyping

3D printing is a multi-dimensional version of the traditional two-dimensional printing press or more recent vector-raster based desktop printing. Predominantly, typeface is conceptualized as a two-dimensional form – at least its output or object is discussed in this way. But typefaces have always been three dimensional and the printed page is, though subtly so, a three-dimensional object as well. Before our current era of offset printing and digital fonts, moveable type was the main technology of printing. In this method, letters are assembled on a composing stick then arranged on the print bed with various leading and spacers. Lead or wood type, composed of varying sizes, are molded to a standard .918 inches in height (called "type high") so that the press's roller can evenly distribute pressure and ink to paper as the roller makes contact with the set type. Pressure, ink, and rollers do the rest.

CNC (computer numeric control) printing machines work according to either a logic of subtraction or addition. In the former, the process is analogous to sculpting from rock. Redolent of Ralph Waldo Emerson's description of language as "fossil poetry," "made up of images," like limestone, which "consists of infinite masses of the shells of animalcules," the subtraction modeling process cuts into material to create an outline, mold or imprint of an object that can, in turn, be produced through injection molding.[44] By contrast, 3D printing works according to a logic of addition and accumulation. Using hot filament, often liquified plastic, the printer produces by building layers. The head of the printer moves along a vertical axis and the base moves horizontally, left to right. I have used a light polymer printer that prints with 1.75 mm PLA, a cornstarch-based plastic. I chose this filament type as it would be most like the semi-organic cheap plastics available at the time. PLA is rated food grade, so it is suitable for children's toys. I created the letters by drawing them as models in Sketchup. Next, I converted these files to stl (stereolithography) format. Whereas lithography is a technology of printing that literally means stone (litho) writing (graphy) in which a printer etches into stone or metal, stereolithography,

with a nod to its historical antecedent, writes with UV rays, using light to activate the transformation of molecules into polymers. The stl format describes surface geometry and prints a Cartesian text composed in three coordinates – x, y, and z.[45] "The Alphabet that Builds Itself" is an instantiation of Loy's idea that language unfolds over the x, y, and z axes. The "Alpha and Omega / of Form" which Loy imagines fused together in Brancusi's sculpture, describes this molecular sculpting process.[46] Loy's emphasis on the fusion of Greek letters to make meaning implies for her own letters an almost Saussarian emphasis on syntagmatic and diachronic or x and y coordinates exploding into the z coordinate: "The absolute act / an art / conformed / to continent sculpture."[47]

Loy's term "rough-draft" also works to define the toy's status as a textual object. In this between status as a model for a toy and as a model for a three-dimensional poem "The Alphabet that Builds Itself" proposes itself as an object that is play-filled, typographic, and speculative. Loy has drawn six capital letters distributed on the page in a grid. The restriction of the typeface to capitals creates a uniform visual rhythm and reduces hierarchies of reading that are produced by the use of upper and lower-case letters. In a combination of red, yellow, blue, and black ink on butcher block paper, Loy has selected two vowels and four consonants, though she has also included a much smaller "Y" in the bottom left. As one reads left to right, and top to bottom, along the page, the six letters become less solidly fixed. The "A" and "B" are intact and complete, though their composition as separable parts is made visible by dotted lines. However, the third letter in the row, the "P," is mirrored by a second figure of itself that detaches into two pieces linked by magnets. The "X," "U," and "S" are depicted simultaneously as complete assemblages as well as exploded letters. In much smaller size and weight – and drawn with black pen – the figures of B, X, and U are illustrated as unconnected segmental parts, as if poised for assembly. Lines of connection, indicated with dotted lines, demonstrate magnetic attraction and interpenetrating dowels and bored holes demonstrate points of insertion. The diagram "The Alphabet that Builds Itself" operates on a two-dimensional plane, yet these dotted lines and segmentation marks imply movement, a "kinaesthetics of action."[48]

The segmentation of the letters draws attention to specific typographic characteristics that indicate Loy's ideas about language and meaning. Unlike the simplicity of the straight lines and arcs that compose the first game, the second game/toy presents a logic of segmentation that preserves anomalous forms. For instance, in "Build Your Own Alphabet," the script depicts an A as composed of three blocks. But in the diagram for "The Alphabet that Builds Itself," the A is composed of only two segments – an inverted V with a flattened apex with a second block or bar fitting parallel to that at the x-height. Additionally, the diagram depicts a third variation of the A. Like the first game's A, this A is composed of three pieces, but the long extenders are not fashioned to indicate a collision of two vectors so much as two blocks whose apex is formed midway along the lintel, following an invisible perpendicular vector. In another instance of the way in which segmentation preserves anomalous forms: a comparison of the bowls in a B and a P also makes evident that these segmental pieces are not wholly interchangeable. Yet, there are opportunities for reuse and recombination. For instance, the X is deconstructed in a smaller (provisional) font size and reassembled as a Y. So too, the U is segmented into pieces that contribute to making an L or an E.

Typography and the alphabet game

Loy's alphabet typeface resembles a number of contemporaneous typefaces: Futura, designed in 1927 by Paul Renner, which became a major Bauhaus typeface, Gil Sans, a 1928 typeface developed by Edward Gill, and Johnston, the London Tube Typeface, designed in 1928 by Gill's mentor Edward Johnston. These typefaces and their font families offer simple sans serif letters, reflecting the modernist rejection of ornamentation and preference for form to fit function. Their simplicity and legibility meant that they were quickly adopted for commercial and industrial purposes. As with these similar typefaces, "The Alphabet that Builds Itself" is a sans serif typeface but – making it a complete departure from Universal (the original Bauhaus font) – it is rendered entirely in capital letters. Since Loy's "Alphabet that Builds Itself" is an incomplete typeface as she only drew diagrams for six (potentially eight, if the "Y" and variant "X" are counted) letters, variations, no matter how minor, are significant. Loy's letters would appear to use equal horizontal and vertical space, making it approximately a monospaced font. But there are exceptions to her monospaced aesthetic. The "A" is visibly wider than the "P" or the "B." Additionally, the A is drawn as an indivisible solid with a thick flattened cap height. In Loy's explanation for the first game "Build Your Own Alphabet," she describes "A" as composed of "two long pieces" that should be put together "until they touch at the top." In her script for the first game, she explains that construction of the "A" is complete when the child "put[s] the short piece across their middle A, and we have 'A.'"[49] However, in "The Alphabet that Builds Itself," the "A" offers an innovative pronounced flat lintel which sets it apart from the Bauhaus typefaces.

The alphabet's similarity to these ultra-modern fonts (Futura, Gil Sans, and Johnston) suggests an embrace of modernist impersonality. However, there is something alien to the machine and beyond the personal or even the impersonal – at work. These letters are charged by polarity, magnetically animated – they are an alphabet intended to "build itself." Marinetti had called for words-in-freedom to augur a new lyricism – "free to de-form and reshape words, cutting them, lengthening them, reinforcing their centers or their extremities, increasing or diminishing the number of vowels and consonants."[50] He called this "the *new orthography* which I call *free expressive*."[51] But whereas Marinetti's new orthography was unruly, consisting of handwritten words, Loy's geometric segmental letters set the alphabet in recombinative flux. Notably, the geometry is approximate – to account for the inevitable optical effects of typeface. Also, letter component pieces are not universally transferable. The angle of the V is hard to put to use in an M. It would make the M quite splayed. I designed the S as two separate arcs. The bottom half bowl of the S is slightly larger than the top, so they are not in "The Alphabet that Builds Itself" able to demonstrate the efficiency of element evinced by the "Build Your Own Alphabet" pieces. But, when the second game/toy pieces are apart they give the impression of perfect symmetry. The spine of the S is cut at the center and the line runs on a vector that marks the boundary of either end of the finials of the S.

Loy left the actual dimensions unspecified. The diagrams give no indication of the dimensions of height, width, or weight. Therefore, I have extrapolated from the diagram. To make explicit the connection of two-dimensional printing into three-dimensional printing I have sized the letters on the z axis to .89 which is .01 lower than "type

high" or .9, the height of moveable type on the modern print bed. If six letters fit on the diagram page the inference is that these letters are not intended to be as large as the single jack-in-the-box B which she fabricated and sent to F.A.O. Schwarz. Taking into consideration the conventional dimensions of children's toys and the size of a child's hand at the age which she/he/they are engaged in reading and writing language acquisition, and the attendant need to make pieces that are not so small that they might easily be swallowed, I decided to draw and print the letters with a y dimension (in 2D printing this is called the body size) of 4.2 inches. With the exception of the A, I have given the X, B, P, U, and S, an x length (in 2D printing this would be called the en space) of 2.25 inches. Based on the diagram, the x dimension for the A is intended to be wider on the x axis than the other letters. Therefore, I drew the A with an x length of 3.3789 inches. Here are images of the six printed letters (Figure 4).

An alphabet that infers its own morphology

The magnets that I have affixed to contact points established by the known confirmations of letters have now been allowed to assemble in an unsupervised way. This demonstrates the alphabet's extension of its own morphology. Here are some images of possible new letters that "The Alphabet that Builds Itself" might create (Figures 5–9).

The alphabet can create the 26 known roman letters, but it can also create n other possible letters. Such an alphabet that learns or builds itself is kinematic. Loy suggests
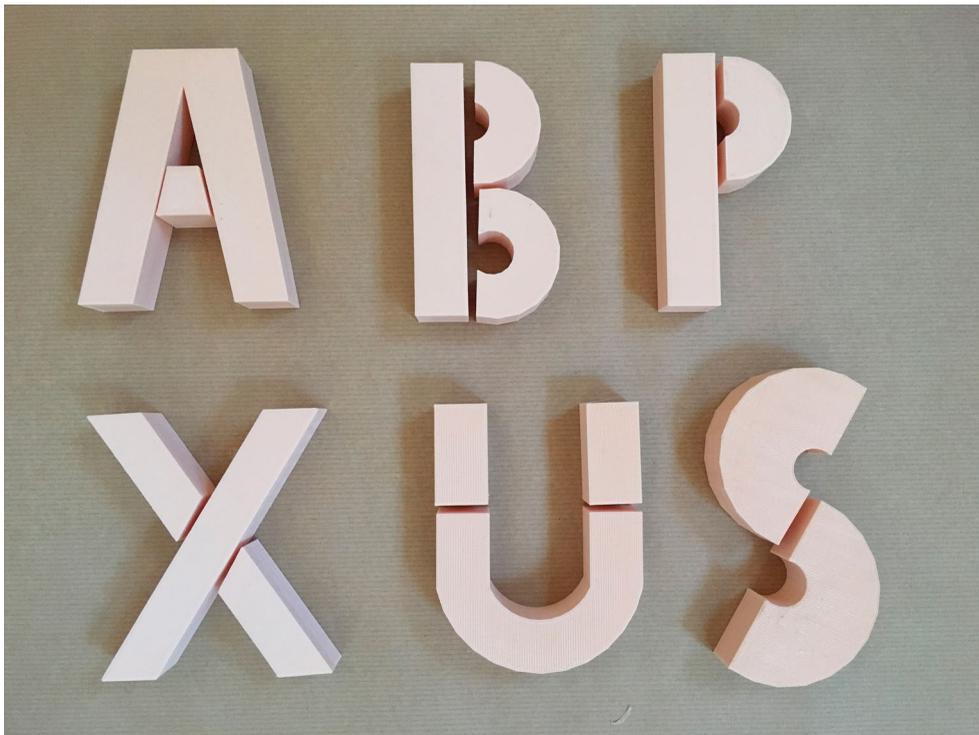

Figure 4. Prototype for "The Alphabet That Builds Itself" / PLA (3D designed and printed).

Figure 5. "VP" "The Alphabet that Builds Itself" – inferring its own morphology. PLA (3D designed and printed).

ways to connect the elements – either magnets or dowels. I have chosen magnets. These thin adhesive magnets at specific juncture points promote combination. For instance, one could assign contact points to a segment then apply a parameter that specifies that any two pieces can combine to form a letter. Alternately, the parameters of letter formation could expand to allow three pieces to combine. Whether it is a two or three-piece letter morphology, the possible combinations of segments that can extend into the x, y, and z axis is n dimensional. The result is a mutating and enlarged system of icons.

The splitting of the alphabet characters emphasizes their geometry. It also emphasizes their concrete relation to nature, to the world of force, weight, and dimension. As building blocks of a logo phonetic alphabet, Loy's diagrams for A, B, P, X, U, and S propose disintegration into pure abstraction: line, length, arcs, and angles. The magnets that endow the elements with polarity and attraction inscribe them with kinetic force and suggest to the player/writer/reader the inevitability of associative meaning-building by accretion, connection, and addition – a building block form that expresses the modernist fascination with collage and montage (making new of the existing through recombination, repurposing, and recontextualization) (Figure 10).

My plastic letters are one version of Loy's proposal – a possible manifestation of her intentions. Like Emily Dickinson's unpublished fascicle poems, Loy's plastic alphabet

Figure 6. "ST" from "The Alphabet that Builds Itself" – inferring its own morphology. PLA (3D designed and printed).

lies below the threshold of social production in which economics, F.A.O. Schwarz, and Loy would have entered into a negotiation and series of compromises in order to produce the toy. These letters are therefore a prototype, a speculative model and an interpretive act that results in an edition of the poem.
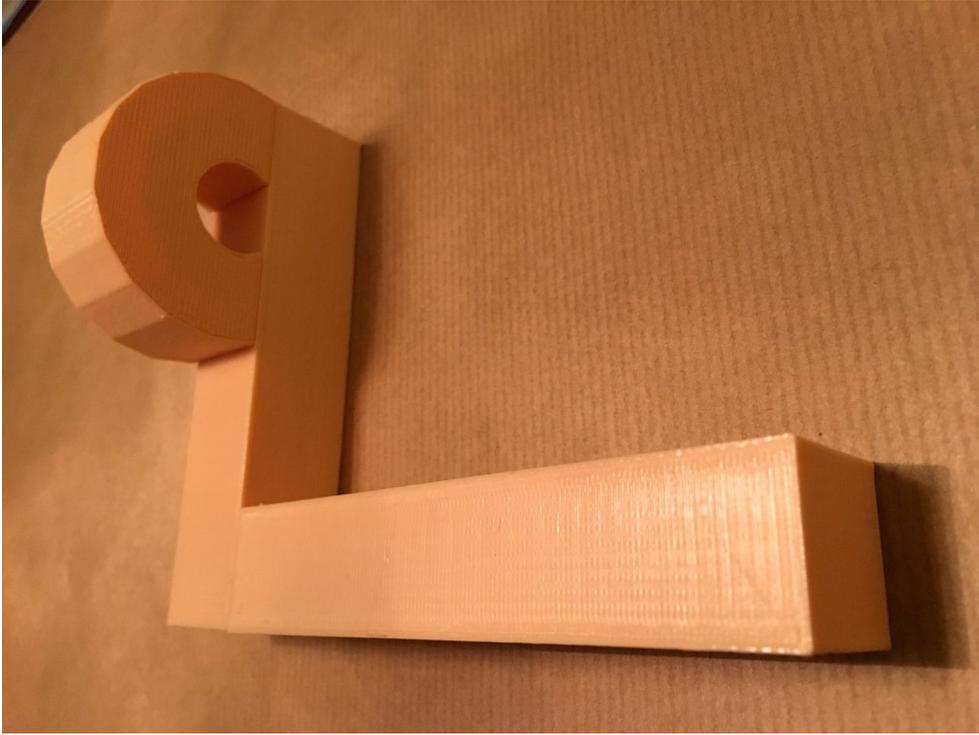
Figure 7. "PL" from "The Alphabet that Builds Itself" – inferring its own morphology. PLA (3D designed and printed).

Loy's game-as-poem or poem-as-game advances a theory of language through object-typography and kinetic learning. As Loy specified, the three games she sent to F.A.O. Schwarz were variations on one theme. The first game, "The Alphabet that Builds Itself" presents the alphabet as combinations of component parts rather than as twenty-six separate icons. Importantly, Loy's script for "Build Your Own Alphabet" includes 27, not 26 directives. Its beginning with I and ending on U suggests the foundational poles of poetic address: I/thou. In "Brancusi's Golden Bird," Loy envisions "The toy / become the aesthetic archetype," yet another indication of her sense of semantic meaning as bound not just to form but also to matter.[52] Her meditation on Brancusi's sculpture, like her praise of Stein, fittingly describes the philosophy of language that her magnetic segmented alphabet conveys. Language is sculptural and kinetically charged with the potential for new forms.

Letterpress, offset, and 3D printing are part of a continuum that reflects a shifting cultural meaning of reading and writing. In some ways, 3D printing signals the rise of haptic reading as well as a renewal of arts and crafts maker culture. Loy's poem as a work of object-typography – typefaces that possess six faces – that is intended to be played with, suggests that reading is, at least in part, a haptic experience.

The rise of the inexpensive 3D printer, like the "inexpensive plastic" Loy designated for the game's material, signals a shift in the cultural evaluation of plastic. It is as if the tension between imitation and authenticity which has beleaguered plastic throughout
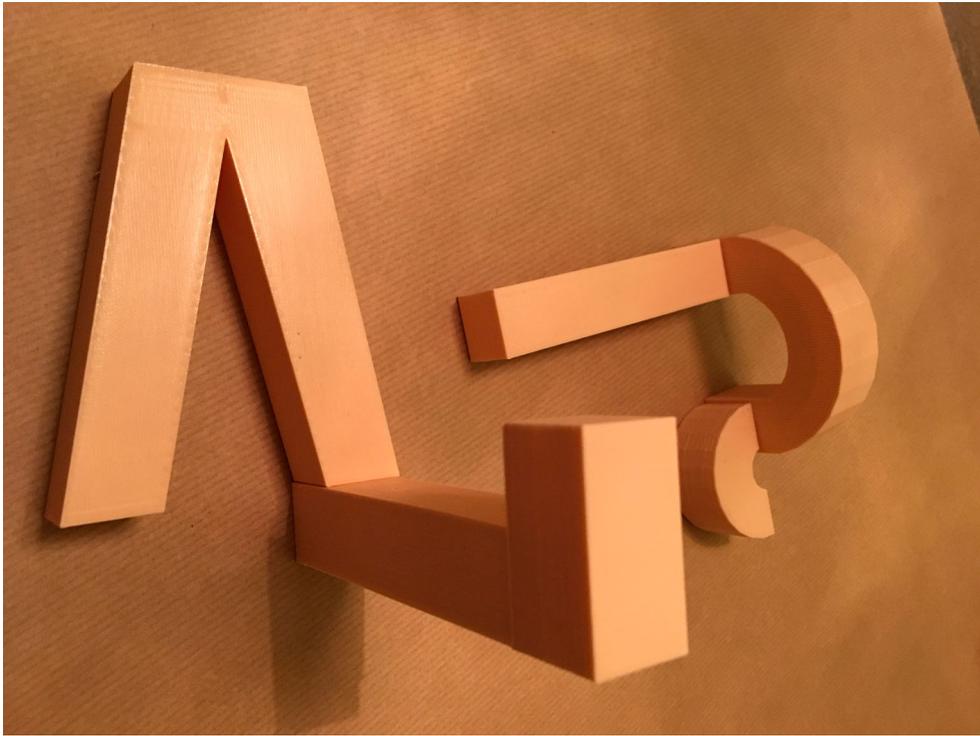
Figure 8. "TVUL" from "The Alphabet that Builds Itself" – inferring its own morphology. PLA (3D designed and printed).

the twentieth century is in the process of being abandoned. The democratic promise of plastic which saturated Loy's era, eroded over the century, as plastic became synonymous with cheap mass production. In today's market, some 3D printers are less expensive than laptops. Rather than a reticence or disgust for the mass-market plastic object, the entrance of the home 3D printer heralds an inverted Arts and Crafts movement in which the mass-market commodity becomes an artisanal object. Boredom with the ubiquity of plastic is embraced now with the playful reclamation of the otherwise smooth, impervious, ideological facades of the plastic that surrounds in everyday life.

Maker culture and its academic counterpart, critical making, resituate accessible prototyping materials in a historical narrative that extends to William Morris. Through its embodied communal meanings and its ability to combine creative and practical impulses, craftwork offers feminist modernist digital humanities opportunities for speculation and exploration. Specifically, 3D fabrication supports an expanded conception of text. This means new occasions for reflection upon how writing technologies operate on specific conceptions of authorship. 3D printing makes an important intervention in feminist text technology histories, giving material weight to the questions: in what alternate sites or textual practices did modernist women writers write? Where is the scene of writing? Further, the practice of CNC prototyping embraces the inherent repetition of making, marking this labor not as drudgery, so much as iterative process.

Figure 9. "The Alphabet that Builds Itself" – inferring its own morphology. PLA (3D designed and printed).

Modeling expands the ways and means by which we can recover, represent, and recirculate modernist women writer's use of alternate text technologies. These prototyped letters, these plastic models, are the first fabrication or first printed edition of that
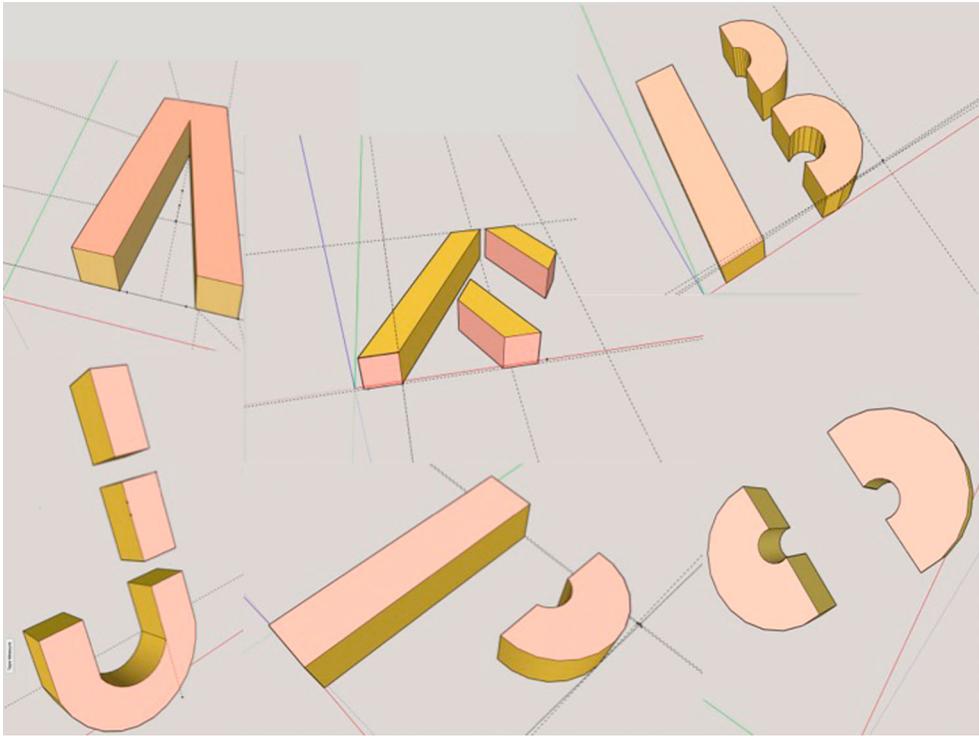
Figure 10. Models for Loy's alphabet letters designed in Sketchup by the author.

which could have been but never was manufactured. Considered in this light, Loy's schematic operates as a pre-text of the textured poem that Loy conceived in 1940.

Notes

1. Letter, Loy to F.A.O. Schwarz, August 6, 1940. Diary entry. August 7, 1940. Loy uses two different names for the third game: "Jack in the Box" and "Toy." Box 7, folder 184, YCAL MSS 6, Beinecke.
2. See series II, box 7: http://drs.library.yale.edu/HLTransformer/HLTransServlet?stylename=yul.ead2002.xhtml.xsl&pid=beinecke:loy&query=&clear-stylesheet-cache=yes&hlon=yes&big=&adv=&filter=&hitPageStart=&sortFields=&view=all#ref168
3. Gilmore, 303, in *Mina Loy: Woman and Poet*.
4. Barthes, *Mythologies*, 53–5.
5. Loy, "Gertrude Stein," 94.
6. Loy, *LLB*, 289, 291.
7. Ibid., 289.
8. Ibid., 290.
9. Ibid.
10. Ibid., 94. Remarking on the Steinian parallels in Loy, Cristanne Miller describes Loy's poetic as that of "wrench[ing] sign from signifier" (*Cultures* 120). Likewise, Gilmore, who, along with Burke, are among the first to discuss Loy's game, speaks of Loy's disassemblage of logos in her play with the anagram as a strategy for "collaps[ing] the oppositions between surface and depth." Burke, *Becoming Mina Loy*, 278.

11. Marinetti, "Destruction of Syntax," 146.
12. Letter. Loy to Van Vechten, nd, [c. 1915], Carl Van Vechten Papers, box 76, folder 1082–1083, YCAL MSS 1050, Beinecke.
13. See Reed, "Craft and Care" and Whitson and Grigar, "Critical Making in the Digital Humanities."
14. See Rainey, Institutions of Modernism and Churchill and McKible, *Little Magazines & Modernism.*
15. Letter, Loy to Mabel Dodge Luhan, nd. box 24, folder 664–665, YCAL MSS 6, Beinecke.
16. Letter, Loy to Mabel Dodge Luhan, nd., box 24, folder 664–665, YCAL MSS 6, Beinecke.
17. Burstein, *Cold Modernism*, 153.
18. Loy, *LLB*, 111.
19. Ibid., 99.
20. Loy, "Valentine," nd. [c. 1940-60], box 7, folder 186, YCAL MSS 6, Beinecke.
21. See Burke, *Becoming Mina Loy*, 365.
22. Loy, "Xmas Tree Lighting," nd. [c. 1940-60], box 7, folder 186, YCAL MSS 6, Beinecke.
23. Loy, "Chatoyant," nd [c. 1940-60], box 6 folder 186,YCAL MSS 6, Beinecke. Mixed material, manuscript typescript, diagram, illustration, sketch, drawing.
24. Ibid.
25. Ibid.
26. See Burke, *Becoming Modern*, 365.
27. Loy to F.A.O. Schwarz, August 6, 1940, box 7, folder 184, YCAL MSS 6, Beinecke.
28. Barthes, *Mythologies*, 98.
29. Meikle, *American Plastic*, 5. Bakelite's chemically rendered substance could not be returned to its component parts – denoting a new kind of plastic.
30. Ibid., 5, as quoted from "Trade Name Index" *Plastics*, 99–101.
31. http://fortune.com/2015/07/15/rise-of-F.A.O.-schwarz/.
32. See Burke, *Becoming Mina Loy*, 392.
33. The top of the duplicate letter indicates that she has sent her materials by registered mail.
34. Loy, Diary, August 7, 1940, box 7, folder 184, YCAL MSS 6, Beinecke.
35. Brown, *Glamour in Six Dimensions*, 147.
36. Frankl, *Machine-Made Leisure*, 112–113.
37. Morgan and Morrison, "Models as Mediating Instruments," 32.
38. Ibid., 11.
39. Ibid., 12.
40. McCarty, "Modeling a Study," 2.
41. Sayers, "Prototyping," 158.
42. Elliott, MacDougall, and Turkel, "New Old Things," 122. Sayers, Elliott, Kraus, Nowviskie, and Turkel refer to archaeologists Hod Lipson and Melba Kursman whose work with 3D printing cuneiform tablets demonstrates the value of prototyping. Using CT scans and 3D printing Lipson and Kursman discovered written messages embedded in the hollow insides of cuneiform tablets. This meant that the original artifacts could be preserved and the replicas destroyed to reveal these characters.
43. Sayers, "Prototyping," 159.
44. Emerson, "The Poet."
45. The 3D print bed departs from the historical terminological usage of the typesetter which specifies x-height as "The distance between the baseline and the midline of an alphabet, which is normally the approximate height of the unextended lower-case letters – a, c, e, m, n, o, r, s, u, v, w, x, z – and of the torso of b, d, h, k, p, q, y" (Schlesinger, "Letterpress Printing in the Postmodern," 485).
46. Loy, *LLB*, 79.
47. Ibid.
48. McCarty, "Modeling a Study," 11.
49. Letter, Loy to F.A.O. Schwarz, box 7, folder 184, YCAL MSS 6, Beinecke.

50. Marinetti, "Destruction of Syntax," 151.
51. Ibid.
52. Loy, *LLB*, 79.

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(New York: McGraw-Hill, 1933), 205–232; and "Directory of Trade Names," MP 17 (October 1939): 447–448.

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