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Designing Living Bricks:
The Architectural Drawing as Conversational Platform

Simone Ferracina

Abstract
The paper argues that the architectural drawing, as a technology for thinking and communicating design ideas between project stakeholders, has remained largely untouched by the advent of Actor-network theory (ANT) and the so-called 'ethnographic turn.' Rather than changing to reflect a distributed understanding of agency or the lived *on-goingness* of projects and buildings, the drawing continues to describe a simple line (from agent to patient) and to congeal into artifacts used to impart commands, increase the architect's status or construct brands (the monologue-drawing and the brand-drawing). From the perspective of Living Architecture, an EU-funded research scheme combining architecture, bio-energy and synthetic biology, the paper proposes new modes of drawing (the medium-drawing, the exaptation-drawing and the seed-drawing) that challenge binary abstractions and demand that the architect relinquish a measure of authorship and control to engage in conversations with the *other* – large and small, disciplinary and non-disciplinary, human and nonhuman, alive and inert.

You need only to think for one minute, before confessing that Euclidian space is the space in which buildings are *drawn* on paper but not the environment in which buildings are built – and even less the world in which they are *lived.*
(Latour and Yaneva, 2008, p. 82)

The monologue-drawing
The architectural drawing mirrors an understanding of the discipline as played out in the tension between authorial figures on one side and finished products (images, objects, buildings) on the other, as a conveyor belt neatly positioned to bridge the poietic gap between the two. While different drawing typologies link to specific end points and levels of consumption (construction drawings to contractors and sub-contractors, renderings to clients and competition juries, sketches to consultants, et cetera), and while the context in which they are produced and displayed has greatly changed over time, they maintain a fundamentally linear character: the straightforward linking of A to B, without detours or complications. If this connective quality, which narrows the scope of the present discussion, cannot be universally applied, it can nonetheless be detected across a diverse range of currents and typologies, regardless of whether the drawing is considered to have a symbolic role – as the – embodiment of architectural ideas – (Pérez-Gómez, 1982, p. 6) – or a mimetic one – as a – neutral collection of information – towards the construction of buildings (Pérez-Gómez, 1982, p. 3). There are certainly exceptions (sketching, for instance, is more horizontal and less definitive of outcomes), but the figure that better describes the architectural drawing is still predominantly the line, not as a neutral connective artery conveying flows in two directions (and depending on two or more agencies), but as a drip system moving water in a single direction and with a fixed orientation: from top to bottom, high to low, agent to patient (in the Aristotelian sense of a clear-cut separation between activity and passivity). The figure of the line is not used here under the essentialist and naïve assumption of a crystalline translation from drawing to building – "a uniform space through which meaning may glide without modulation" – (Evans, 1986, p. 3), or to endorse the possibility of the authorial

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imposition of semantic monocultures, but to under-score the projective drive – the – motive force – (Cook, 2008) – underpinning drawing: an active vector exert-ing pressure upon (and moving towards) a seemingly passive recipient or substrate. Our interest is not the architectural drawing as a translation or generative technology, but the biases implicit in its unidirectional development and modes of transmission, whether they result in Richard Meier's *Athenaeum* or in Mad-elon Vriesendorp's *New York Series*. If what defines the architectural drawing vis-à-vis other representa-tional technologies is 'reverse directionality' – the fact that it precedes its subject matter (Evans, 1986, p. 7) and is constitutionally locked into a forward-facing position – , it is unsurprising that direct authorship (individual or collective, human or cyborgian, prag-matic or speculative as it may be) would be favored over more complex, rhizomatic and nuanced authori-al configurations.

In this hylomorphic and hierarchical framework, in most cases 'high' corresponds to a disciplinary interior versus a 'low' exterior (the construction of the building as carried out by un-initiated 'others' lacking a genuine understanding of architectural values) or to a pure prescriptive voice being either transport-ed outwards into the real world of concrete pours, budgets and inhabitation, or folded into the rubric of disciplinary knowledge, ideas and archives. From the masterplan to the 1:5 detail to the visionary render-ing of architectural utopias, the drawing remains chiefly concerned with fidelity: with how the knowl-edges and intents it represents and illustrates can be transferred across agencies without soiling the purity of their message. And while there is more to drawing than mere conveyance, a degree of functional in-tegrity – the curation of an 'appropriate experience' (Wollheim, 1987; Feagin, 1998) or reception – is often required.

The need for legibility is emphasized not to empower discussions, or to increase exchange, but to ensure that discussions follow (come after) the luminous voice of the architect; that they lubricate a kind of *monologic phototaxis*.

The photographic and digital turns in the production and diffusion of architectural images, as well as the proliferation of CAD/CAM workflows, exemplify the

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double-edged obsession with readability; not (only) as a means to objectivity and 'exactitude,' but as a choreography of control geared towards the seamless correspondence between design intentions (e.g.: the computational drawing process) and designed outputs (e.g.: the rendering or machined prototype). Similarly, the success of the drawing as a readily consumable critical and discursive architectural output, and as a research tool independent of buildings – from Piranesi to Webb, Taut to Rossi, Woods to Holl – cannot be entirely dissociated from the expressive authority the drawing affords.

An anecdote might help further illustrate this point: Neil Levine recounts how, shortly after the invention of the daguerreotype, architect Henri Labrouste commissioned a photographic reproduction of his Bibliothèque Sainte-Geneviève in Paris and used it as the basis for an engraving of the building (Levine, 2012, p. 325). The differences between the two images – the removal of signs of human inhabitation, of street lights, chimneys, and ventilators; the recalibration of shadows and sharpening of friezes; the smoothing of imperfect surfaces and correction of misaligned details according to their original design (Levine, 2012, p. 327) – , reminiscent of the highly photoshopped and staged photographs featured on the glossy pages of today's design magazines, epitomize the architect's relentless drive towards the imposition of *his/her* vision, even after the construction of the building – a desperate attempt to extend the prescriptive validity of the drawing *ad infinitum,* or to claim its reality as superior to that of the actual (living) building.

The brand-drawing
Actor network theory, from Latour's "principle of irreduction" onwards (Latour 1988, 2005; Latour, Yaneva 2008), and the so-called "ethnographic turn" in architecture (Callon, 1996; Houdart, Minato, 2009; Yaneva, 2009) explode the profession into multitudes of interweaved agencies and hierarchies/alliances, putting to shame a binary understanding of drawing. The very notion of authorial clarity ceases to be interesting or viable. No longer can the drawing be a simple interface connecting an agent and a patient, a catch-all formula, a set of instructions, or a sign post marking (or a flag claiming) a territory. Rather, it

becomes a complex fabric stretched over legions of actants and negotiated through overlapping sets of communicating ecologies, protocols, media, economies, materialities, methods and technologies. There aren't only two windows or organs at either side of a simple line – the drawing is not a phone call between a mouth A and an ear B. Eyes and anuses and stomachs and veins and skins and hertzian waves and electrical charges spread across and occupy the entire surface of the drawing, pulsing and shivering and talking and eating and digesting and deflecting and absorbing each other's outputs. And yet nothing of this complex and monstrous ecology emerges to stain the surface of the drawing; not in the office, not in the construction site, not in the museum, not in the book. There are no accidents, no incidental encounters, no impurities. In other words: nothing has changed. Gehry's sketches still hang on the gallery wall, radiating genius-waves. The drawing continues to beautifully ignore the multitude of forces and flows that underpin it, rejecting a distributed model of agency that would force the architect to employ it as a tool not to think and design, but to think and design *with*. Instead, while in the real world his aura dissolves into hordes of surveyors, civil engineers, lighting experts, software packages, specification writers, cost estimators, model makers, clients, drafters, industry reps, bricks, editors, et cetera – Cuff's "countless voices" (1992, p. 62) – , the architect clings to a (vacated) position of privilege and power, deploying drawings to enlist other actants, enforce alliances, and coax us into recognizing (and attributing value to) an authorial brand. Such a brand no longer relies on fidelity, on accurate translations, but on the production of abstracted counter-narratives that distill the creative process, polishing it by reduction – scooping away all manner of non-disciplinary agency (Labrouste's deletions). The more control the drawing exercises, the more strength it dispenses; the more opacity it casts, the more meaning (and aura) it ascribes.

But can a new typology of architectural drawing spur architects towards relinquishing a measure of control and engaging more genuinely with the complexities revealed by these theoretical realizations, outside of the narrow romantic and neoliberal confines of authorship and brand? And can it move even further,

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beyond networks and into a volumetric and vibrant materiality that resists abstraction into clean-cut slices, labels and actors? In other words, can the architectural drawing cease to *format* and fix solutions and decisions, and rather become a *medium* for vulnerable, open-ended and materially charged conversations across disciplines and beings?

The medium-drawing
Perhaps the architectural drawing can be rescued from the staleness of a 'Euclidean space… in which buildings are drawn on paper' (Latour, Yaneva, 2008, p. 82) and begin to imitate the liveliness and vibrancy of the buildings they depict and imagine. If, as Latour and Yaneva propose, a building is "not a static object but a moving *project*" (2008, p. 80), then the warm blood of the drawing must continue to flow through it, resisting coagulation. While the histories of art and architecture have a penchant for finished objects that can be easily categorized, compared and captioned (title, author, date), a paradigm based on *on-goingness* would require ways of producing, evaluating, archiving and disseminating that are not dependent on objects reaching 'completion' (thermodynamic equilibrium, death) but on their persistent malleability and responsiveness; on their ability to simultaneously be actual and potential. How may such a transformation – from static artifact to mutable platform, from representation to action – be ushered in, without collapsing design into inhabitation, the architectural drawing into the building (or life) itself? How can the drawing-as-process begin to outline a productive space between sign and object, a durational script that steers, responds to, and is co-authored by reality? And how can we promote the uncertainty, openness and adaptability that such a paradigm invokes?
A thorough exploration of these questions exceeds the scope of our present discussion, yet it is clear that drawing (as a verb, rather than a noun) could no longer describe a simple path between two points (an authorial cluster A and a definitive output B), but would rather become an on-going and precarious interweaving and colliding of agents, directions, times and media. The surrealist *exquisite corpse* – a method whereby successive collaborators draw on a sheet of paper before folding it over and passing it on to the

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next person, revealing just the edges of their contri-
bution so that it may be built upon – might represent
a starting point toward such a model: a tempering of
authorship and control that still relies on individual
design inputs but denies their ability to overdeter-
mine and fix results. Here, the drawing allows for "the
existence of that thrust called intentionality" (Bennett,
2010, p. 32) upon which design depends, while simul-
taneously demanding a distributed mode of author-
ship, a temporary and changeable directionality, and
the attainment of goals that are always partial.

The remainder of this paper presents preliminary
graphic investigations developed in the context of the
Living Architecture project, which are concrete yet
rudimentary attempts to address these questions – to
invoke marks, shapes and traces not as tools to think
through, stabilize or promote solutions, but to gener-
ate (and ask) questions. In no way do they represent
an exemplary model to behold, or the achievement of
a particular degree of success. What they do, howev-
er, is test a new drawing ethos from the privileged
ground of a research environment shared by archi-
tects, scientists and bacteria. Whereas the architec-
tural profession still generally privileges the integrity
of the architect's intent over the innumerable flows,
disciplines, trades and knowledges that inform the
construction of buildings, the transdisciplinary
framework of the Living Architecture project imposes,
from the get go, a democracy and plurality of voices,
and an understanding that designs do not trickle from
the top down, but are negotiated across multitudes of
agencies – disciplinary and non-disciplinary, human
and nonhuman, alive and inert. Here, designers don't
have all the answers, and our drawings must bow to
an experimental approach – ask, attempt, learn, wait,
listen, and perhaps end up crumpled up in a dust bin,
drawn over, or forgotten.

Living Architecture is an EU-funded collaborative
scheme active across the Schools of Architecture, Plan-
ning and Landscape & Marine Science and Technology
(University of Newcastle, UK), the Bristol BioEnergy
and Unconventional Computing Centres (University
of the West of England, UK), the *Centro de Investiga-
ciones Biológicas* (*Consejo Superior de Investigaciones*

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Científicas, Spain), the Laboratory of Artificial Biology (*Università di Trento*, Italy), Explora Biotech S.r.l. (Italy) and Liquifer Systems Group (Austria). The project's objective is to design arrays of 'living bricks': modular units of construction that comprise bioreactors (a microbial fuel cell, a photo-bioreactor, and a synthetic module) whose metabolisms can be programmed to accomplish useful tasks such as producing electricity, biomass, household products like next-generation biodegradable detergents, purifying water, and removing pollutants.

The role that drawing can have in such an advanced research environment is not obvious. We could appeal to orthodoxy (the standard industrial brick or the notion of the brick as a fundamental modular unit of construction) and work through established frameworks and professional paradigms/sensibilities (overall configurations, aesthetic and performative goals, interlocking mechanisms, joints between components and materials, proportions of parts to wholes, relations of space, scale and number), yet these would not take us very far. Our 'site' is not an open field waiting to be 'in-formed' or a disciplinary, individual or industrial horizon of ambitions, but the context provided by the experimental practice of the scientists in the Living Architecture consortium. While drawing typically processes known parameters (e.g. setbacks, property boundaries, building codes) towards predetermined or self-imposed objectives (e.g. program, appearance, performance, critical stances), placing the architect in a conductorial role, here the parameters are not entirely given, the goals are not predictable (they depend on living organisms) and expertise cannot be presumed to concentrate around the figure of the 'problem-solving' designer. In such an experimental context, the drawing no longer develops or sells a design, but probes possibilities, illuminating not a single coherent proposal, but a multi-directional, fragmented and contradictory collection of discursive attempts and hypotheses. At first, our drawings begin to investigate how we might integrate in the chassis of a brick the first kind of bioreactor, the Microbial Fuel Cell (MFC). The researchers at the Bristol BioEnergy Centre describe it as an energy converter, a wet battery that translates the metabolism of microor-

ganisms into outputs such as oxygen, electricity and water. It is an electrochemical device comprised of two chambers, the anode and the cathode, separated by a membrane. In the anodic chamber, anaerobic bacteria form biofilms – the microbial equivalent of cities – and these oxidize an organic feedstock (for example, sugar or urine), thus generating electrons and releasing protons. In the cathodic chamber, these protons and electrons, having flowed through the membrane or run along an external circuit respectively, react with oxygen to produce water. Now, how can these metabolisms be encouraged within a load-bearing brick, collapsing structure and process? And how do we begin to formalize (to draw) such encounters? Indeed, some of the scientific jargon and ideas can be mystifying, and we remain largely ignorant vis-à-vis our scientific partners, yet at the same time terms like 'anode' and 'cathode' find, in our minds and hands, a novel spatial dimension – of rooms, partitions, adjacencies, forms, orientations – which they lacked in a mere scientific context, and unlock, through explorative drawings and almost by mistake, unforeseen possibilities. This is where transdisciplinary conversations begin – from a position (a common ground) of humbleness and trust, rather than mastery and expertise.

A mapping of decision-making in this context, specifically as it concerns drawing, is worth briefly unpacking. We suggested above that design decisions are made during/through the drawing process by an individual or collective 'author' (drawing as monologic thinking). In truth, however, even the drawing itself – the graphic standards, tools, colors and aesthetic preferences that inform it – is structurally dependent on the receptivity of a specific kind of audience, and on precise typologies. That is: for the construction detail of a window sill to be intelligible, a designer will resort to standard ecologies of hatches, line weights, grid systems and symbols that, while having been selected, do not represent a truly independent choice. The same applies to the most experimental of drawings, which will have been composed to quench the thirst of an avant-garde audience ready to appreciate and discuss them. A drawing typology is, in this sense, nothing but the selec-

tion of an audience, one that frames and channels the production of the drawing itself, guiding the designer towards a specific toolset and spectrum of decisions. I'd like to suggest here that the audience can be identified as the end point in the linear development of drawings, and, as such, a 'living drawing' must elude typological constraints and allow for audiences to be transitory and changeable. Similarly, a living drawing cannot be evaluated on the sole merits of its internal constitution, appearance and structure, but also on its openness and performativity.

The Living Architecture drawings presented here were originally developed as a way to capture and jump-start discussions with non-architects about the synthesis of specific tasks, functions, scales, materials and durations. As such, they do not fit into established typologies, precedents or protocols, nor do they target specific sensibilities/modes of receptivity, or aspire to immortality. Their configuration is relatively arbitrary and open-ended, guided by basic principles of orthographic projection and hinging upon the need to be performed through conversation.

We depend on decision-making processes that take place outside of the drawing and extend beyond disciplinary or professional boundaries.

To situate drawings within a performative 'life' and ecology of use also underpins a second reflection on decision-making: whether it occurs on the inside or outside of drawing. By 'decision making,' we don't mean here actual design decisions (which in a professional context often comprise the inputs of clients and consultants *in response to* the architectural drawing) but the attribution of design value. In most practices, drawing is precisely the process through which different sets of solutions are tested (often between computer aided software packages and rolls of tracing paper) and progressively fine-tuned towards the best possible designs. And while 'best' might refer to a wide range of values and considerations (aesthetic, economic, environmental, etc.), the graphic output nonetheless embodies a drive towards betterment, towards the 'good' solution. One need only read the glowingly optimistic descriptions architects write of their projects to ascertain that the linearity of drawing usually corresponds with a journey towards greener pastures. In the case of the Living Architecture drawings, on the other hand, designers lack the scientific expertise and judgment to recognize good from bad designs. We depend

on decision-making processes that take place outside of the drawing and extend beyond disciplinary or professional boundaries. Evaluations on the measure of success of the drawing's emergent spatial solutions rest largely on the shoulders of our scientific partners (on their expertise and experience), but also depend on the unpredictable behaviors of the micro-organismal metabolisms they address and engage.

We soon realize that we are designing a city for bacteria, a micro-architectural (and micro-agricultural) environment for biofilms to thrive in (what molecular biologist Simon Park might call crypto-geographies). Of course, we are not doing it out of naïve bacteriophilia; there are metrics in place to measure the success of the project (for instance, the ratio between bacteria, feedstock and electrical output), and they are all but nonhuman. Nonetheless, we find ourselves working for and co-designing with bacterial communities, catering to the unknowability of "strange strangers" (Morton, 2010, p. 41), and expecting surprises. Our patchy explorations of different geometries, depths, porosities and materialities for the membrane between anode and

Fig. 1 - Protonic Windows
A: Anodic chamber (microbial fuel cell)
C: Cathodic chamber (microbial fuel cell)
1. Adjacency in single-thickness membranes
2. Bounding boxes: thickness and porosity variations
3. Material insertions
4. Proton-exchange intensities
5. Studies in membrane geometry
6. Kissing chambers
7. Embracing chambers
8. Structural chassis as membrane
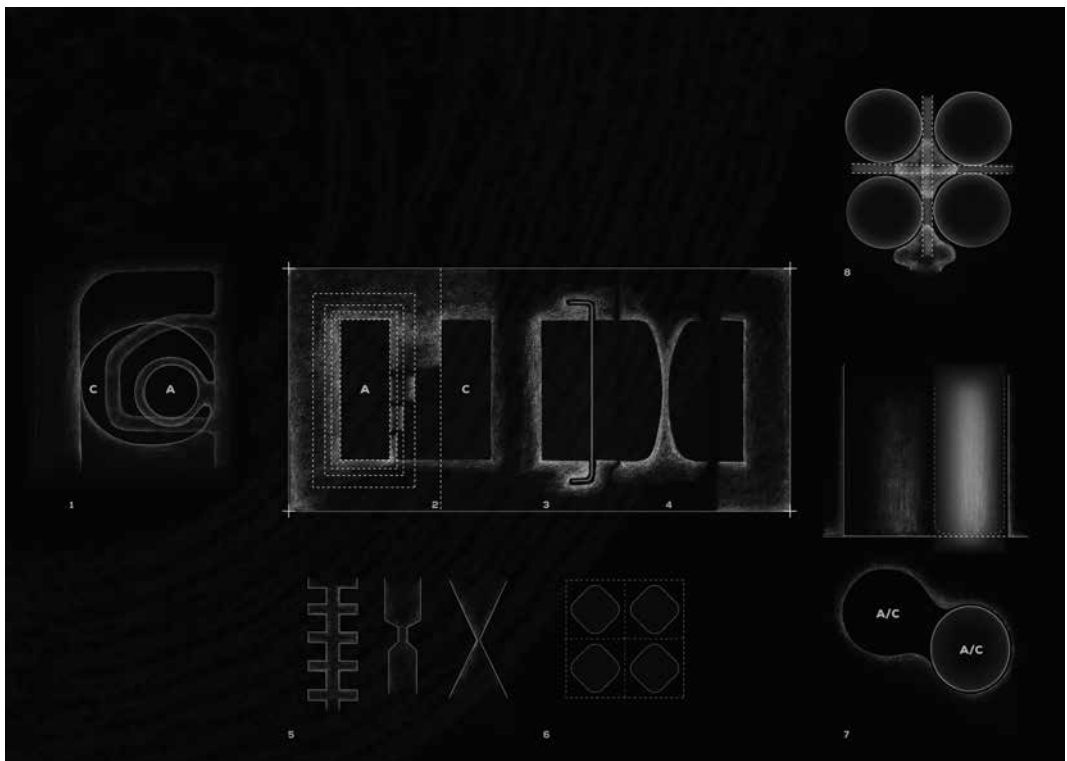
cathode (Fig. 1), for instance, are not purposeful or generative until they are discussed with our scientific partners and translated into prototypes that can be tested in the laboratory. The same goes for the outlines (Fig. 2) that begin to articulate possible individuations and relative proportions between chambers – like piazzas, families, and fields. Here we encounter the second kind of 'organ' in the project: the photobioreactor. The inhabitants of this chamber are microorganisms that, like algae, require light to photosynthesize and grow. These phototrophic organisms transform the 'living brick' from a dull lump of material, with no directionality besides that suggested by the practice of brick-laying, to an oriented body in its own right – firmly situated within an environment, seeking maximal exposure to light. But how does one orient a brick, and what kind of materials (glass, acrylic) or shapes might an oriented brick suggest? What exchanges are invoked by vessels that communicate across opaque, translucent and transparent chambers? These questions continue to emerge in relation to the third and last bioreactor, the Synthetic Microbial Consortia (SMC), which

Fig. 2 - Living Chambers
A: Anodic chamber (microbial fuel cell)
C: Cathodic chamber (microbial fuel cell)

1.
a) The cathode as algal garden (photobioreactor)
b) The cathode as piazza
c) Differentiated anodes and cathodes
d) Homogeneous chambers

2. Orienting the brick: external cathodic garden
3. Orienting the brick: internal cathodic garden
4. Anodic fields
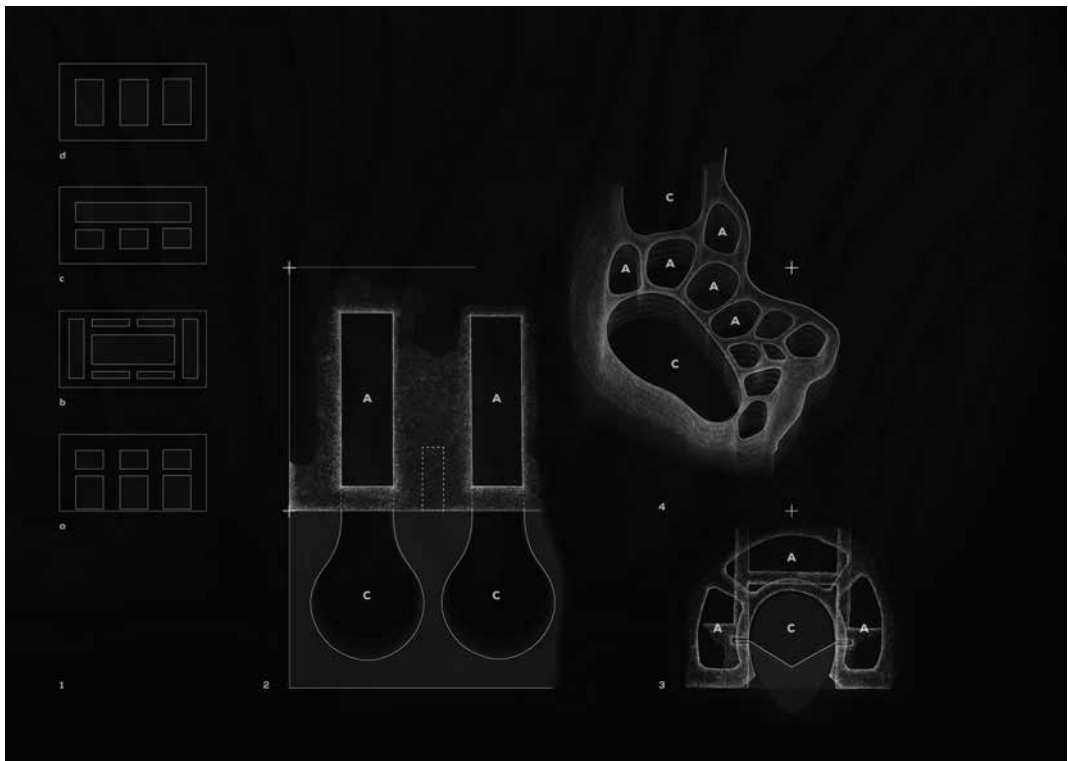
is comprised of a cyanobacteria-based 'farm module' that synthetizes easily metabolized carbon to feed a bacterial-heterotrophic-based 'labour module' that uses it as energy source. The labour module, which includes microorganisms modified with synthetic biology tools, is designed for specific functions, such as cleaning gray water/polluted air, or removing phosphate and nitrogen oxides. The last drawing shown here (Fig. 3) begins to address brick configurations that combine the three types of bioreactor, and to design affordances that respond to specifications and experiments across their varying bodies and metabolisms. Wall systems begin to take shape, but not as top-down expressions of architectural ideas – as bottom-up byproducts of conversation across disciplines and species.

Questions of an exquisitely spatial and architectural order start moving back and forth, from the drawing desk to the lab bench and vice versa, shifting and evolving with each iteration. Are changes in the thickness of the membrane between anode and cathode conducive to a concentrated protonic ex-

Fig. 3 - Metabolic Wall Assemblages
A: Anodic chamber (microbial fuel cell)
C: Cathodic chamber (microbial fuel cell)
F: Cyanobacteria-based farm module (synthetic microbial consortia)
L: Bacterial-heterotrophic-based labour module (synthetic microbial consortia)
S: Structural scaffolding
1. Radial configuration (central structure, intermediate anaerobic chambers, peripheral gardens)
2. Plug-and-play microbial fuel cell
3. Two-headed brick (double orientation)
4. One-headed brick (single orientation)
5. Mono-pod wall system: to each unit corresponds a specific chamber and function
6. Multi-pod wall system: units comprise a range of chambers, materials and functions
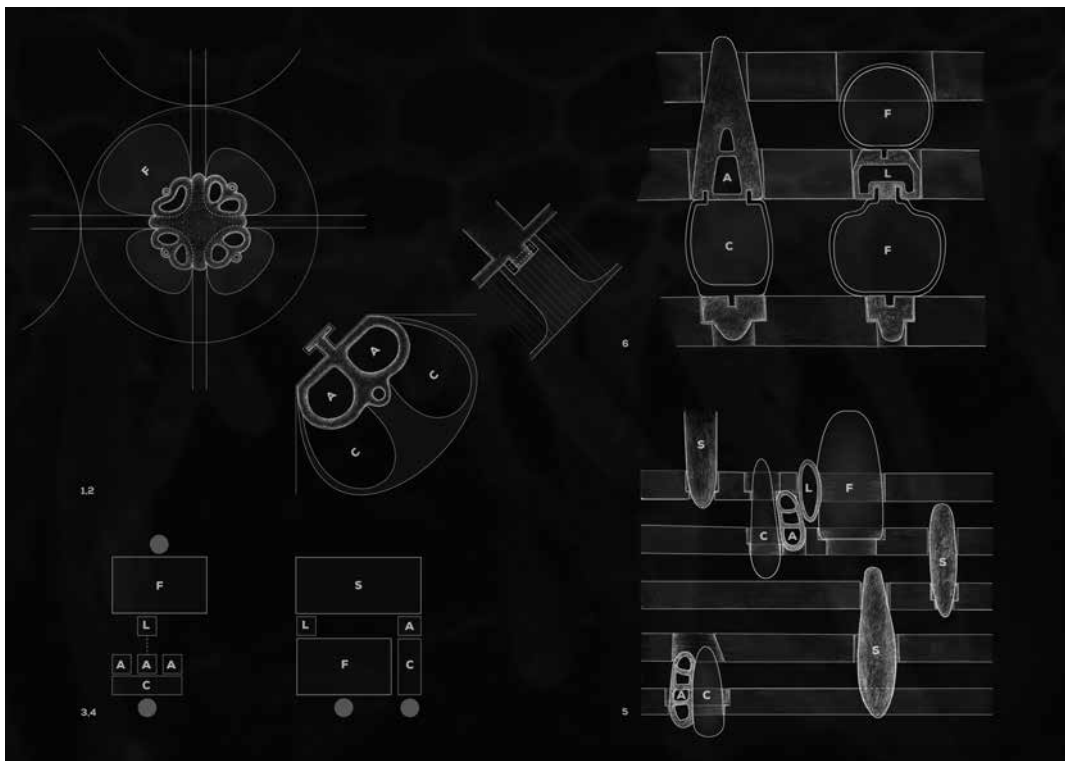
The exaptive drawing, instead, inherits images and graphic marks, which it co-opts into novel associations, layers, juxtapositions and adjacencies – re-tracing, cutting, pasting and remixing.

change? Should the contact surface between the two chambers be reduced to a minimum or maximized? What kinds of ceramic materials or shapes catalyze the colonization of biofilms? We invent questions through sketches and fragments, the scientists clarify, select and translate them, the bacteria respond, and then we sketch some more. In this sense, the drawing is conversation, on-going and alive: it is a snapshot of developing research questions rather than an answer with a shelf life of its own.

The exaptation-drawing
These images propose an evolutionary path to the design of the brick, understood not as linear or arbo-rescent adaptation towards a predictable set of goals and intents (along a trajectory of preconceived better-ment), but as a more organic, nonlinear and exaptive process of discovery, whereby forms are co-opted into roles and uses previously unforeseen (Gould, Vrba, 1982; Ferracina, 2014). Coined by Stephen Jay Gould and Elisabeth Vrba in a milestone 1982 article, the term 'exaptation' drives a wedge between form and function, allowing for the emergence of the former independently of the latter. 'Fitness' is released from the clutch of natural selection, or, in our case, from the calculated grip of design and *poiesis*, and allowed to be discovered serendipitously – and to be promiscuous. A dynamic drawing, as opposed to the self-satisfied and inert monologic drawing discussed above, necessarily demands such an approach, which converts outputs into inputs, frustrating both their supposed archival quality and the architectural ob-session with starting from scratch (the vacant lot, the white sheet of paper, the blank computer screen). A *tabula rasa* is, of course, not indifferent to the ques-tions of legibility and authorship we are concerned with: writing on a clean slate minimizes noise and in-terference, affords complete control over results, and averts external constraints (one can write anywhere one likes). The exaptive drawing, instead, inherits images and graphic marks, which it co-opts into novel associations, layers, juxtapositions and adjacen-cies – re-tracing, cutting, pasting and remixing. The collage would appear to be a good illustration of such methods, privileging, as it does, "process over prod-uct" (Shields, 2014, p. 2). From Picasso to Archigram,

from Tzara to Paolozzi, the collage hybridizes and re-purposes images, diverting their original intents while continuing to index past uses, meanings and histories (Waldman, 1992). This kind of assemblage remains, however, a mere illustration of exaptive principles: like lines and colors, or the mortar and bricks of building construction, its newspaper clippings and various other fragments are used as mere *materials* – blocks stacked on top of one another in order to construct (to complete) a drawing. In other words: while the collage does, as a process, entail a measure of authorial inhibition, it still pursues the stability of a finished output. Yet could drawings be seeded with the proclivity to change, to be hacked and up-cycled? Can collages be re-collaged? The exaptive ethos in the Living Architecture drawings presumes as much, re-imagining the role of the architect as protean and open-ended, not only in the sense, stressed above, of a shared and distributed intentionality, but also as it pertains to more general considerations on method. By proposing formal configurations whose endorsement lies with the murky and unreliable judgment of microorganisms, the architect's traces necessarily commit to a degree of blindness. Yet this uncertainty undermines one of the core disciplinary truths of architecture: the wholesale rejection of arbitrariness. Whereas architects understand the ability to justify decisions as part of a necessary ethical stance, and employ theory as a framework to contextualize 'reasons' and construct/verify the integrity of their work, our evolutionary history suggests that, once the authorial field has been radically widened – once cyanobacteria, protocells, electrons, lichens, protons, termites, weather patterns, oxygen molecules, discarded polystyrene cups and human inhabitants are all invited to participate in the design process – there might be value in explorations that are, from an 'equipmental' (Heidegger, 1962) or even an expressive perspective, not justifiable. If justification (intentionality) endowed drawing with the thrust and focus needed to go from A to B (to the end of the line), a decrease in purpose might allow it to extend in perpetuity; to hop across agencies, geometries and intents; or to never quite arrive – not archived but paused, suspended, meandering. The graphic investigations in the Living Architecture project point precisely in such a direc-

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tion; the designer and the evaluator of good designs cease to be one and the same, and the drawing itself can be taken 'for a walk' (Klee, 1953) by successive generations of asynchronous and unchoreographed actors. The drawing becomes the testing ground for a participatory architecture capable of generating form without content, and spaces that are not (always, or entirely) overdetermined, labelled, formattable, pure and programmed. It becomes the architect's humble admission that we do not necessarily hold the key to the distinction between what is and what is not worth making.

The seed-drawing
As a case study on method, the Living Architecture project offers further insights. As we have seen, the drawings precipitate encounters and feedback loops between lines and metabolisms; hatches and heat; graphite, architects, scientists and bacteria. These encounters are emergent, and y*et al.*ways localized, event-specific, and inseparable from their context and underlying components. The sludge used to inoculate and feed the microbial fuel cells, for instance, is sourced locally and is therefore dependent on site-specific bacterial consortia and affordances. While a certain population of *Pseudomonas putida* might 'prefer' a ribbed surface or a stomach-like set of folded membranes in a certain setting, the same strain in a different context (or a different strain, as either present in that particular environment or selected within the anodic chamber) could behave otherwise, generating, out of the same drawing, different prototypes and experiments, and steering the design in widely different directions. Such a vivid embodiment of local possibilities inspires the project to aim not for one hyper-efficient solution frozen into the final and perfected drawing, but for a generic and malleable set of instructions and dormant suggestions that may be activated, adopted and co-opted by various actors and in different situations and environmental conditions, generating sets of diverse regional arrangements. These drawings do not include (and respond to/resolve) a context in the way typical architectural proposals do – as the inert cartographic substrate upon which design decisions are graphically actualized. Whereas a black background – a figure of potentiality – re-

places contour lines, coordinates and grid systems, the drawing is not devoid of context. Contextuality is enforced precisely by repressing (by bracketing out) the *representable context* – context as something that can be predicted, measured, controlled, and drawn; It is attained by rejecting the architect's hubris (the presumption of being able to find *the* correct architectural answer for a particular site) and turning drawings into seeds, into potential kernels that may germinate *in* and be developed/grown *by* the context within which they operate. Dismissing the one-size-fits-all paradigm of industrialization and modernism (the International Style), the seed-drawing – as a design ethos, rather than an output per se – understands context as a vibrant and active co-designer of spaces; as a practice situated between gardening and critical regionalism (Frampton, 1998), between the bottom-up and open-source design processes of remix culture (Lessig, 2009) and the authorial restraint of adhocism (Jencks, Silver, 1972).

Rather than defining one program or set of values, or of setting up a relational network that hinges on variables, the living brick drawings sketch loose guidelines and suggestions, a technological toolset that is tested (and reconfigured) through situated experiments. The drawing becomes the architectural equivalent of recipes that, like Enzo Mari's *auto-progettazione* furniture (2002), Rachel Armstrong's synthetic soils (2015), Julia Child's *salade nicoise*, or ANT's "moving projects," (2008, p. 80) delineate a space for making through active and engaged interaction and improvisation – one that is validated and re-tuned, in part choreographed and in part re-adjusted following local needs, resources, creativity and taste.

Perhaps these are the first moves toward drawings that quiver, heave and breathe – their interstitial dance being one of bodies animating buildings and buildings animated by bodies; of material relations choreographed around and through the transient territories they imagine. Perhaps they will respond and transform, or they will be destroyed and forgotten… with a whimper, or bang. Or, like dandelion seeds, they may be dispersed by the wind, take root and sprout – far from the hand and eye of their creators.

Dismissing the one-size-fits-all paradigm of industrialization and modernism, the seed-drawing understands context as a vibrant and active co-designer of spaces.

These are the first moves toward drawings that quiver, heave and breathe.

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