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Ink, Paper, Bodyminds and Ideas: Material Consciousness in Architectural Sketching

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ABSTRACT

Sketching in the context of architecture has often been framed as either the intellectual development of an idea by visual means, or more recently as a heuristic instrument. In both cases, the influence of the lived body and subjective experience have been sidelined. This article investigates these material conditions of architectural sketching. I examine the notion of a “cultural technique” (*Kulturtechnik*), highlighting how architectural sketching is always predicated on a set of norms and practices that precede and sustain its creative potential. I provide an interdisciplinary framework drawn from philosophy of science, media theory, cognitive science and cultural studies, drawing parallels between the ways in which artistic and scientific modes of experimentation are conducted and materialized. I examine the material aspects of sketching practices, as well the defining characteristic of cultural techniques: they enable and sustain an experimental system around themselves. Such cultures are predicated on material conditions, which must be understood to gain insight into the efficiency of sketching. I consider selected material factors that play decisive roles in sketching practices regarded as a cultural technique, illustrated by a series of sketches. These are the role of fluid media like ink, enabling a seamless transmission from ideas to the physical domain; the shaping of the bodymind in gesturing and enacting architectural ideas; and the role of sketching paper, its spatial properties and its diaphaneity in developing architectural ideas. Jointly, these factors constitute a preliminary account for the “material consciousness” of architectural sketching.

Keywords: Sketching; Design Thinking; Cultural Technique; Experimental System; Aesthetic Knowledge; Design Cognition

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1. Introduction

Over the past decades, a rich literature has grown up around the topic of architectural sketching. Its uses, its idiosyncrasies, its role in realizing architectural concepts, and its effects on design thinking have been investigated thoroughly. While much of the literature in the English-speaking world has focused on the designing as a decision process, the socio-cognitive aspects of creativity, or the characteristics of so-called “designerly knowledge”^[1–3], recent research in the German-speaking world has framed design as a *Kulturtechnik* or “cultural technique”^[4–8]. This shift has the advantage of considering a familiar discipline from an unfamiliar vantage point, bringing new aspects and questions to light.

Up until now, limited attention has been paid to the following issue: how do the *material conditions* of architectural sketching render it effective as a creative method? To respond to this issue is the aim of this article. Instead of following the lines of thinking that have been hitherto attempted, I will consider architectural sketching here from the viewpoint of a cultural technique. This has several marked advantages that I will introduce in detail at a later stage. However, I will avail myself of a single concept to start with, which Richard Sennett calls “material consciousness”^[9].

Material consciousness is the degree to which skilled practitioners can appreciate and value the work of others in their field. Sennett uses the anecdote of a medical conference where, by accident, some images of a surgery were projected. Those not familiar with surgery responded with disgust, while skilled surgeons appreciated the surgical situation on display. To value how materials and techniques are used in a specialized setting requires familiarity with the details of practice. This is material consciousness—a finely tuned insight in the refinement of technique in context.

In Section 2, I introduce how sketching has been disembodied in two different ways and historical periods. The upshot of this exposition is that by disembodiment sketching practices, paying scant attention to what happens between the drawer, the media deployed and the drawn, thereby overlooking a methodological angle that helps us to understand architectural sketching in a new light.

To introduce an alternative frame of reference, I examine in Section 3 the notion of a “cultural technique” (*Kulturtechnik*), highlighting how architectural sketching is al-

ways predicated on a set of norms and practices that precede and sustain its creative potential. Adopting an interdisciplinary approach, I will avail myself of research carried out in philosophy of science, media theory, cognitive science and cultural studies, notably on the ways in which experiments are conducted and materialized. In the realm of experimentation, the sciences and arts overlap: experiments invite openness, establish evidence, require technique and skills and are materially localized in a wider culture of practice. Although each discipline possesses different experimental standards, procedures and expectations, I utilize the contact point between the sciences and the arts to highlight how the material conditions of architectural sketching render it effective. In effect, this is a plea to re-embody sketching practices.

Moreover, I examine the inherently practical and encultured aspects of sketching practices, as well as what I regard as a defining characteristic of cultural techniques: they enable, sustain and stimulate an experimental system around themselves. But such a culture is necessarily predicated on material conditions: ways of experimenting, types of sketching media, sketching techniques, the partial opacity of sketching paper, bodily and mental disposition of the drawer, accepted modes of arguing about and considering sketches... all these factors form an interlocking professional, artistic or experimental “culture” that renders architectural sketches effective and which has a recognizable logic of its own. Moreover, it requires that practitioners are initiated into this culture, shaping their professional predilections in turn.

In Section 4—the thematic heart of this article—I consider several fundamental material factors that play decisive roles in sketching practices regarded as a cultural technique. These are the role of media like ink, enabling a seamless transmission from ideas to the physical domain; the role of the bodymind in gesturing and enacting architectural ideas; and the role of sketching paper in nourishing and developing architectural ideas. Jointly, these factors constitute the “material consciousness” of architectural sketching.

The response to the question introduced above is twofold. First, I suggest that a cultural technique creates and sustains the conditions of its own efficiency. We cannot think “technique” without a broader operative context that forms the “culture” in which it is embedded, and which is sustained by it. Once we grasp this point of view, the second

aspect of the response is introduced: *architectural sketching is effective precisely to the degree that is embedded in a prior set of material and epistemic practices*. That is, it is effectively precisely because it is a cultural technique.

To understand the efficacy of architectural sketching requires painstaking attention to how concrete material factors shape a culture of practice, the minds of its practitioners and its accompanying concepts and methods. Ink, paper, biochemistry and ideas are everyday, yet determining factors of such a culture.

1.1. Role and Selection of Illustrations

For this paper, two design projects have been selected, both spanning almost two years of development. One project deals with urban design, notably the development of sustainable urban strategies for the neighborhood of Pendrecht/Zuidwijk in Rotterdam, The Netherlands. In this case, the idea was to explore and update the public space design and building architecture to adapt to the climatological demands of the 21st century. In the second project, the assignment was to formulate an overall landscape vision for the municipality of Beekdaelen in Southern Limburg, The Netherlands. In this case, the geographical features of the landscape played a major role in how the assignment was approached. Hand sketching was the primary vehicle of design development in both cases. As stated, the (philosophical) aim of this article is to explicate the nature and efficacy of architectural sketching by means of the concepts of cultural technique and material consciousness. The visuals included here serve as illustrations. They support the philosophical account of sketching provided here, highlighting points explored in the main text by visual means. Some drawings illuminate individual points that are difficult to describe. Thus, the role of drawings here is not evidential. A different treatment of such visuals is needed if they are to serve as proofs of claims that are being made. This article does not aim to establish such an evidential basis by means of visuals.

1.2. Critical Reflection on the Author as Reflective Subject

How does one critically reflect on drawings of which one is the author? The criticism can be leveled that the distance needed for such reflective efforts is lacking, ren-

dering the author's view biased, as one cannot disentangle oneself to reflect on one's own work as one does on that of someone else. Although certainly justified, in indeed the guiding thought under research in the exact sciences, this criticism can also be effectively countered. First, the emerging discipline of auto-ethnography provides a methodological framework for considering works that one has authored. In the manner that an ethnographer approaches an observable phenomenon, auto-ethnography offers descriptive methods to contextualize, interpret and extrapolate from architectural works. Important is that the collapse of the two roles (author and researcher) into one another produces a novel interpretation that an external person cannot accomplish. As authors have a degree of "privileged access" to their own minds, mental processes and memories, these sources can be effectively used in thinking about architectural research. Second, as in all types of scientific research (including the humanities and design sciences), any form of interpretation of experimental results requires a fine balance between the objective and subjective elements in the description. One must be objective in presenting the relevant features of the experiment, while also allowing one's personal (and inherently subjective) experience and skill in interpretation to interact productively. In design research, what one has designed becomes the object of inquiry afterwards, often to understand the creative process that underpins such endeavors. Once more, this discipline has established a wide array of reflective practices to create some distance between the designer, the designed and the reflection. These three approaches (auto-ethnography, interpretation, design research) jointly demonstrate that the issue need not be problematic: in the architectural sciences, it is often a given. However, it requires that one be transparent in one's reasoning, even highlighting where personal experiences inform the interpretation.

In the case of this article, the visuals are not discussed as creations that prove this or that point conclusively: they appear as illustrations of points that are in detail argued in the text. So, the reader can reconstruct the chain of reasoning that structures the argument instead of having to take the author's word that a certain drawing "proves" a point.

2. Disembodying the Drawer and the Drawn

Paradoxical as it sounds, much post-Renaissance thinking on drawing has attempted to disembody it. Sketches

have often been regarded as derivative entities, merely as outcomes of processes that precede them and that are ontologically primary. Notably during the Renaissance, drawing came to be regarded as an authorial practice, simply rendering absent objects present by visual means. This viewpoint is closely correlated to both classical and early views on the imagination: it was regarded as the faculty for visually representing objects before “the mind’s eye”^[10]. Or, in modern versions, it was regarded as a faculty for reproducing images in memory, notably in Kant’s first *Critique*. Both drawing and the imagination were viewed as means to produce visual representations.

2.1. The Authorial Architect

One of the most obvious remarks one can make about architectural sketches or formal drawings is that they visually replicate an object, rendering an unrealized or otherwise absent object visually present. Especially the development of scale drawing allowed the architect or planner to determine the properties of a building in advance. While Medieval building practices required the designer to be present on the building site, the Renaissance witnessed the architect turning into an authorial figure whose physical presence was not even required anymore. The architectural idea acquired a life of its own in the drawing. By means of visual representation, the architect could “imagine” the entire building beforehand, while others would realize it according to the instructions which had been drawn up to scale.

The invention of scale drawing allowed the architectural idea itself to be “intellectualized”. Its “evidential” character was held to demonstrate the fittingness and harmony of an architectonic idea. Rather than being embedded in a physical building site and material practices, the architectonic impetus moved on to the drawing board, where its properties could be represented in a different medium^[11,12]. While there is an entire story to be told about this development and its relation to the development of the perspective in painting, it suffices to notice for the purposes of this discussion that a certain distance between the act of (artistic) creation and the physical reality of the building site was established^[8,13,14]. The architectural idea moved from the concrete and physical to the realm of the abstract and intellectual. The turn towards the “intellectualization” of the architectonic process is not without a precedent in western thought.

In the context of discussing the architectonic nature of classical Greek theatre, Alberto Pérez-Gómez noted perceptively that while theatre evolved from participatory event to choreographed stage play with spectators, Greek philosophy likewise progressed from engaged Socratic dialogue in the *agora* to distanced contemplation in treatises^[15]. The decision to make contemplation and intellectualization the prime drivers of creative activity drove a wedge between architectural creation and its embodied, material aspects, just as it drove a wedge between thinking as a social practice and the activity of the individual mind. The “cult of genius” which is so characteristic of the 19th century (and in the form of “starchitecture” of the 20th century as well) is no surprise—it is the inevitable culmination of the viewpoint that the “genius” realizes a breakthrough on his own^[16].

The decidedly European idea of ascribing a moment of insight either to God or the unique mind of the genius fits this pattern of thought. Once the architect becomes the distanced author of an architectural idea, all the creative work is done by his mind. The locus of creation is thereby firmly located in the individual, who conceives of entire new, imaginary (or virtual) worlds. The striking architectural templates for ideal cities or visionary philosophical works like Plato’s *Timaeus*, St. Augustine’s *City of God* or Thomas More’s *Utopia* utilize this type of world-building.

That the “cult of genius” is not dead can be observed in the 20th century fascination with urban utopias, ranging from Bruno Taut’s *Die Stadtkrone* to Ludwig Hilberseimer’s *Hochhausstadt*, Tony Garnier’s *Cité Industrielle*, Corbusier’s *Plan Voisin* to the work of Yona Friedman and the *Groupe d’Études d’Architecture Mobile*, the Situationist International, Haus-Rucker-Co’s *Pneumakosm*, the far-reaching visions of the Japanese Metabolists and the late 20th-century fascination with “starchitecture”. Moreover, philosophical works following in the footsteps of Ernst Cassirer’s analysis of culture emphasized world-making, examining how human thought is predicated on conjuring up entire new realities, thereby perceiving glimpses of the imaginary within the boundaries of the real^[17,18].

The visual precision with which (scale) drawings can be produced hides the fact that they are not just replications of absent objects^[19]. While the notion of re-presentation hints at this imitative feature, to view drawings and sketches as mere *a posteriori* “illustration of thoughts” underestimates

their utility as generative instruments, downplaying the importance of the embodied practice of drawing itself. The fact that pictorial arts have often used the real world as a model only reinforces this mistaken assumption: what could be more natural than to assume that the painter or designer intends to replicate the “real world”?

Neither does it help that in the case of architecture, especially technical drawings *must* faithfully represent the properties of an object to ensure correct realization. Details, proportions and materials must be represented with metric accuracy. But even if we grant this correspondence between drawing and object, we are no closer to understand the efficiency of architectural sketching in the process of developing an idea or architectural concept. After all, we should reiterate Jean-Luc Nancy’s critical question here: was drawing meant in the first place to represent at all^[20]? Was it—like text—meant to signify? Moreover, we can immediately ask a second question: what does it mean to visually replicate a building detail or floor plan? The drawing is not the plan—it is of a very different order than the built object.

The conception of sketching as intellectualization or illustration smuggled a dubious assertion in: that sketching and drawing merely illustrate an idea that is already present in the mind. How else could one visualize it? However, this conception has been repeatedly criticized—and, as I will argue later—for good reasons^[10,16,18,21].

Summarizing, the first way of disembodied drawing practice was to downplay the act of drawing itself. By replacing it with the notion of drawing as illustration or an instrument of intellectualization, the practice itself (particularly its embodied and integrative aspects) were side-lined in favor of a moment of “creative conception”. What replaced these embodied aspects was the notion of drawing as an intellectual exercise, the victory of reasoning and proportional scale over artistic acumen, gesture and indeed a type of refined sensibility required for successful creation.

2.2. Sketching as Decision Theory

With the advent of post-war design theory during the 1960s and 1970s, the view of sketching as representation was reiterated, but this time, drawing was regarded as an instrument for heuristic thinking. This line of thinking that reverberated all the way through to the 1990s^[22–25]. Visual representation was held to be a technique for navigating an

abstract space of possibilities. This thought gained such currency that the problem space was regarded as “the fundamental category of design”. Consequently, sketching was seen as a specialized form of “fast and frugal heuristics”, allowing designers to navigate “ill-defined” or “wicked” problems. Only in the first two decades of this century became the properly expressive features of drawing once more to the fore. Architectural design embraced the spontaneity and sometimes disruptive potential of drawing. It embraced what Sir Peter Cook called “mobile and extensive addition of evidence”^[26] (p. 172).

When the practice of architectural sketching attracted academic interest during the 20th century, it stirred initially the curiosity of researchers who had close links to the newly developed sciences of cybernetics and decision theory. As it was recognized that representational practice could effectively deal with complexity and the open-ended nature of “wicked” or “ill-defined” problems, architectural sketching was regarded as a special way of problem-solving. Moreover, the creative process in which drawing took place was framed as a largely cognitive process, once more an intellectual exercise in rational decision-taking. The designer, framed as a rational optimizer or *homo economicus*, was held to represent the most feasible options visually, re-integrating them in an evaluative reasoning process, ranking and further optimization. While the “first generation” of design theorists were correct regarding the heuristic properties of architectural sketching, they were also limited by their view of human cognition. By viewing it as the faculty for rational optimization, sketching became just a means to an end. Once more, the idea of sketching as intellectualization informed this perspective, but this time, it merged with the conceptual frameworks of cybernetics and decision theory, casting an old idea in a new form.

So, sketching was still viewed through a representationalist lens. As many protocol studies indicate, researchers assumed that designers were “representing” the problem they worked on. By asking them to verbalize their thoughts while sketching, they attempted to reconstruct the drawing-aided reasoning process. But as the titles of Lionel March’s and Horst Rittel’s seminal works—the 1964 *The Logic of Design* and the 1988 *The Reasoning of Designers* respectively—indicate, we run into a fundamental problem: we would like to learn the *thinking* of designers, not merely

their *reasoning* or their *logic*. Moreover, for the purposes of the present paper, we would like to understand how the material properties of the drawing materials inform design thinking. Why is a cultural (and decidedly aesthetic) technique required for architectural designers to think effectively at all? Already, a first suggestion has been made: what seems to be missing is the recognition that a finely honed sensibility for artistic creation enhances effective reasoning processes. Or, alternatively, how the two skills are effectively conjoined in an integrative practice.

So, we witness another way of disembodying sketching practice: the lived body was regarded as the tool that produced the sketch, but the “real” process for which sketching was utilized was once more reduced to the domain of the intellect, this time in the guise of information processing. The lived body played an unduly limited role in it. The sometimes shockingly abstract flowcharts of design processes testify to this view: the human being was regarded as the information-processing machines that many cyberneticians adored.

3. Culture as the Environment for a Technique

As discussed, sketching has for a long time been viewed apart from its embodied, enactive and embedded components. Recently, so-called 4E conceptions of cognition, following on pioneering work in embodied cognition, have gradually started to replace older ideas about the relationship between body and mind^[27–30]. Drawing on evolutionary psychology, the underlying concept is that cognition is best understood as irreducibly embodied phenomenon, enacting its choices in an environment in which it is embedded. Consequently, it seems within this conceptual framework better to speak about an integral “bodymind” rather than a separate “body” and “mind”^[31,32].

If we view sketching practices as visual representations or heuristic instruments (like the first generation of design theorists did), they become mere tools for a prior, intellectual process, executed by a disembodied Cartesian *cogito*. However, we should turn our viewpoint radically around in this case: without a body, no sketching occurs, as a veritable literature in the cognitive sciences demonstrates. Just as the body and the art of dancing are intimately connected, so too

is the art of sketching coupled to the body and the affordances it provides. Technical skill is required to master pencils, thin liners, thick markers or charcoal. The history of science is full of examples in which technical competence is required to render a new method or invention effective. One of the most famous examples is the invention of the scalpel. It allowed for enormous breakthroughs in anatomy but required its inventor to devise a method to operate it effectively. Only competent users could unlock its potential as an analytical instrument. The analogy with the scalpel is not coincidental: medieval architectural drawing practices demanded that a shallow incision be made on parchment which was filled up with ink. Like the scalpel, the drawer’s knife demanded precision and concentration, creating a permanent physical mark.

3.1. The Embeddedness of Architectural Sketches

For the purposes of this discussion, I focus on a particular feature of sketching practices: they are *embedded*. They do not take place in an ideal, abstract space, like the first generation of design theorists stipulated. Even while modern science invented a geometric order of representation and used drawing (notably coordinates and line graphs) to transmit its findings, the art of sketching itself is embedded in a contexture of (I) affordances processed by the embodied mind, (II) the materials being used, (III) the limitations of technique and (IV) mental processes that function in conjunction with all these factors.

The transference of fluid thought to fixed material (the literal translation of the Greek *skeziado*—to sketch) is not a process of jotting fully formed ideas down that were already there. Such ideas do not exist in a kind of limbo, languishing there before the hand of the artist sets them free. Instead, ideas change and evolve when exposed to the material conditions of sketching practices. They interact with a variety of material factors that are just as important as their conceptual contents.

The reciprocity of the mental and the material relies on the physicality of the body: one must gesture to make lines; master the technique of holding the pen; check the accuracy of a perspective; project lines and planes. The recent 4E account of cognition connects the notions of physical embodiment and a material environment with the inherent

performativity of acting out lines through gestures. And what is sketching, if not a continuous, formative practice?

Sketching is naturally enactive: one must not merely draw a line; one must enact what it stands for. A sweeping line demands a sweeping, rounded gesture. Precise lines demand slow, painstaking acumen and prolonged concentration. Spontaneity in a line is one of the hardest skills to master, as it must be purposively enacted without losing its spontaneity and vitality—an almost paradoxical assignment.

Indeed, in Chinese thought on painting, the “efficacy of the line” has even begotten its own concept: *shi*. This term denotes many different yet overlapping notions: it has been respectively translated as force, dynamism, vitality, effectiveness, spirit or expressiveness. It is all of these, and yet not of them precisely. Jullien describes it as the capacity of an artist or author (or even a military strategist or politician, since the concept is generic) to make optimum use of the disposition of things, events and circumstances^[33] (p. 32). It is the “potential born of disposition”. That is, *shi* is at the disposal of those who understand a situation and the forces at work in it. A skilled drawer knows the paper, the medium, his intention, how to develop an architectonic idea... combined with the means at hand, intentions, skill and control of the medium determine how well an idea materializes. So framed, *shi* encompasses technique, understanding, insight and attitude.

Not coincidentally, definitions of *shi* differentiated widely in Chinese thought. The body of the artist, his state of mind, his life experience, the properties of the brush and the ink all contribute to the field of circumstances that come together to produce a compelling artwork. These factors figure into the production, while it is the integrative skill of the artist to “make the most” of the circumstances in which he finds himself.

With regard to the third technique of “hiding tip”, Cai Yong explicated that it is realised by “making an initial movement in the direction opposite that in which the brush must travel, both at the beginning and at the completion of the ideogram, thus concealing the mark made by the brush tip at the start of the stroke.” Descriptions like this act as guides to both the quality of brushstrokes (shi of brushstroke) and the movement of body (shi of body). To

some degree, it can be said that the gesture of the body, the movement of the brush and the form of a brushstroke are simultaneous equivalent^[33] (p. 108).

Not surprisingly, Chinese thought emphasizes reciprocity: communication between the body and skill of the artist, the medium and the properties of the object depicted^[34]. How well a line captures an artistic intention depends on how these circumstances are balanced. A fleeting cloud demands light, floating lines; a majestic mountain range demands lines that express its jagged peaks and imposing size:

[I]t is shi that “gives life” and that makes the slightest dot or stroke vibrate, as if we were re-living the moment of its execution. Shi always enhances what would be mere empty representation without it, for shi gives depth to a representation and exceeds its concrete limitations by revealing within the actualized static form, a dimension of perpetual, soaring flight^[33] (p. 178).

Shi is the quality that pushes a sketch beyond mere representation, rendering it performative and revealing an inner dynamism. But this dynamism is embedded in a form that—once drawn up—appears as static yet is still open-ended. The “soaring flight” has been enacted and has been embedded in a system of material conditions. Moreover, the concept of *shi* provides a handhold to interpret the notion of embodiment for architectural sketching: the intention of the author is visible in the character of the stroke. It possesses an inherent openness that seems to point beyond itself. The point made in Chinese thought is quite radical: the bodily comportment of the author determines the degree to which a work (be it a sketch, painting, or poem) will exhibit a vital quality that invites and stimulates interpretation.

In that sense, the author is not an agent producing symbols, but the initiator of a process that refuses to settle for a fixed definition, and that displays multiple qualities at once or in succession. It has been put elegantly into words by Jullien in his detailed examination of Chinese painting and calligraphy:

Rather than an imitation of an external object set up as a model and considered only from

a perceptual point of view, what is at issue is a power of figuration that anticipates the entreaty emanating from beings and things and joins them in the internal aspiration that makes them exist, leading them to employ^[35] (p. 111).

According to this line of thought, the sketch is not a representation but the “power of figuration” in action. By making entities exist by visual means, their power “employs” itself. What is needed, however, is timing and technique to align the circumstances in such a way that the employment takes place.

This conception of the power of figuration chimes in with architect Marco Frascari’s notion of the *brouillon*: a drawing that is generated again and again to make the essence of an architectural idea emerge. The *brouillon* is not figurative but tries to catch multifaceted essence of an architectural idea^[36]. Its value lies in repetition: every time the drawing is made, a slight difference, whether in bodily comportment, state of mind or media imposes itself on it, becoming part of the idea. For Frascari, this process is part of the inherently “slow sapience” of architecture^[37]. Architectural ideas divulge not all their contents at once. One must become acquainted with them. As Paolo Belardi has emphasized, to say something new, one must know an idea inside and out, editing, subtracting and changing elements here and there^[38]. There is as it were a continuity with the past, a slow positioning and maneuvering relative to what it perceived, a feature we will discuss in section 4 in more detail.

The embeddedness of sketching practices requires a conceptual framework that does justice to these many, simultaneously acting aspects. The disembodiment of drawings fatally underestimates the degree to which the effectiveness of sketching can be traced back to its material origins. In fact, we require a re-embodiment or re-embedding of sketching practices to fully comprehend their utility. One way of re-embodimenting the sketching practices is to examine them through the lens of a “cultural technique”.

In German, techniques like writing, algebra, sketching or reading are referred to as *Kulturtechniken*, cultural techniques^[8,10]. Human civilizations have used these techniques in various times and places to construct *cultures*, sets of habits, norms, modes of relating to the world or devising conceptual frameworks to transmit the core values of their society. Cultural techniques all rely on combined material

and symbolic practices^[8,39,40]. Whether we speak of dance, reading, theatre or painting, what unites these cases is the fact that they constitute a material-symbolic practice. Likewise, can discern their inherently performative aspect. To deliver a speech, to perform a dance or reading, to act out a certain role, or to complete a painting requires a combination of sustained effort, skill and sensibility to bring the contents of the work to life. The same principle applies to architectural sketching. The concept of *shi* emphasizes the importance of skill: a line might be drawn with vigor and life, or without it—in which case its efficacy is severely diminished.

Not just any technique is a cultural technique. To see why, it pays off to consider that the word was first used in an agricultural context: the techniques of farming were “cultural techniques”^[41,42]. Right away, one notices the link to the theme of cultivation: cultural techniques are not just meant to complete a given task, but to sustain an order of operation. In the case of agriculture, such techniques ascertain not just that crops are grown, but that they can be grown for the foreseeable future. Fields are cleared, weeds are removed and the soil is prepared for farming. We should not be surprised that in Chinese thinking on sketching paper, even the paper itself is seen as the soil on which ideas are grown:

The architect’s drawing surface is not merely a neutral support awaiting the appearance of meaningful marks. Like soils on a site, drawing board materials impact the work. The drawing sheet is an active participant that is already propitious, or, as Chinese calligrapher Li Yang-ping wrote, excellent drawing paper is ‘generative’ (sheng-chih) in that even when unmarked, it is not empty because fine paper is ‘endowed with life like fertile soil’. Paper’s qualities can inspire the consideration of a particular site’s qualities^[43] (p. 35).

Cultural techniques are predicated on practice: like the farmer, the artist or architect must “work the soil”, so to speak, to generate an idea. Through this practice, the possibility for innovating and developing the practice itself becomes explicit. In every design process is therefore the possibility to extend and refine the design process itself. Its methods fully imply this recursive potential (pp. 366–367)^[10,40].

This simple fact is a first pointer to see how the embedded nature of sketching is integral to its efficacy as an

instrument of creation: its technique is always a compound of factors. In this case, between the sketching hand, the instrument that it wields, the fluidity of the medium, the experiencing mind and the receptive paper.

Extending this inquiry further, we might legitimately consider factors like the biochemical state of the drawer's body. What if the architect was nervous while making the drawing? In that case, adrenaline, dopamine and the resulting muscle contractions are part of what the sketch becomes.

Anecdotes cannot be used as evidence, but it was an abiding fact among urbanism students across all my study years that the best sketch was made in the night before the final studio presentation. Why this late moment? Is not a reasonable speculation that at that point, anything superfluous has evaporated from the technique? There is no time to engage in inessential business, and at that point, true technique or efficacy shows itself. Only when faced with a limit, and through emotions like frustration, or through bodily states like exhaustion or elation, shimmers an idea through.

What is often framed as a "moment of insight" is the moment in which much hard work comes together—or when *shi* is present. It reaches its generative zenith in a confluence and strategic alignment of factors: bodily, mentally, materially and technically.

3.2. Sketches Embedded in Experimental Systems

Still, such moments of insight imply a careful calibration between the elements at play in sketching: a proficient artist or designer must be trained in the ways of their art; possess a degree of technical skill to embody these insights visually; must critically think what to sketch and which roads to explore; must be receptive to what the sketch—the externalized process of formation—tells them. Here, we encounter what Knorr-Cetina has called an "epistemic culture"^[44]. That is, a collective of practitioners that share practices, norms and discourses to jointly make sense of, interpret and develop what they produce. The areas in which Knorr-Cetina conducted her studies were the sciences—biology and physics, respectively. But her findings can be straightforwardly extrapolated (if appropriately adapted) to various epistemic cultures, including the arts or architectural design.

First, epistemic cultures are characterized by experimental practices. These practices are predicated on a com-

plex of material artefacts, instruments, methods, procedures and circumstances. Epistemic cultures include what Hans-Jörg Rheinberger has termed "experimental systems" (pp. 21–23)^[45,46]. Somewhat radicalizing Rheinberger's thinking, we can state that each experiment—scientific or artistic—is materially embedded. The environment of instruments and practices determines how experiments are conducted, what can be investigated, how answers are interpreted and how practical solutions are improvised during experimentation. In a series of fascinating studies on the development of cell biology, biochemistry and genetics, Rheinberger raises three important points:

1. Each discipline faces its own, unique problems while experimenting. For instance, cell biology relied in its development on various magnification techniques and increasingly sophisticated preparation of samples^[47] (pp. 314, 315, 317, 320). These practices determine what can be examined and how it appears. For sketching practices, this means that the materials determine what can be drawn and how the result appears. Likewise, they also determine what remains hidden or implicit.
2. In any experiment, we deal with a sense of "touching" the subject matter. For cell biology, this involves extracting cells with a probe, injecting chemicals to make certain contours light up or excising tissue^[47] (p. 317). For sketching, this is often the literal contact point between the tip of the pen and the paper, but likewise, the touching point between immaterial idea and material constraints. Moreover, even taking the lessons of quantum physics seriously, observation itself is a form of touch. One regards a sketch, and immediately, this affects one's understanding of it.
3. Experiments involve not just experimental materials and methods, but also the documentation proliferating around them^[47] (pp. 314, 324). This documentation ranges in the sciences from research reports, correspondence between experimenters, lab instructions etc. In architectural design, such documentation involves preliminary sketches, discarded jottings, sections, elevations, reworked models, etc. If we examine such documentation, a detailed picture of experimentation emerges: it is a thoroughly dynamic, constructed phenomenon, sensitive to new outcomes as well as

hunches, intuitions and guesses.

Due to its material organization, all forms of experimentation open new spaces for discovery, or what could be called an “experimental culture”^[46] (pp. 164–165). The ways in which an object is “touched” or “prepared” co-determine how it appears. The experimental system constitutes a set of possibilities for the new to appear under stable circumstances^[45] (pp. 26–29). It provides a certain material stability for results called “*handhabbarkeit*” by Rheinberger. This notion can be roughly translated as “maintainability”. In the etymology of the term, we discern the importance of touch: the hand is an integral part of the operations that keeps the experimental material available, so that information can be derived from it. The very notion of understanding (*begreifen*) implies grasping (*greifen*). In turn, this suggests a degree of fixity, of holding on to or maintaining a set of conditions for experimental purposes.

For good reason, the philosopher Vilém Flusser predicated much of his phenomenology of gestures on what he called “*ein suchendes begreifen*” (a searching understanding)^[48]. To understand is to touch, to engage in haptic ways of exploring the unfamiliar, just like a blind person might touch their surroundings to navigate. The idea of touch—as Rheinberger’s observation emphasizes—implies a precarious balance between knowing what one encounters and what remains hidden. Likewise, it implies that one discerns how the touch changes the subject matter. As philosopher Alain Badiou put it, the question of drawing is not “to be or not to be”. Instead, it is “to be *and* not to be”^[49]. Presence and absence, the proximate and the suggested, the untouched and the touched, the direct and the delayed—they occur simultaneously, transformed by hapticity:

Even if drawing is, as they say, mimetic, that is, reproductive, figurative, representative, even if the model is presently facing the artist, the trait must proceed in the night. It escapes the field of vision. Not only because it is not yet visible, but because it does not belong to the realm of the spectacle, of spectacular objectivity—and so that which it makes happen or come [advenir] cannot in itself be mimetic. The heterogeneity between the thing drawn and the drawing trait remains abyssal, whether it be between a thing

represented and its representation or between the model and the image^[50].

Sketching balances on the precipice between the known and the unknown, the not-yet visible and the growth of form. It is not illustration, but the practice of encountering the unknown as it emerges on paper. It is thoroughly generative, in the sense that its efficiency sustains its own creative potential. For this reason, Derrida invokes the tension between the line, which is not yet visible, but which becomes only intelligible afterwards. The “abyssal” element is required to produce the new, which can be understood as the coming-together of many material factors.

Examining such material factors, Bernhard Siegert frames cultural techniques as “operative ontologies”^[51]. Experimental systems should not be understood in terms of classical, abstract ontologies that come with their own distinctions. Instead, Siegert suggests that we should closely scrutinize the level of the concrete (or *ontic*) if we wish to understand how cultural techniques function. Grand distinctions like being and nothing, internal or external, pure or impure etc. derive from classical ontological schemes. But once we pay close attention to what occurs in artistic and scientific experiments alike, concrete operative factors allow us to discern how of understanding unfolds through practice.

Not coincidentally, there is a close conceptual link between the “maintainability” of the sketch and the notion of Heidegger’s *Zuhandenheit* (ready-to-handness)^[52]. The sketch renders an idea tangible, keeping to ready to hand. This allows for manipulating an idea or exploring its potentials through bodily engagement. The “touch of the hand” in sketching gesturally and expressively “makes sense”. It is not that sense or signification erupts from the drawing, as if every image is a like a text to be read. Instead, in keeping an idea close to hand, sense is actively manufactured, even before its visual representation is completed. It assembles itself in the host of materials that surround and sustain it.

Here, the productive dynamics of “experimental systems” touch on the Jean-Luc Nancy’s conceptual triad of meaning, signification and exposure^[53] (pp. 53–64). For Nancy, signifiers like words, sentences or images (sketched or otherwise) never exhaust the totality of meaning. There is no closed system of signifiers that generates an ultimate, stable meaning. Instead, meaning simply *presents* itself—according to Nancy, meaning itself lies beyond represen-

tation, but it is through multiple significations that we apprehend it. This thought bears remarkable similarity to the concept of a line's efficacy (*shi*). In a purely expressive manner, the line presents itself, even while its presence does not yet represent anything. Even before it has any value as a representation, it already touches the cognition through its discernible qualities.

Examining the moment of touch, Nancy invokes the concept of exposure: by exposing ourselves, meaning emerges. Blind persons must expose themselves to their surroundings, giving themselves over to it so that it reaches out to them. In a similar manner, sketching demands an active and searching attitude. The drawer requires a "searching understanding". In experiencing limits, new conditions, intensities and affects, new patterns of coherence emerge. It is not far-fetched to extend this reasoning to experimental settings. Whether in a scientific laboratory, an artist's studio or at an architect's desk, the materials involved in the experiment are allowed to present themselves. They can be touched, manipulated and maintained for prolonged periods of time.

If we apply Nancy's reasoning to architectural sketching, we can see that it continually exceeds signification, as it is more akin to organizing and directing a formative force than to depict an idea that has already been formed in the mind. What Derrida described as an "abyssal" element points to this continuous excess, an overflowing abundance of meaning.

3.3. Cultural Technique and Operational Culture

Second, epistemic cultures are characterized as spaces of exchange and encounter. Experimental results appear under certain forms, and are interpreted, compared and deepened. Critical flaws come to light and demand solutions; problems caused by the experimental setup emerge and material breakdowns demand a re-orientation of ideas and values. The result is a particular operational culture in which the minds of practitioners are "encultured". That is, they are shaped to respond with precision to the type of subject matter that is their experimental system.

While for the sciences, a space of discovery is organized in a laboratory or a clinical trial, for the artist or architect, it is organized in the materials used to sketch, ranging from the paper and the table to the gestures ingrained in the bodymind, the habits of thought that the encultured mind deploys and the formative force inherent in the sketch^[54].

What in the context of the sciences has been called "the space of discovery" is not a problem space of abstract possibilities, but the practice of exposing oneself to the conditions enabled by the experimental system, in this case the sketch.

The epistemic culture is a place of *enculturation*. What is usually designated as *Bildung* in German humanities (notably in work of Hegel, Dilthey and Gadamer) is the process of initiation, becoming acquainted with the techniques required to manipulate the material of one's craft. While the word *Bildung* could be translated as education, its significance stretches well beyond this definition, and is closely related to appropriating cultural techniques. As discussed, cultural techniques presuppose and sustain a culture of practices and norms, tools and skills. To become encultured is to acquire the skill to "merge" with the subject matter: one thinks through sketching. Through cultural techniques, the subject matter appears as relatively well demarcated (thus graspable), but simultaneously as open-ended (allowing for further exploration).

The etymological link between *Bildung* (education, formation, cultivation) and *Bild* (image, picture) should not surprise. The practitioner is through practice shaped into an ideal image of his craft. What Sennett called "material consciousness" refers to the skill of thinking through the materials of one's craft. As Downey and Lende have convincingly argued, our brain is the most encultured organ we possess. It is malleable and receives much of its form from the outside. Skills like learning, remembering, manipulating symbolic systems and projecting our thoughts are all neurologically anchored. They shape the brain that enables them, including the nervous system and the regulatory systems of biomarkers^[55] (pp. 23–25).

At least as important is the fact that sketches appear on a demarcated surface. It is as it were a plane or "proper space" in which ideas appear *as* ideas. Just like the laboratory is a space where material and media are organized to reveal regularities or patterns, so too is an artist's studio or architect's drawing board a space for materially organizing the elements of an idea.

4. Marking out the Space of Sense

So far, I have spoken little about architectural sketching *sensu stricto*, merely introducing the conceptual framework

for examining it. Following Siegert's appraisal of the ontic (concrete) level, we start with operational factors. In the case of sketching, with marks, sketching instruments (pen, pencil), media (ink, charcoal), enactment (gesture and hapticity) and lastly, the paper (in this case, tracing paper). This range of material factors is certainly not complete. Yet, it provides a few fundamental handholds. In this section, examples are drawn from urbanism and landscape architecture, illustrating various aspects of the material efficacy of sketching.

4.1. The Force of the Mark

Each marker is intimately connected to the hand and the exertion of force. Whether a line appears as robust, fragile, thick or decisive is determined by how the implement is held and which force is applied. The link between the verb "drawing" and the application of force is fundamental: originally, drawing implied pulling a hard point across a rock to leave a visible mark. Drawing is thus in its foundation like carving: even well into Renaissance, parchments had to be carefully cut, whereupon the carvings were filled up with ink^[56] (p. 29). In a metaphorical sense, one might think of this drawing activity as "carving reality"—new possibilities are engraved on an existing order. Right away, this imposition of a new order signifies the potential of drawing, almost its violence: as if the world is treated with the same rigor as the scientific sample. As Nancy puts it: "Drawing is the opening of form (...) participating in a semantic field where act and force (*puissance*) are combined"^[20]. The pen or pencil becomes the point of contact between an idea and its material manifestation. As Nancy emphasizes, drawing inhabits the paradoxical twilight zone between what is forming and what is formed. The moving tip of the pen contributes to an idea forming itself^[20] (pp. 11–12). As such, all sketching is to some degree recursive: the forms that appear contribute to the formation of form itself. From a purely logical viewpoint, this statement is nonsensical, it disrupts the linear order of cause and effect, of idea and realization.

Logical considerations notwithstanding, this formative force (*forme formatrice*) demonstrates something about the efficacy of the hand-drawn line: it is the contact point between a visual force that dynamically changes the understanding once it becomes visible^[57]. This feature—hard as it is to catch in determinate concepts or propositions—characterizes drawing. Understanding is not something that occurs once

all the facts have been neatly lined up. It occurs during and through the act of giving form to an idea. Once more, this form-giving is a process of "searching understanding". The act of comprehension is not the terminus of a process of searching—in sketching, understanding is implicated in the ongoing act of formation, of form-giving itself.

In this sense, the alternative Dutch term for design—*vormgeving* (lit. "formgiving")—is directly relevant. The sketch gives form to an idea; but this form contributes to a renewed understanding of the idea that is being expressed. To give form, then, is to allow the form to give a renewed and deepened understanding back to the drawer. The recent tendency to regard marks as "traces" is understandable, and even informative if one aims to trace how ideas develop. Yet, there is a clear and present danger to interpret them as words or sentences, rather than as pure expressions. There are analogies between sketching and writing, but one should not reduce the sketched mark to the written mark.

Making a sketch takes time, but the result is directly experienced (p. 195)^[58,59]. It has been aptly said that putting a line on paper amounts to creating a condition^[60–62]. From its very inception, the line orients the surface on which it appears, bringing an order to it that allows for perception and thought to develop in parallel:

Labour intensive, slow architectural lines belong to the aging cellar of a refined multisensorial and emotional understanding of architecture. Without a lingering drafting sapience, there is not architecture and the drafting sapience originates within architects' compelling material imagination. Sapience stems from thoughtfully sensible considerations on how material transforms into matter and this is the foundation of thinking in architecture^[37].

The order that is brought is a form of sapience or slowly sedimenting, accruing insight. Like the scientific experiment, it allows for certain contours to gradually foreground themselves, thereby deepening the understanding. For sketching, a certain speed is required, allowing for spontaneity and to some degree coincidence to occur. All these spontaneous explorations allow jointly for a refined and ultimately layered understanding of architecture. Sketching is indispensable for reaching an understanding that resonates with all aspects of the human condition, and which is reflected in architecture.

4.2. Ink: The Fluidity of Thought and Medium

The sketch is a medium of exploration^[63]. Quick strokes of a stylus, brush or pencil enable the “coming together of inner and outer perspectives”^[37]. Ink—diluted or pure—was the medium through which ideas could be made intelligible, but also allowed different “speeds” of drawing. the hand imitating the quickness of the object of study. For good reason, there is quite a history on the preparation of high-quality ink, as this medium is ubiquitous throughout drawings^[43,56,64] (p. 102).

For many architectural drawings, such spontaneity was not available. Whether an outline of a building was erected on a building site or on the drafting table, the process of carving and inking—and later of pencil lining and inking defied spontaneity over procedural sequence. Yet, such drawings were not without a dynamism of their own, especially when ink was diluted, and washes could be added.

A similar forward-thinking convention was used in architectural drawing during the 19th century: building elevations were shaded, using a 45° angle, with the light entering from the top left corner. Even while the real building might be positioned differently in reality, this convention showed the depth of various projections. To prevent the drawing from becoming too dark, diluted ink was used for shading, overlaying the lines of the elevations with an extra layer that represented the play of light:

Shading was characterized by the application of dilute ink washes to produce graduated areas of tone to suggest the modeling of three dimensional forms or the affect of light. To create the graduated affect of shading, architects traditionally relied on flat tints of a single dilution of ink evenly applied in layers over a decreasing amount of the area to be shaded. This technique resulted in clearly defined areas of tone progressing from light to dark^[64].

Thus, ink was used to make drawings layered, adding elements of shading and lighting to suggest depth and movement. In sketching, this technique was used to create images that were suggestive rather than accurate. Indeed, the cult of the “master sketch” was largely predicated on this skill: to use a few effective lines that supposedly caught the “essence” of an idea without literally drawing it^[16].

Partially, sketching media determine what stands out and what recedes. There is a double movement here: tools that prioritize certain features obfuscate others; conversely, even a blurry splotch or shading might catch a precise movement or suggest a possible interpretation:

The pure expression of ink may be found in the energetic splash, while gypsum’s truth lingers in the formless mass. Like the silhouettes and patterns of mountains, clouds and stars, the plastic results are most often irregular and amorphous^[65] (p. 55).

The “fuzziness” of such fluid media is their greatest asset—they allow for pure expression without concepts. Once a medium becomes imprecise, its range of meanings (or its formative force) increases, opening forms in the sketch to a process of interpretation. Consequently, its agency and possibilities must be organized, but also taken advantage of. When Derrida characterized drawings as possessing a gift and a debt, he indicated exactly this feature: a drawing must be appropriated, as it is not only the author who “gives form” while drawing^[50] (p. 30). The drawing itself gives form back, engaging in a “conversation” with its observers^[66]. The idea of *shi* (efficacy) entails just this: the effective use of media requires effort but gives form back. Yet, there must be an act of appropriation, of opening up to the drawing, not just in the simple sense of perceiving it, but in allowing the expression to speak. This openness is *shi* in action: what happens is not that one interprets, but that certain visual and even tactile qualities rather than propositions or statements coalesce into the foreground.

Ink (and media like charcoal or pencil) allow for the shortest distance between thought and expression, while retaining the largest possible flexibility in negotiating between the two.

4.3. Engaging the Bodymind through Sketching

As embodied practice, sketching draws effort and expenditure into itself, directing the perception, indeed shaping behavioral patterns. Gestures are not mere embellishments of thoughts or ideas, but an integral part of thinking itself^[67,68]. As architectural theorist Juhani Pallasmaa has worked out in his detailed study on the “thinking hand”,

gestures enable the drawer to “fuse” with the subject matter, investigating and extending its properties through tactile and haptic engagement^[69,70]. The effect of embodied engagement is that persons within an experimental system predicated on sketching develop the skill to explain the fundamental features to themselves or others^[71–73]. Sketching activity is searching and purposive, even if it comes across as lacking direction. It allows for a direct and intimate entanglement that serves as evidence or confirmation of an underlying idea (**Figure 1**). Learning is implied in

sketching. The sketch keeps many elements in play, so each sketch is a conglomerate of cognitive grips on an issue or problem. In **Figure 2**, we see how structural landscape elements are depicted as purely visual structures, while their spatial relationships are explored via a section. By working on both sketches in parallel, new ideas for situating villages in an existing landscape could be worked out with respect for older, agricultural structures. “Parallel processing” of information is required to keep a tangible understanding of the spaces one proposes.

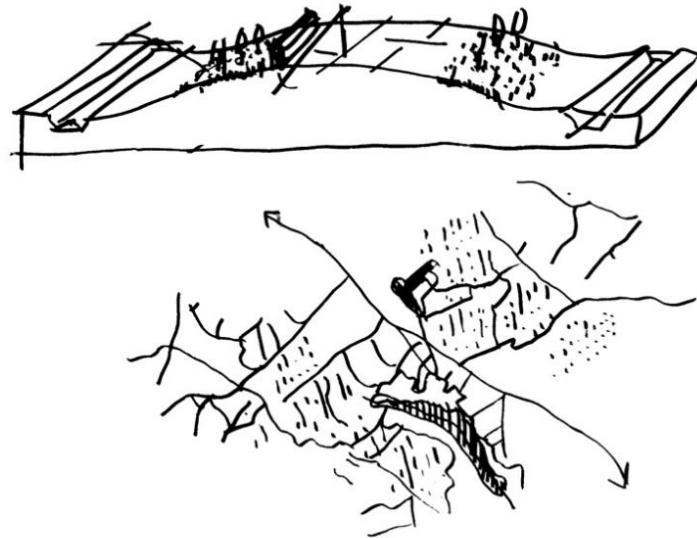


Figure 1. Sketch that combines a section (above) and a structural analysis of landscape elements (below). In this sketch, different levels of precision, causal chains and viewpoints co-exist and inform one another.

Source: Paans, 2022.

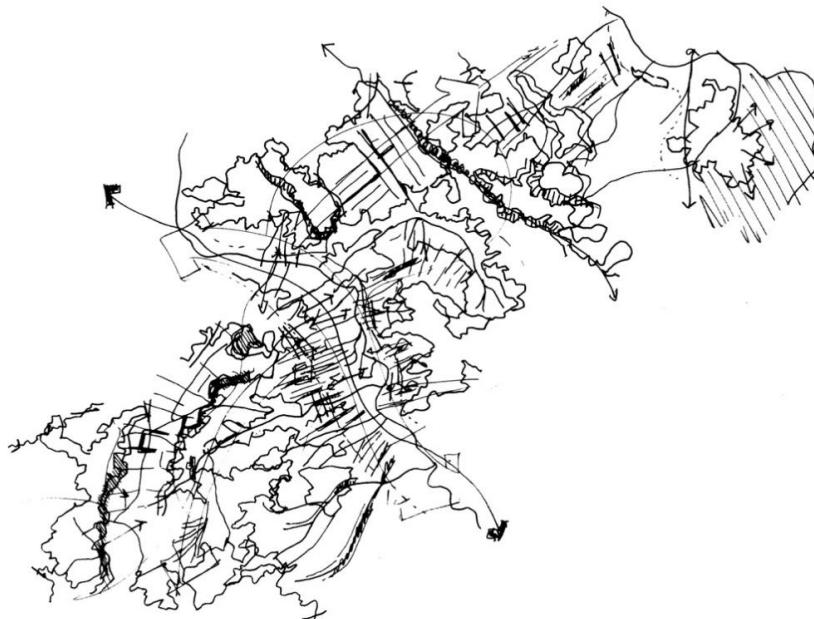


Figure 2. Tracing of overlapping landscape features, resulting in an analytic image that is structurally precise and in its combination of factors experimental.

Source: Paans, 2022.

While gesturing, the bodymind creates and refers to perceptual symbol systems (PSS). These PSS are layered neural traces that contain some of the motor information of the gesture that was executed in working an idea out^[74]. As there is an intimate link between gesturing, language and procedural memory—that is, knowledge on how to perform certain actions—the combination of speaking, sketching, gesturing and perceiving leads to a rich, multisensorial understanding^[75,76].

The gestural connection allows one to conceive not (yet) imagined possibilities by operating via an aesthetic pathway. Contra the notion of intellectualization, sketching utilizes this aesthetic approach to nurture understanding. Fittingly, this has been called an “epistemological aesthetics” or the development of knowledge via artistic practices in which multisensorial understanding achieves insights^[77,78]. In the case of **Figure 2**, the overlapping of structures and developments leads to a visual pattern that is open to multiple interpretations, leading to new possibilities. It is important to resist closure: the meanings inherent in the structure must be allowed to present themselves.

This aesthetic approach treats lines as if they were processes instead of depictions or propositions^[79,80]. The multisensorial understanding results in significant cognitive changes, notably in grasping new possibilities by tracing structures. One might call it a transformation of one’s “affective frame”^[81]. This affects for example the way in which someone relegates certain visual aspects to the cognitive periphery while pulling others towards the center of cognition. This associative ordering is importantly influenced by bodily states, including memories, feelings, emotions and affects. Literally, gestures change what we perceive and what we deem important. Rheinberger’s observation is fully applicable here: experiments allow certain features to foreground themselves, while backgrounding others.

Tool-use in general (including sketching) changes the conception of the body image, thereby altering one’s own view of what one is bodily capable of^[82]. The body image is not isolated from affects, persistent or suddenly erupting moods but is conjoined with it. For instance, landscape architect Adriaan Geuze draws attention to this feature in an article on the final assignment of one of his students:

This stage [of the design process] is about synthesis, the integration of all aspects. (...) [T]he

architecture must become sensual and physical, getting dirty hands, enjoyment. You must really look, get the design out of the world of thought, making it more erotic, more beautiful with your imagination^[83].

Integrating the different aspects of an idea does not rely on reasoning alone. Sketching is a sensual activity, a real-time change of moods, affects and atmospheres^[84]. Geuze invokes feelings of enjoyment and arousal—euphoric moods and enjoying the thrill of seeing many threads in an idea converging and materializing. To elevate the design beyond the world of thought is to de-intellectualize it to some degree, engaging its affective and emotive aspects. What has been theorized as “flow” in creative processes is on full display in sketching^[85,86]. The “formative force” is characterized by directness: the mark which can be read afterwards is made and immediately perceived, leaving a direct perceptual imprint.

On the other end of the emotional spectrum, we witness tension, feelings of apprehension or the commitment to perform. In an example, Peg Rawes invokes the example of a student on the day before her studio review:

She goes down to the kitchen to make the first of several very strong, hot, sweet coffees that she will drink over the next four hours. But it is also the day before her studio review in which she will be assessed by a group of tutors. (...). [A]nd so, the drawing will be, in part, a drawing of adrenaline, mixing desire, anticipation, worry and concentration in the process^[87] (p. 264).

Rawes’ conclusion seems correct: drawings do not just consist of ink, paper and lines. The ingredients that do not form part of their physical attributes nevertheless constitute them, even if invisible to the onlooker. And so, we close a feedback loop between instruments, sketch and bodymind:

Thus, her use of instruments and tools of constructing spaces (...) such as pens, pencils, rulers, erasers, compasses, set-squares, computer software, mouse and keyboard – to the powers of her imagination, will all be handled in the context of these feelings^[87] (p. 264).

The wider context of the sketch involves diffuse, unde-

niably material influences of stress hormones like adrenaline or feelings of elation induced by endorphins. If we apply the concept of *shi* here, we see that such bodily factors are not accidental, but constitutive of an idea. How this dynamic mixture of capability, emotional response and material affordances plays out is largely, if not exclusively, determined by technique. A process of slow enculturation, of developing thinking habits leads to a rich reservoir of experience. Nonetheless, even experience might become a drawback, as Herman Hertzberger soberly notes:

Accumulated practical acquaintance leads eventually to experience, habituation and finally routine, as a result of repeating formulas that have proved to be successful. In spite of yourself, you measure every new experience against the quality of all foregoing experiences of a like nature, so that your chances of finding something new that is better than what you already know keep diminishing, and so for most people the need to continue searching will diminish too. So we see everyone doomed by a natural process of selection, so to speak, due to the tendency to follow self-made paths, thus with a minimum of risk^[88].

Must we accept this somber conclusion? Cognitive science proves Hertzberger partially right. A robust body of neuroscience confirms the observation that repeated patterns of action cement themselves in the bodymind, altering the physical brain structure and its mental operations. As such, the bodymind is given shape as much as what is drawn.

We could legitimately defend the opposite thesis, experience can deepen and ripen, extending itself into new directions. Once more, the notion of a cultural technique becomes relevant. As discussed, an integral part of cultural techniques is to re-invent their boundaries. This is clearly shown in Rheinberger's case studies of experimental systems. Such systems evolve, allowing for asking better questions, developing more effective methods and more illuminating outcomes. Sketching would be powerless if it did not include this recursive characteristic of influencing and changing what it can accomplish. What Sennett called "material consciousness" is a wellspring of generative potential that can only be tapped into through material engagement.

Here, Chinese thinking adopts a perspective that is re-

markably close to Nancy's thesis: the painter or artist is admonished to be "cheerful" or "harmonious"^[35] (p. 165). Emphasizing the fact that body and mind must be in a relaxed state to paint "free and easy", Chinese theorists were not shy in providing many practical details to prepare for effective painting. Only when the mind is relaxed can it engage in true "seeing" or "seeing-by-becoming". By practicing a deliberate untensing (*dé-tente*), one forgets the intellect and its constrictive structuring, paying full attention to what one's mind has to offer and what appears in the drawing^[35] (p. 172). The suggestive question that Jullien asks—"is this kind of seeing not more like listening?"—can be answered with a different response: maybe it is more like touching, connecting the physicality of the body with the free processing of the mind in a visible mark that precipitates one's comportment and knowledge in a sensible form.

4.4. The Space of Sense: Tracing Paper

Paper is the first physical space in which a drawing emerges—literally on a plane, be it a table or a screen. The drawing appears as a "panorama" that one can survey and take in^[89] (pp. 62–83). It allows for some control and the framing of issues.

One of the best examples of the efficacy of this surface are rolls of tracing paper used in architecture studios around the world. A regular roll of tracing paper measures $33 \times 5,000$ cm, resulting in a surface of $165,000 \text{ cm}^2$. It consists of semi-transparent paper that weighs 50 g/m^2 and that can be used to trace existing drawings. Most people in the designing profession use them in some way or the other. In fact, the sketch roll is a very long and narrow rectangle on which ideas are developed (**Figure 3**). Alternatively, one could think of it as a line with a certain width. Customarily, one sketches on it, gradually moving along its surface.

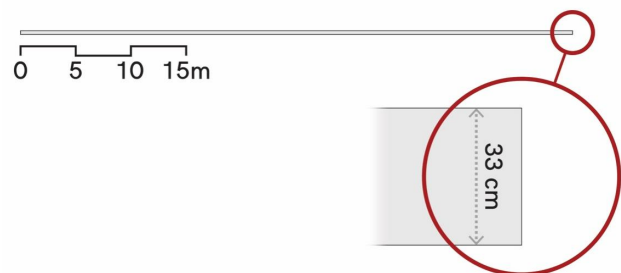


Figure 3. Proportions of a sketch roll drawn to scale. It can be viewed as a line with a limited height.

Source: Paans, 2023.

I focus on three material aspects of the sketch roll. First, the aspect of orientation, as enforced by the dimensions of the paper. Second, the fact that the sketch roll offers a space for formalizing ideas in a “proper space”. The third aspect concerns the materialization and presence of the past, activating an entire network of notions and ideas.

4.4.1. Orientation

While sketching, one works from left to right, so everything that shifts to the left during a sketching session becomes a visible archive of what was drawn (**Figure 4**). Looking to the left over what was drawn, one follows with one’s eyes the opposite direction of writing. In this manner, one acquires a glimpse of the past in a condensed, mostly

linear form, witnessing the genesis of the most recent sketch.

The physical shape of the sketch roll forces an orientation of working on the designer. Still, this limitation leads to an affective and cognitive orientation in thinking. So, multiple links between doing and thinking occur, some of which we explore in more detail here.

Occasionally, one can use the full extent of the roll’s limited height to add sketches above and below a certain idea or use a central sketch to spin a detail out (**Figure 5**). When working around a central sketch, the orientation of working and reading changes: instead of working from left to right along the longitudinal axis, a given drawing becomes a centrifugal point, or at least the point of reference for a small microcosm of ideas developing around it.

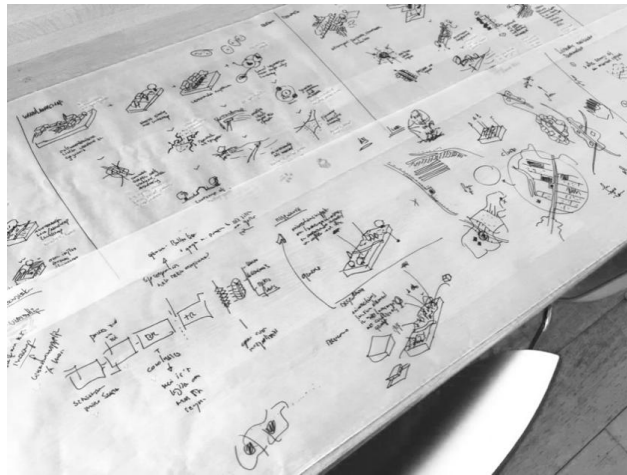


Figure 4. Section of a sketch roll, with a visual narrative broadly linearly unfolding from left to right.

Source: Paans, 2022.

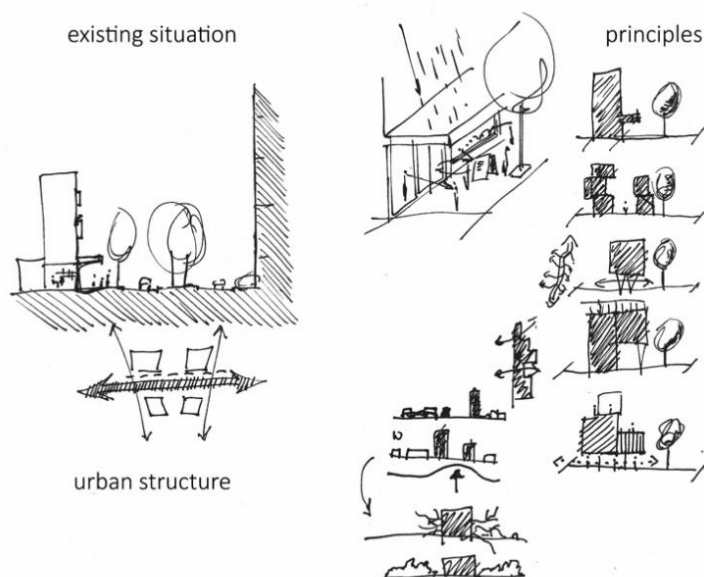


Figure 5. A compact experiment: the existing situation on the left, and compressed due to height limitations—a range of design alternatives on the right.

Source: Paans, 2018.

So-called “local experiments” in design processes can be clearly discerned on sketching rolls. Often, the central sketch provides an “overview” or concept, while all kinds of variations or aspects are worked out in a centrifugal manner^[90]. Everything that finds no place in the central sketch is worked out in smaller, auxiliary drawings. Alternatively, the central sketch provides a “strong concept” or guiding idea that directs all subsequent attempts to clarify and work out its latent possibilities^[91].

Despite these variations in working orientation, the sketch roll has no orientation in the literal sense, it is directionless like any piece of blank paper. If one sketches serially, the left-right movement gives the sequence of representations a clear direction, if only because the vertical space is limited to a height of 33 cm. There is a certain analogy with writing here: texts are meant to be read sequentially, from left to right, and from the top of the page to the bottom. They possess a chronological order that is reflected in how they are structured. A written philosophical argument unfolds in a linear structure in which the most basic components are

explained first, before any conclusions are drawn. So, the elements of a text require a certain linear relation that plays out chronologically: they are prior or posterior to another element. The utility, but equally the limitation of a written text lies in its linear, sequential ordering.

Sketches are not completely bound by this linear orientation. They exhibit an inherent simultaneity and can be read in all directions. An urban master plan with little details easily finds its place next to an intricate detail or precise section (Figure 6). The paper is a plane on which various elements with highly differentiated qualities and levels of informational precision exist simultaneously. It is this panoramic character which makes the individual elements interact with one another^[89]. This simultaneity implies also that there is no fixed chronological order or prevailing direction in which the drawing has to be read or interpreted. In the case of the master plan, different possibilities that presented themselves or that could be inferred were quickly jotted down, as an “open archive” of options. As Berdali already noted, the past is continuous with the present, seeping into it, as it were.

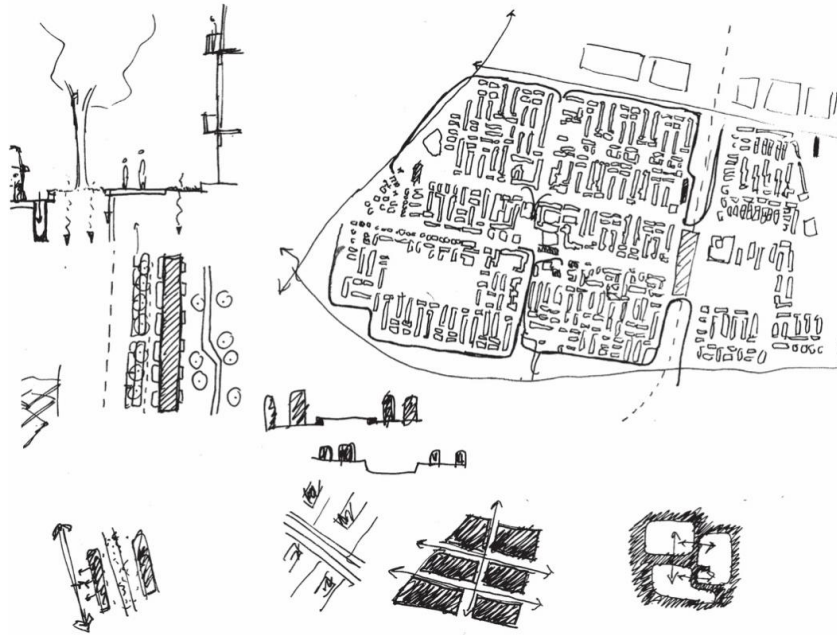


Figure 6. Urban structure and a few guiding lines as “strong concept”, together with details and experiments in section and drawn as diagrams.

Source: Paans, 2017.

The material properties of the sketch roll allow one to capitalize on this panoramic character. Unlike a text, the sketch roll invites direct juxtaposition and comparison. Many things happen at once, freely combining diagrams, accompa-

nying texts, instructions, principal sketches, technical details or even atmospheric images. If we put this in informational terms, sketches are “thick” or “semantically saturated”.

They contain many different types of superimposed

information that can be observed individually or in a loose, affective or associative manner. The fact that (a) the multitude of drawings can be read in many directions and (b) their contents can be freely combined makes them neither stable nor unstable from the viewpoint of meaning (Figure 7). Nancy's thought is that this variegated presence is a form of *presentation* prior to fixed meaning. Likewise, we have

now a specific clue as to how Frascari's layered, multisensorial understanding develops, and how the *brouillon* aids in this process. Each variation in Figure 8 is a partial transformation of an earlier option, modifying a few spatial features at a time. This gradual approach allows one to explore and navigate the pros and cons of various options, as well as coming to appreciate certain combinations.

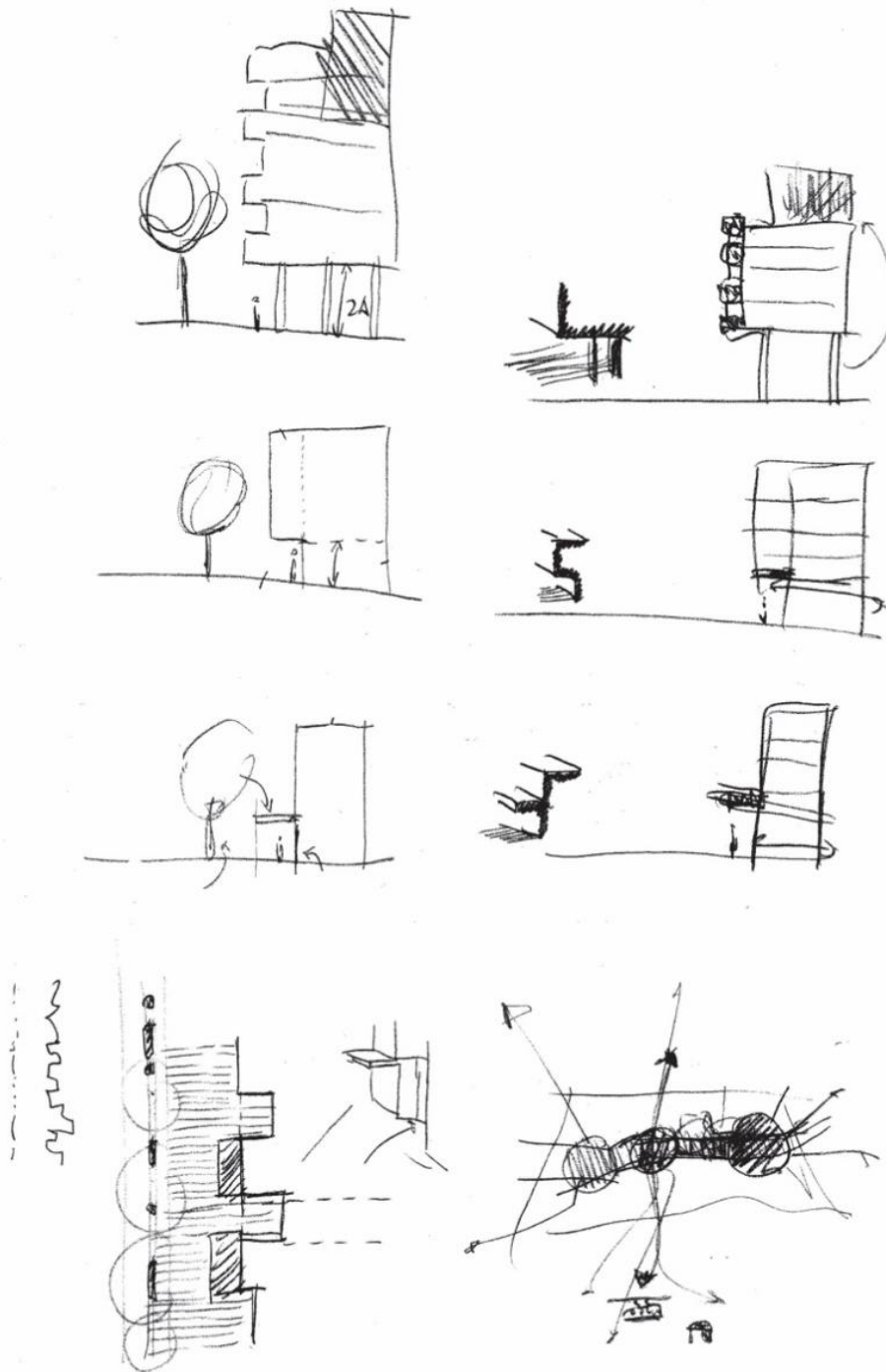


Figure 7. Experiment with an urban principle at the bottom, and a range of increasingly complex variations above it. The variations combine elements from earlier versions.

Source: Paans, 2018.

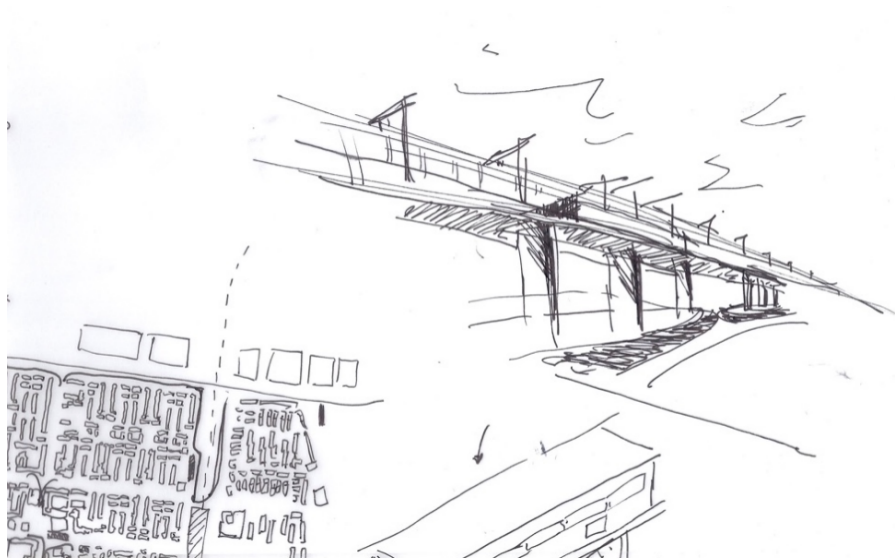


Figure 8. A spontaneous thought next to a regular urban plan. The allusive, unfinished sketch imagines a new, raised railroad connection. Source: Paans, 2018.

A half-finished, allusive sketch can invite a wide array of interpretations and associations that all may be valid (**Figure 8**). Possibilities coalesce, dissolve, emerge and differentiate into overlapping interpretations. If we examine this phenomenon from a cognitive point of view, it holds many factors perceptually available. Many specifics are as it were maintained for a prolonged period. The sketch roll is a “physical workspace” that aligns, presents and condenses all the information deemed relevant at various points in time. Again, the link with the generative potential of *shi* is tangible: the tracing paper is the plane on which new dispositions are tried out, and which influence the course of one’s thinking.

4.4.2. Creating Proper Space

The French philosopher Michel de Certeau argued that writing created *un espace propre*, or a “proper space”^[92]. The French term “*propre*” carries the multiple meanings. Here, I discuss the connotations of “clear”, “appropriate”, “well-defined” and “own”. This layered meaning provides a clue about the quality De Certeau doubtlessly had in mind: on one hand, the space of drawing is “clear” in the sense that it offers a workspace for developing an idea. On the other hand, it introduces a quality of perceptual clarity because the means of drawing are extremely basic, and the most complex issues are reduced to a few lines. The anecdote about producing the best sketch in the night before the studio review can serve as an illustration of this quality. The essence of an architectural idea is condensed into minimal means that can be grasped immediately. This condensation of an idea

resonates with the meaning of “proper” as “appropriate”.

The sketching paper offers a “space of formalization” for ideas. If one reads De Certeau’s treatment of this notion closely, it is not just about “working out” or detailing ideas, but about the act of expressing ideas, thereby connecting the mental and the material domains. Ideas that come up during sketching sessions are entrusted to and enacted on a surface. In this capacity, the sketching roll provides a well-defined, demarcated physical space for thoughts assume a shape. What is formalized are the properties of an idea that would—in the form of a thought or a mental state—remain undeveloped, implicit, or unexplored. Following Nancy and Chinese thought on *shi*, we are not yet in the realm of information or representation, but in the prior domain of meaning-making where meaning “presents itself”. Yet, this presentation requires a well-defined space in which it is forced to assume a shape.

Still, the appropriateness of an idea requires a naturalness or internal logic—not just any shape or line will convey the essence of an idea. To develop an idea requires to stay true its own nature, assuming its proper shape. The meticulousness with which architects and urbanists study shapes, curves and materials testifies to this fact: an idea is crucially dependent on the material conditions that give rise to it. An idea that lacks its own character or that lacks appropriate expression cannot convince. In Chinese calligraphy, this idea is taken to its extreme, as the “character” of a character is communicated via the quality of the line. In Chinese painting, we find the same emphasis on naturalness^[35] (p.

108). From this thought, it follows that sketching should avoid contrived expressions. To achieve this, one must grasp an idea in all its aspects to bring it to life.

The orientation of the sketch roll necessitates the compression of visual marks and information in a limited space. The limitation is a precondition for effective sketching: the boundaries of the sketching paper condense the ideas which form on it. The space for drawing is a space of formalization, a plane where (visual) language and conception become part of a larger experimental system. This system is, however, porous: “The scriptural [sketching] enterprise transforms or retains within itself what it receives from the outside and creates internally the instruments for the appropriation of the external space”^[92,93]. What happens on the paper is not a representational event isolated from the outside world. It is a transfiguration of the world through visual means. By practicing a cultural technique, the attitude of the designer towards the world, the bodily influences the properties of the material all seep into how the “proper space” absorbs the marks enacted on it. It influences how designers perceive the

world through sketching in a new light, either through the image appearing on the paper, or else when lifting their gaze from it (**Figure 9**). By playing around with a few factors, the entire problem might be reconceived, or the understanding of it might be altered.

Sketching creates cognitive-expressive instruments to appropriate the external world. Through sketching, one has often to invent the tools and ways of sketching, shading and orienting to effectively work on a problem. The limitations of the sketch roll provide a gentle direction. Here, we witness the sustaining and self-renewing aspect of a cultural technique that Schüttpeitz examined: sketching fully includes the invention of new forms of sketching to enhance its own potential. The effective designer acquires through practice and material consciousness the acumen to identify the point where working on the problem itself does not lead to results, but the invention of new visualization methods does. The innovation of cultural techniques lies hidden in *how* they are practiced: not merely as instruments, but as self-renewing patterns and sequences of enactment.

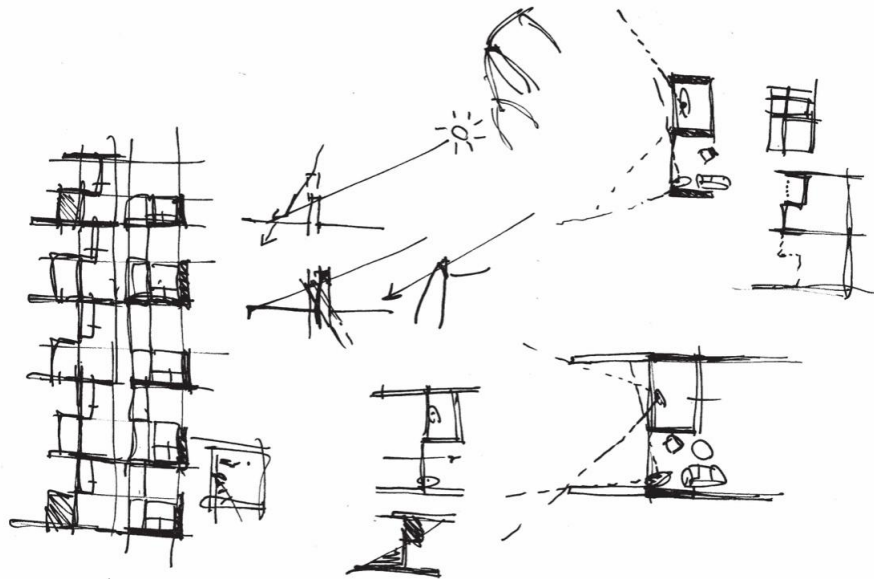


Figure 9. The sketch as the development of analytical methods to evaluate what is the right design. In this case, the angle of sunlight is used to decide on the plan of a building, relative to its orientation.

Source: Paans, 2017.

4.4.3. Sketches as Materialized Traces of the Past

The sketch roll's linear orientation makes it easy to move back and forth to construct or recombine ideas from earlier jottings. If one works from left to right, the piece of

paper on the left forms an archive of the recent past, with multiple variations, conceptual leaps, side-lines and associations, or alternatively with increasingly developed versions of an idea. Maintainability is one of the greatest assets of a sketch roll. The complexity and aspects of an idea must

be kept relatively ready without impeding new thoughts or free association. As the number of mental items that we can maintain is limited, the sketch roll provides a stand-in for memorization. Once an earlier sketch is revisited, it is often easy to pick up the line of thinking which led to it, allowing easy access to earlier thoughts. The relative proximity of earlier sketched facilitates targeted reflection, allowing designers to revisit various aspects of a problem in quick succession.

Although there is robust evidence that once a sketching session unfolds, designers tend to commit to a certain course of action, the opposite is equally true^[94]. Effective sketching allows also for *decommitment*: by revisiting earlier sketches, a hitherto promising idea can be discarded or modified. In this case, the past re-presents itself, allowing to reiterate Nancy's term "the opening of meaning". This feature has been linked to effective creative processes: often, truly creative minds keep options open for a long time, only committing themselves at a late stage in the design process^[85]. The presence of the past (which is not really a past, but an ever-widening web of lingering associations and notions) enriches an idea until out of this "creative culture" one option is distilled.

The transparency of sketching paper allows for a different presence of the past, this time in the form of tracing. What has been called the "diaphanous" or translucent is a marked creative asset for experimentation. To be diaphanous is to appear as half-hidden, vague, fuzzy, as partially present^[56,95]. It is a simultaneously becoming-visible and becoming-faded

of certain characteristics. Urbanist Frits Palmboom puts it succinctly:

The [sketch] paper is not transparent in the same way glass is, but makes the underlying image somewhat foggy and unfocused. By tracing the map, its information is reduced to a play of lines, a graphic pattern that reveals compositional proportions (...). It opens the map to new interpretations. As more transparent sheets are superimposed, the image of the background (the initial drawing) becomes more blurred. The previous drawing or design still shines through, but becomes less and less compelling. This strengthens and stimulates the process of choosing, omitting and highlighting. As the uncertainty of what lies beneath grows, so does the freedom of interpretation"^[96].

The skill of tracing those features that matter requires technique and knowledge. Once new patterns are traced out, new interpretations emerge (**Figure 10**). The sketch is an environment where meaning is open-ended, presenting itself in new visual patterns that are allowed to their unique expression. The fuzziness so characteristic of tracing paper is sometimes also present in individual sketches. As visual quality, it is highly valued, as it provides a visual environment that is inherently open and "presenting" itself, so that many possible interpretations are simultaneously present^[16,78,97,98].



Figure 10. The opaqueness of the sketching paper blurs the background, making it easier to focus on easily discernible structures and simplifying to perceptual field for purposes of abstraction.

Source: Paans, 2023.

The capacity to “see things in sketches” or “putting down potentials” are two core competences, aided by translucency. There is a certain refusal to close, or a tendency to stay “in play”. The opposites of “to be” and “not to be” are simultaneously present. On one hand, one can discern the essence of an idea that is forming beneath the tip of the pen. On the other hand, such suggestions are shot through with openness or a hazy “diaphaneity”. Both qualities exist simultaneously, without settling into a fixed configuration. The art is to maintain the elements in play, while using their emergence and disappearance to one’s advantage.

Through the translucency of sketching paper, multiple realities can be visually present without demanding a closure of their interplay. As Palmboom indicates, the underlying layers become increasingly vague, although they never quite disappear. Like a spectral presence, they linger beneath and alongside more recent ideas, overlapping, influencing and transforming the space of discovery. The complexity of design problems can be effectively navigated by exploiting this capacity for maintaining openness. The productive capacity of the experimental system is its resistance to closure or fixity. The presentation of meaning is aided by the nebulous, half-hidden (and half-emerging) presence of the past. As design processes often unfold over prolonged time, their past becomes an integral part of the experimental system that they inhabit, a feature that we can understand as its maintainability. As Goldschmidt has documented, the openness of sketching practices proceeds with an object, the finished design is still in the future^[16,99]. During sketching, new ideas emerge, aided by their counterparts that surround them, either on the same sheet of paper, or the ones below it.

Drawing becomes a key technique for developing a notion of the future artefact. In his absent-minded scribbling, [the designer] discovers clues, which, bit by bit, he is able to build on^[15].

This thought directly resonates with Sir Peter Cook’s observation that the pleasure of drawing proceeds in adding and extending evidence. It is not evidence as in the confirmation of a fact, but as in disclosing or discovering the properties of an object-to-come. In this interplay between opposites, allusions, decisions and shapes, meaning emerges. The layered presence of many factors simultaneously allows for the “sedimentation” of a complex idea, slowly settling

into relatively stable configurations.

5. Conclusions

Before concluding, I summarize the conceptual line set out in the preceding sections. Sketches are not mere illustrations of prior, independently existing ideas. They are a means of thinking in practice. This thinking-through-sketching practice is embedded in a wider *experimental system*. Such experimental systems include a wide array of material, bodily, technical and mental factors that can be examined. The experimental system itself forms part of an epistemic culture. That is, ways of acting, thinking and speaking among specialized practitioners.

Sketching can be understood as a *cultural technique*. That is, a collective material-symbolic practice that creates the material and discursive conditions for self-renewal, innovation and its continued efficacy, transmitted among practitioners of an epistemic culture. It follows that these practitioners need to be encultured or trained in specialized skills to sketch and think effectively. Their effectiveness as practitioners determines how and to what degree they rejuvenate the culture of which they form a part and which skills are transmitted.

Bodily involvement in sketching entails that it is an *embedded and embodied* phenomenon: sketches are enacted on physical or digital surfaces. Bodily enactment (particularly gesturing) affects mental states. The dynamic biochemical state of the bodymind determines what is sketched and how perception is influenced. Media like ink or charcoal provide a fluidity that matches the quickness of thinking, transmitting ideas into a material format. Lastly, in the case of sketching paper, the orientation, its materiality and transparency enable the structuring of an initially complex idea, utilizing earlier attempts to accumulate insights.

Given this theoretical framework, what can be concluded? Let’s return to the assertion with which we started. The claim was that *architectural sketching is effective precisely to the degree that is embedded in a prior set of material and epistemic practices*. A cultural technique is constituted by material factors. So, the claim is that a particular material culture and its accompanying material consciousness renders architectural sketching effective.

The confluence of these factors results in an experi-

mental system that is extraordinary in its generative scope. The combination of embodied cognition, gestural enculturation, the use of aesthetic means to formalize ideas and fluid media to match the speed of thinking, as well the artificial limitations of sketching paper converge into a practical constellation that deals effectively with complexity. It does so with surprisingly rudimentary means. It would lead too far to attempt a comprehensive “phenomenology of sketching” here. In support of the claim I just re-iterated, I offer a few points in the form of a conclusion.

First, sketching should be explicitly considered as a cross-cultural practice. In that sense, this study offers a perspective that is obviously limited and culturally circumscribed. It largely focused on architectural practices that are current in the Western world, and that utilize drawing conventions and design processes that developed after the Second World War. However, a fuller theory of what it means to sketch, its relation to the creation of meaning, its creative potential and its aesthetic import could be obtained by conducting a study of how the aspects discussed here play out in different cultural contexts and historical epochs. While some material on Chinese aesthetic thinking has been examined here, a thorough and comparative intercultural study on sketching has not been conducted yet but would be of immense value. Moreover, this study is largely descriptive (and to some degree speculative) and does not prescribe a novel or more effective design method. As such, its direct practical application is limited, and at best indirect. Yet, as it strives to contribute to a renewed understanding of sketching practices, its value resides in providing new ideas for discourses in architectural theory, design theory, and philosophy of media.

That being said, investigating the connections between the state of one’s bodymind and efficacy could well provide handholds for sketching under different physical circumstances. Often, the focus in design studios is on the assignment itself. However, given the importance of bodily involvement, it would probably pay off to conduct studios in which participants also test and probe the limits and strictures of emotions, bodily conditions like fatigue, shortage of time, pressure to sketch quickly, etc. This would move the focus away from the assignment and towards the attitude or mood with which one designs. Such situations are very likely to occur in professional situations, and one could fruitfully test

how and why it influences the formation and development of ideas. The goal of such studios would not be to come up with the perfect design, but to become acquainted with material conditions and influences that are always present, but often overlooked, leading indeed to a sharpened “material consciousness” while designing.

Second, architectural sketching is a *recursive phenomenon*. Like any cultural technique, it creates and sustains the conditions for its own efficacy. Bit by bit, overlaying clues and fragments from earlier attempts, sketching paper becomes a fertile ground on which ideas assume shape. As cultural technique, however, sketching deals not just with solving problems. While sketching and overlaying the present on the past, a new reality emerges—a type of worldbuilding that allows for thinking through one’s prior notions and ideas by way of superimposing multiple viewpoints that cohere into a synthetic unity which is nevertheless open-ended. The ways of accomplishing such relational entities are likewise subject to innovation and development. Cultural development occurs while sketching.

Third, the sketch as part of an experimental system artfully oscillates between maintainability (and thus stability, albeit a multivalent one) and fluidity (in the form of suggestion and diaphaneity). It negotiates the boundaries between the temporarily fixed and resistance to closure. It stimulates interpretation, but at the same time it defies it. Any examination of sketching is required to pay close attention to the moments in which stability transforms into instability; where commitment changes to openness; and where seemingly inevitable conclusions are undermined. Where sketching disrupts, obstructs or differentiates a line of thought, we witness its productive potential. Experimentation is required to encounter such moments.

Fourth, sketching enables new forms of criticality, not bound by the conceptual scheme of hypothesis-experiment-confirmation or falsification. Instead, practicing sketching develops an embodied criticality that fuses hypothesis and experimentation into the singular act of the visual mark. Evidence is not found, it is created and gradually appears in increasingly coherent visualizations. The directness of drawing fully involves the sensibility that creates and experiences the drawing, literally drawing the observer in. As the boundaries between the roles of creator, experimenter and spectator blur, so too become cognitive modes belonging to these roles

conjoined. The critical mind of the spectator directly influences the next move of the creator. The purposiveness of the experimenter fluidly transforms into the gesture of the creator. Seeing, thinking and doing emerge not as separate moments, but as aspects of an embedded process that develops and widens its own goals and directions as it progresses.

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