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Kyle Miller  
*University of Kentucky*

Clark Thenhaus  
*University of Colorado – Denver*

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# Translations: Digital & Physical Interchanges

Kyle MILLER<sup>\*a</sup> and Clark THENHAUS<sup>b</sup>

<sup>a</sup>University of Kentucky; <sup>b</sup>University of Colorado – Denver

**Abstract:** *This paper presents experiments in digital design teaching methodologies at the collegiate level within architectural education. The experiments manifested themselves in the form of three design workshops for students from different levels within the undergraduate architecture degree program at the University of Kentucky. Collectively titled “Translations”, these workshops speculated on strategies for the integration of analogue drawing and making with digital translations within the architectural design process. The events were organized around the concept of employing multiple modes of making, a diverse set of design techniques, and mixed media. The theme of the workshops grew from the belief that multiplication and hybridization of making ensures a cyclical design process in which concepts are translated from state to state, opening the possibility for interpretation, intuition, and innovation within the process of architectural design. The workshop series demonstrated the production of sophisticated architectural concepts and potent architectural design investigations through carefully considered blending of analogue techniques of drawing and making with complex digital design software and relevant digital fabrication resources. Materiality, pattern making, composition, architectural form, and digital craft were featured as primary points of departure and output within each workshop event.*

**Keywords:** *Architecture, Digital Design, Parametric Design*

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\* Corresponding author: University of Kentucky | USA | e-mail: kyle.miller@uky.edu

## Architectural Design Paradigms

After nearly two decades of investment in developing digital design as a new medium for architectural investigations in both education and practice, a confrontation between modes of making (technique) and cultural meaning (cognition) persists. The digital paradigm has begun to advance well beyond the merits of formal exploration and technical fetishization, extending now to make contact with deeply human aspirations of spatial sensation, calling on the digital to become increasingly pliant and the post-digital to be increasingly precise. However, even two decades afterward, contemporary architectural investigations in academics, digital or otherwise, remain misaligned from mainstream, professional practice invested in curating the cognitive experience through cultural narrative. Rather than continuing the post-modern paradigm of people as readers and buildings as texts to be read, new modes of architectural engagement may be found in potent combinations of pattern, color, texture, and form to induce wonderment through novel visual and spatial experiences enabled by new organizational and formal strategies unearthed through the clever combination of re-tooled analog and contained digital modes of making.

Primary to this critique is the recent re-birth of narrative as a means of describing cultural and spatial meaning. A recent issue in the series of Architectural Design (AD) Primers authored by Nigel Coates, titled Narrative Architecture discusses the role of narrative and its resurgence within the discipline. "In architecture, narrative prioritizes human experiences and the need to shape them into stories. It places the emphasis on a building's meaning rather than performance. To architects, the enduring attraction of narrative is that it offers a way of engaging with the way a city feels and works. Rather than reducing architecture to a mere style or an overt emphasis on technology, it foregrounds how buildings are experienced." This description of the agency of narrative and the lack of the agency found in other means of project conception (style and technology) is both incorrect and incomplete. Narratives do not construct feelings for architecture; rather they force references to elsewhere. They deny the immediate, non-cerebral sensation that truly potent architecture can produce for the individual viewer or user. Rather than attempting to embody meaning in our architecture or embarking on a search for that meaning, greater attention and respect can be paid to true mastery of composition of form and space, and the assembly of the ingredients native to the practice of architectural design – color, pattern, texture, and translucency.

The perceived superficiality of narrative and other forms of alibis for architecture, namely affect and sensation, has provided fuel for recent debates among the newest generation of progressive architectural design educators. Where narrative is largely the editorial of one author who wishes other to adopt his/her legislation, affect and sensation make no such claim. The pursuit of affect and sensation restores the ability of experience to be partially dictated by the individual through non-representational, unfamiliar forms of architecture. A conversation between Peter Zellner, Tom Wiscombe, Lisa Iwamoto, Heather Roberge, Elena Manferdini, and Kivi Sotamaa in *Log 17* (2009), discusses the role of affect and sensation in contemporary architecture and its viability as a device to ensure a wide range of success in architecture (public reception, technical performance, disciplinary relevance, etc.). The discussion centers on the perceived superficiality of some of their architectural investigations and the ways in which "the superficial" differs from "the serious". Peter Zellner defines serious architecture as the reenactment of standardized content and form (familiar architecture). This group of architectural designers is seeking to present their efforts as

serious architectural investigations that transcend reenactment. They are consciously seeking to make the seemingly superficial (novel, unfamiliar, and exotic) more serious. Heather Roberge understands the need to align the “superficial” and “the serious” stating “To put the superficial in opposition to the serious is a mistake that would leave us vulnerable to charges of incompetence and irresponsibility.” Sensibility fills this gap, allowing architecture to transcend pure functionality - to perform socially and contribute to culture. “The superficial is the embrace of the synthetic and the real, the technological and the natural, the fleeting and the permanent.”

Parallel to discussions surrounding “the superficial” in architecture, the topic of ornamentation has also found its way into a conversation on superficiality and has been another subject of recent debate concerning this topic. In a very classical way, or mannerist at best, the reintroduction or continuation of ornament as a design driver has been embraced by Neo-Postmodernists. Designers, educators, and design offices such as FAT (Fashion-Architecture-Taste) and NATO (Narrative Architecture Today) employ ornamentation as a device to stimulate narrative. In their projects, the constructed narrative becomes the alibi for the architectural resultant. In a project such as “The Villa” from FAT (in Hoogvliet), in addition to the narrative backing the resultant, it’s very easy to understand how ornament becomes the primary ambition of the architectural investigation. The architecture itself becomes a narrative to be read. In the words of the architect: “It is a decorated shed, using timber rain screen cladding to create an architecture of communication which evokes Hoogvliet’s industrial past, whilst the references to elements of nature in the entrance and in some of the cut-out features of the façade, recall the bucolic ideas on which the design of the New Town was originally based.” The ambition of projects such as “The Villa”, aside from the utility of providing enclosure and a space to host the desired functions of the structure, are to induce focus on something other than the architecture itself. Practitioners and educators such as Farshid Moussavi have provided additional proposals on the agency of ornamentation in contemporary architecture.

In the introduction to Moussavi’s book The Function of Ornament, she writes, “[Buildings] build expressions out of an internal order that overcome the need to “communicate” through a common language, the terms of which may no longer be available. It is paradoxically in this way that building expressions remain resilient in time.” In this publication, categorizations of ornamentation such as “spiral” or “fluted” do not discuss the affective (virtually functional) qualities of ornamentation, but rather are positioned or categorized in the realm of visual recognition through the lens of geometric repetition. In these instances, ornament is branded as a visually familiar device to be recognized. In the most current endeavors of redefining the role and agency of ornamentation in contemporary architectural practice and education, attention has been paid to the inherent qualities of the architecture itself. Material affect, the complexity of pattern, and the sensations of hybrid forms of making allow ornamentation to become a non-cognitive device to be consumed optically and haptically rather than cognitively. This form of ornamentation, with its ability to induce sensation through empty associations, becomes both performative and operative within the conceptual agenda of contemporary architectural education. The alibi for these investigations does not only lie in their inherent relevance to the education and practice of architecture, but also in their ability to avoid a discursive consumption of the product of architecture, allowing it to carelessly slip into other disciplines such as story telling or geometric codification.

## The Agency of Materials, Patterns, and Hybrid Forms of Making

Recently at the University of Kentucky a series of workshops were organized and curated by Kyle Miller, Assistant Professor of Architecture at the University of Kentucky College of Design to experiment with an oscillation between digital and physical production of architectural objects and to understand and promote the agency of color, pattern, texture, form, and translucency within contemporary architectural investigations. The workshops were organized around an ambition to test the viability of these items (color, pattern, texture, form, and translucency) to provide an alibi for these seemingly hermetic and self-serving investigations. The workshops were paired with series of lectures collectively titled "Translations." All events were organized around the concept of employing multiple modes of making, a diverse set of design techniques, and mixed media (digital and analog) within the architectural design process. Multiplication and hybridization of making were adopted to ensure a cyclical design process in which concepts would be translated from state to state, opening the possibility for interpretation, intuition, and innovation within the process of architectural design. Omnidirectional seams of invention and production were inserted into the process of making within each workshop event that stitched architectural concepts, design techniques, and production mediums together. The events reflected upon the possibilities associated with producing sophisticated architectural concepts and potent architectural design proposals through carefully considered blending of analog techniques of drawing and making with complex design software and relevant digital fabrication resources. Materiality, pattern making, architectural form, and digital craft were featured as primary points of departure and output within each workshop event.

In the first workshop, titled "Digital Materiallurgy", led by Adam Fure of Sift Studio and the University of Michigan, students participated in a design task seeking to celebrate inherent material eccentricities. This workshop expanded the discourse on materials and making with exotic and unwieldy materials. Students worked through material experimentation, digital fabrication, and full-scale prototyping. The material palette of foams, silicones, thatches, and paints were foreign and conventionally misaligned as complimentary materials, thus forcing students to develop novel potentials out of seemingly strange matter. Initial experimentation focused on the material's latent tendencies to aggregate (how it naturally bundled, bunched, bent, and folded for example). Students tested, recorded, and codified techniques of assembly—ultimately coercing the unwieldy matter into working systems of aggregation. Avoiding a fundamentalist attitude towards the use of these materials, they were burnt, painted, smothered or otherwise manipulated and then recombined in order to extend their possible qualitative effects and overall affect. There were no material essences sought, only evocative textures, colors, and forms that offered up new visual sensations.

In one project, the possibilities of material transformation and mixing are explored. The project is an exploration of material juxtapositions in pursuit of highlighting the inherent haptic qualities and potentials latent in a vast array of quotidian materials. Through individual material transformations (of fake moss, plastic, and wax) and aggregations of the transformed materials, this project seeks and embraces cross-contamination yielding a field of shifting colors and textures. Ultimately, the project is focused on creating an oscillation between solid states of singular materials and fluid, fibrous concentrations of multiple materials acting as one.



Figure 1. Material investigations, Source: J. Cavallo, A. Culler, B. Kolder, and L. Mattingly

A second workshop, titled “Patternism”, led by Brennan Buck of FreelandBuck and Yale University, sought to explore the agency of pattern as a device for making potent tectonic and volumetric proposals for architecture. This workshop investigated the potential of non-modular egg-crate or cellular structures to produce dynamic forms and spaces. The process was first focused on the development of irregular, differentiated pattern in two-dimensions and then through oblique and distorted extrusion of the two-dimensional pattern. The three-dimensional pattern, then a form, was carved from, introducing voids into the resulting semi-solid matrix. The ambition was to produce a volume of perceived shifting size, scale, proportion and orientation from a seemingly simple initial array of one-degree curves and orthogonal cells. The end result, a hollowed volume, retains a potent array of nuanced visual, spatial, and formal scenarios based upon the original planar development of pattern and the extruded, transformed array.

In one project completed during this workshop, the ability of a layered, semi-regular pattern to produce an irregular aggregation of both fragmented and continuous spaces was investigated. The diverse pattern, coupled with the variation in the size of planar cells, yielded a volume which gained the capability to construct, deny, and curate visual trajectories into and through the tectonic resultant. The overall construct both negated and reiterated its external boundary by presenting moments of cellular density through scalar shifts and cellular scattering, which masked the extents of the three-dimensional frame.

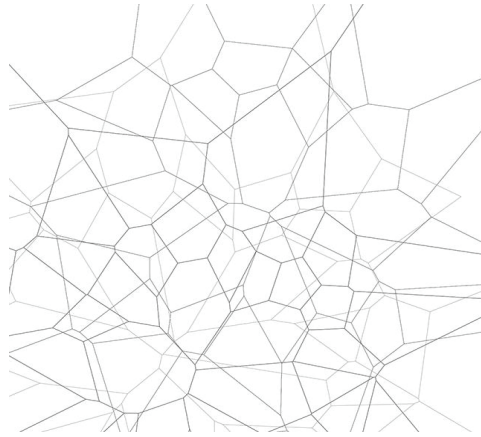


Figure 2. Pattern overlay, Source: M. Gannon and C. Wahl

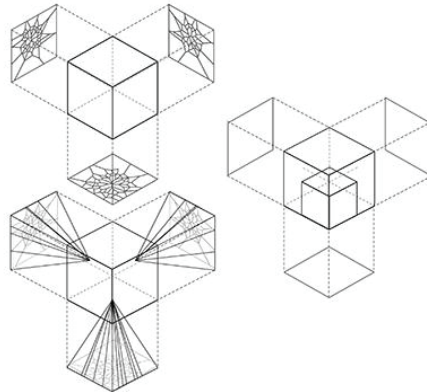


Figure 3. Pattern overlay, Source: M. Gannon and C. Wahl

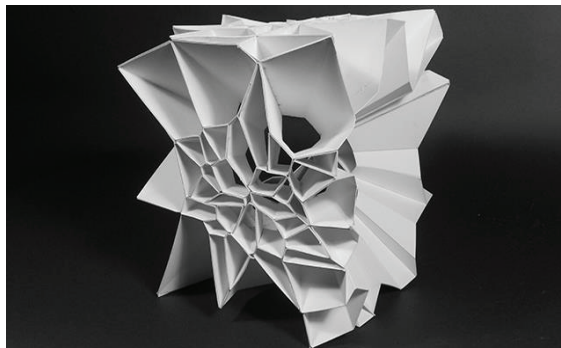


Figure 4. Physical construct, Source: M. Gannon and C. Wahl

The third and final workshop, titled “Parametric Topographies”, led by Clark Thenhaus of Endemic, sought to combine the tendencies, techniques, and sensibilities related to the themes of sensation through drawing processes syncing with digital

translations. Thenhaus deliberately terms the partnerships between emergent drawing techniques and digital protocols as ‘digital gardening’, or the act of growing something anew born of existing and emergent material conditions. This investigation, which proved to be most true to the ambition of “Translations” and is an expanded discussion herein, focused on the development of complex topological (and topographical) design techniques and the possibilities of seamless integration of object and field. The development relied on bridging tolerances among varied drawing and fabrication techniques at the scale of a three-dimensional physical architectural model and through analytical investigations conducted virtually on a two-dimensional plane. Overall, the workshop augmented the ability of the participants to extract multiple complex topographies from the variations and densities of color contained in an original abstract drawing that intuitively mixed pigments within a known boundary.

At its core, the workshop proposed drawing as material (in)formation, opposed to a post-produced representation to be evaluated through decipherability or applied narratives. Rather, the ‘alchemic’ drawing is better understood through behavior and organization, composition and field, and excess and accumulation resulting from material tendencies. Drawing in architectural practice and education is a foundational medium serving as a conceptual, analytical, and operative tool with a rich history in the discourse of architecture and education. However, the increased digitization in architecture has seen drawing largely reduced to the application of associated narratives of digital technique as opposed to tangible, dynamic, and material compositions in which relationships between organization, form, surface, material effects, and building technology emerge independent a priori or standard convention. The translation of material drawing to architectonic conditions enlists the digital yet reaffirms the importance of material energies within the expanding field of computation, parametric modeling, and digital craft. This assertion initiates the agency of drawing as having less to do with an imposition of an idealized or internal mental image unique to the author than it does with an external emergent formation in which sensing outweighs deciphering through embedded color, texture, behavioral tendencies, and inherited data. This feedback fosters technology that is more pliant and material drawings that are more fertile.

One project completed in this workshop best demonstrates the agency of these topological drawing and analytical techniques. This project has a particularly unique compositional and material sensitivity through which spatial indeterminacy, implicit and variable depth, and procedural tolerances hybridized analog and digital. The topographic qualities exhibited in the milled model are the composite effects of analog drawings mixed with a parametric abstraction using implicit splines and points intuitively mined from the drawings as multivalent tools capable of redefining scale, intensity, and density of soft topographic features and rigid networked abstractions alike. This variable capability in defining the surface echoed the shifting hierarchy latent in the drawings while reinforcing the notion that the drawings, as a fluid material composition, are better understood through sensing and interpretation rather than calculable measurement. It is this compression of physical behavior or material tendencies partnered with the acquisition of geometrical, topological, or organizational systems and schema in which new relationships between form, surface, performance, and sensation are curated.





Figure 5. Initial ink drawing, Source: B. Richter, A. Schwab, and D. Taylor

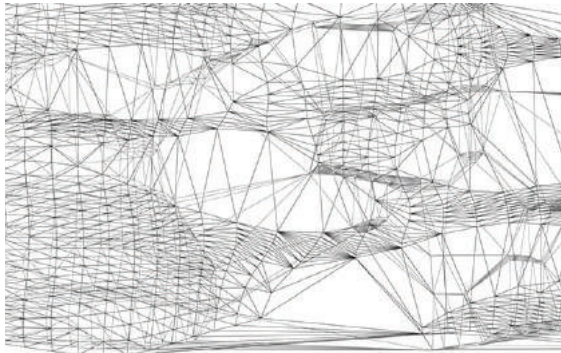


Figure 6. Fluid matrix translation, Source: B. Richter, A. Schwab, and D. Taylor

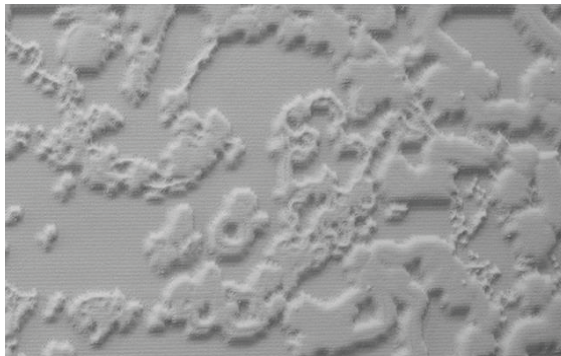


Figure 7. Physical translation, Source: B. Richter, A. Schwab, and D. Taylor

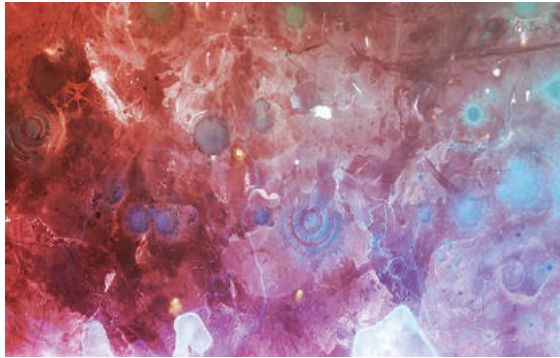


Figure 8. Digital hybrid synthesis drawing, Source: B. Richter, A. Schwab, and D. Taylor

#### The Relevance of “Translations” and Other Contemporary Architectural Investigations

As a series of educational lectures and workshops, “Translations” proved to be a tremendous success with respect to exploring the potentials of architecture’s native ingredients and seeking potent architectural proposals with empty associations. The series was also quite successful in aiding and promoting the ability for students in architectural design to explore and apply multiple modes of making, both analog and digital, within a variety of short design tasks. The projects exhibit great dexterity and a capacity to both mask and celebrate the means of conception and execution.

The topics of design concept development, fabrication techniques, aesthetic drivers, life cycles of design concepts, ornamentation, and architectural alibis were all investigated throughout the course of these design workshops. With regards to these topics, the overall ambitions of this event series, and the ability of its output to contribute to the discipline of architecture, much can be surmised. As was evident in both this event series and a broader survey of ongoing architectural investigations, technique is still very prominent and pivotal in architectural design. Both digital and analog techniques of making heavily govern the end result of contemporary architectural investigations, both in the aesthetics and the overall sensibility of the project. In these workshops, technique (and the strategic application of it) was a latent driver of the design tasks and aided the development of both the motivation and the novel feedbacks between idea and technique for the final products of each event. The techniques were used with precision and held as the control device in order to test the variations of output relative to material qualities or spatial capabilities of two-dimensional pattern making and subsequent three-dimensional translation. Design techniques are still very much at the forefront of contemporary architectural design and architectural design education and are helping to bridge the gap between architecture that bears a responsibility to its point of conception (inspiration) and architecture that is solely about performance and developing agency over its context and contents.

With respect to the development of the contemporary architectural aesthetic, many drivers can be identified - many of which find their point of conception in an academic environment before they make their way into professional practice. Parallel to the range of digital design techniques (surface modeling in Rhino, subdivision modeling in T-Splines and Maya, volumetric mesh modeling in Mudbox or Symvol, etc.) that drive architectural aesthetics, are the ingredients internal to the discipline of architecture

that help to differentiate those very techniques. Students and practitioners alike are transcending the immateriality of the virtual environment by calling on the capacity of color, pattern, texture, and translucency to enliven their digital constructs. With the duality of the virtual and the physical playing a role in project development, contemporary architecture seems to be nearing a healthy balance between celebrating the process (techniques) and the product (specific application of the ingredients for desired spatial and visual effects). In “Translations”, inherent material properties such as color, texture, and translucency (alongside other pertinent items that dictate the visual consumption of architecture such as pattern and form) were strategically combined as points of entrance, insertion, and departure. In each workshop the final results gained visual autonomy from the techniques that enabled their development and from external references and associations. As is the case with the work of many emerging architectural designers, the pieces were celebrations of themselves and the discussions focused on the products on hand and the architectural qualities that they exhibited rather than the ways in which they drew reference to external objects or constructed narratives to be read.

In support of the points of conception and desired output was the working toolset for these events. Simply for the expediency that it enabled, digital fabrication was paramount to the success of these workshops. Tools such as the CNC mill and the laser cutter not only enabled efficiency in production, but also served as analytical devices with which to quickly test possible trajectories for the design teams to pursue. In most instances, design was neither altered nor compromised by the inclusion of digital fabrication resources, but rather augmented by enabling the designer to swiftly generate ideas and test them directly through making. With this shared sensibility, the work was purposefully understood to be post-digital. Parallel to the employment of digital fabrication technology, the use of generative drawing and modeling tools and parametric data management software (in this case, Grasshopper for Rhino, Rhino Nest, and Processing), permitted and promoted efficiency in production and enabled intense iteration of plausible design proposals within each design event. Visualizing potential outcomes quickly allowed for objectivity within the iterative process. Criteria could be established and designs could be measured against themselves allowing for a truly inwardly focused, discipline specific process to be rigorously explored and celebrated. The avoidance of external alibis such as narrative was critical to the success of these events. The inwardly focused nature of these types of design investigations, ones that within each workshop focused on topics such as material eccentricity, patterning, and complex topographical landscapes, yielded visually and spatially autonomous outcomes. The commitment to autonomy is what allowed the themes of each workshop to be addressed directly. Overall, focused design tasks and instruction enabled a commendable level of knowledge transmission with respect to the conceptualization of architectural design concepts and employment of applicable techniques for development and realization. In parallel, an unprecedented level of production across multiple media and platforms for making was achieved.

The “Translations” workshops expose the companionship between digital and analogue as opening new possibilities within architectural and landscape design not through applied meaning, rather through sensate effects and intuitions. These possibilities now encompass notions of sensation, tactility, texture, ornament, and physical behaviors along with more central digital doctrines of fabrication, interactivity, and assembly. The partnerships between disciplinary palettes of color, texture, pattern, and organizational effects with advanced digital protocols is demonstrative of a new

breed of translations ‘from drawing to building’ as a contemporary model of practice and pedagogy that sync matter with digital paradigms at multiple scales with multiple interactions and feedbacks. It requires grafting otherwise opposed systems into coalescent mutations and weeding out of non-operable or standard techniques in an effort to cultivate anew from within disciplinary palettes.

In conclusion, this series of lectures and workshops proved to be very instrumental for the instructors and participants alike in further developing architectural design sensibilities that are both sophisticated and specific. Simultaneous to the development of design sensibilities, the augmentation of skill sets in design development (and project realization) was evident in the ways in which design was thoroughly explored and rigorously developed with quickness and confidence. The workshops, meant to serve as a sampling of what emerging architectural design practices are engaged in, successfully demonstrated the possibilities associated with a cyclical, inwardly focused design. Design concepts primarily focused on developing ideas and employing matter native to the discipline of architecture were translated across mediums to arrive at truly sophisticated and potent architectural design proposals.

Parallel to the ambition to have “Translations” contribute to this larger survey, the more nuanced agencies latent in material eccentricities, pattern making, and topographical design were explored and celebrated in this set of dynamic architectural events. The products of “Translations”, in conjunction with the products of professional architectural investigations, engage in and promote the capability of architecture to participate in and augment the visual and spatial experience of the built environment and the activities that take place within it. This engagement is the responsibility of the contemporary architectural project - to insert its influence over the built environment in a seductive and subconscious manner. With these ambitions, contemporary architectural investigations can successfully develop the conceptual and technical skill sets necessary to produce potent and provocative visual and spatial experiences.

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