A Nonterrestrial Approach to Space Inhabitation

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This paper outlines two linked pedagogical exercises that aim to diversify and enrich the space community. The exercises engage new areas of expertise besides engineering in a collaborative process that aims to develop a framework that allows groups to go beyond previous proposals for space inhabitation. The authors propose both a studio-based collaboration and a larger scale international competition based on the premise that in order to depart from prior solutions, a nonterrestrial approach must be cultivated. A studio-based model is proposed as the architect's under-recognized value is in constructing models that lend meaningful appearance for a wide variety of users. A nonterrestrial approach is sought as previous design and space agency studios and studies have approached the problem of space inhabitation with the assumption that the model simulates a natural, given condition. This has heretofore limited the set of possible solutions. The authors here detail a new approach using a web-based framework that allows a distributed network of participants to self organize along lines of common purpose and participate in producing and adapting a shared ground through a public forum.

I. Introduction

THIS paper proposes a collaborative, distributed, transdisciplinary and nonterrestrial approach for two studio-based investigations into the creation of space communities. The premise of our investigation is that the meaningful appearance of phenomena (even ostensibly observed as natural phenomena) is already within the structure of a

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shared ground delimited by the imposed structure of language itself.†† A transdisciplinary approach is used because it makes use of different disciplines, yet assumes a shared understanding between all members of the team. A nonterrestrial approach is used in an attempt to create a shared ground, bracketing the presuppositions associated with terrestrial experience. *Terrestrial* is used by the authors to refer both to the "Real"‡‡ context of human perception and activity, as well as the implied paradox of the condition of the Real's appearance and recognizability. Thus a "terrestrial approach" conflates the natural and the cultural in the creation of the Real but also denotes acceptance of the terms of the Real's appearance. Taking this observation at its most radical implication, we approach both the techniques of the engineering community and the judging authority of the end-user community as the terms to be reconciled in order to truly approach a radical "difference"—one that is recognizable in terms beyond the given. This difference by necessity may be virtual, having gained its appearance through the employment of techniques developed "naturally" and in the context of material givens, but logically extended in terms of immaterial consequences. We can consider this a "virtual difference" and describe their political consequences in terms of a nonterrestrial approach to human inhabitation.

The authors also contend that architecture is well poised to mediate and assimilate the criteria of the divergent communities that play a role in designing for space inhabitation. One may differentiate the architect from the experts of the surrounding fields—the engineers and industrial designers—in that the position of the architect is more freed from a specific calculus but obligated to the model itself. The primary technique architects bring to collaboration is modelmaking. In the best situations the architect functions as "blind justice" or a more impartial judge required to enact the law. Each field of expertise, whether involved in minimizing radiation levels or with maximizing volume, is concerned with a particular calculus to be optimized within the model. Distinct from each of these experts, the architect—not beholden to any particular calculus—is required to evaluate the work of the others and create a model in which these calculi of qualitatively disparate phenomena must somehow reconcile themselves within the same space, and accordingly be appraised.

In this paper the authors reflect on an expanded role for the architect in the space community as well as specific applications. In discussing our research, however, our primary goal is to develop a pedagogical model wherein design problems will be solved by future generations of designers. We are seeking to broaden the role of design while questioning the assumption that the solutions of design problems are the product of an engineered process operating under the aegis of a pure science.

II. The Model in Previous Design-Space Endeavors

Surveying the past contributions of architecture studios to space research, we find the discipline of architecture in each case couched within a more specialized engineering or industrial design field.

Consider three types of studies where architects are participants in the research team. The first may be considered extreme environments; the second, interior, controlled environments and human/object interfaces; and the third, psychology and human environment. What they share is a methodological assumption that design is a cunning manipulation of the given. In the first case, extreme environments, the determining factors are external

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†† This is a general tenant of phenomenology that stems from Kantian physics, Hegelian phenomenology, Vico's ideas on culture and history and the modern hermeneutics of Herder and Cassirer. Giorgio Agamben writes "Hegel was the first to truly understand the presuppositional structure thanks to which language is at once outside and inside itself and the immediate (the nonlinguistic) reveals itself to be nothing but a presupposition of language. 'Language,' he wrote in the *Phenomenology of Spirit,* 'is the perfect element in which interiority is as external as exteriority is internal.'" [1, 2]

‡‡ The authors draw on Zizek's conception of the Real. "... the Lacanian Real: it is not the ultimate referent to be covered/gentrified/domesticated by the screen of fantasy—the Real is also and primarily the screen itself as the obstacle that always-already distorts our perception of the referent, of the reality out there. In philosophical terms, therein resides the difference between Kant and Hegel: for Kant, the Real is the noumenal domain that we perceive "schematized" through the screen of transcendental categories; for Hegel, on the contrary, as he asserts exemplarily in the Introduction to his Phenomenology[sic], this Kantian gap is false. Hegel introduces here THREE terms: when a screen intervenes between ourselves and the Real, it always generates a notion of what is In-itself, beyond the screen (of the appearance), so that the gap between appearance and the In-itself is always-already "for us." Consequently, if we subtract from the Thing the distortion of the Screen, we loose the Thing itself (in religious terms, the death of Christ is the death of the God in himself, not only of his human embodiment) - which is why, for Lacan, who follows here Hegel, the Thing in itself is ultimately the gaze, not the perceived object." [3]

natural conditions that immediately impinge on the biological or life condition of the human subject.[§§] In the second, controlled interior environments, both physiological and psychological phenomena are accounted for in terms of the subject's interface with the immediate environment.[***] As in the first type, the parameters are "natural" even if they concern the spacing of footrests or the location of laptop computers relative to a resting subject in a human neutral position. These parameters are referred to as "natural" because they are given conditions and constitute a known physical environment for a human subject. The third group of studies, psychology and the human environment (human factors), deals with humans as "political animals"[†††] and therefore approximate environmental factors by treating properly human subjects as natural subjects within environmental "givens".[8] To natural scientists and engineers trained in the observation and cunning manipulation of natural forces, this would appear logical and common sense. To an audience outside engineering and much of the social sciences, this would appear contradictory and inconsistent for the simple reason that humans make poor "natural subjects" even with respect to collecting only physiological data.

Consistent with the rendering of the design problem as "natural" is the role of models, both virtual and physical, as methodological tools. A cursory analysis of the use of modeling in all three of the studio types outlined above reveals the operative assumption that a model simulates a natural condition as a given condition which exists either elsewhere at present or as a possibility in the future. In other words, the model is always seen to refer to a "real" condition which is at that moment "absent but possible" and as such is optimized to the degree that the model itself may be transparent in the experiment with regard to that absent "Real".

III. Promising Models

We can begin formulating our proposed studio by looking at speculative studio experiments that confront, or at least, move the "real" out of the abstract and into the design studio itself as a methodological component of the design process. Thus we can begin with so-called "virtual" or "collaborative" studios that use mediating technologies to allow distributed environments to work together.

In spring 2007, a collaborative design studio between Carleton University (Ottawa, ON) and Pennsylvania State University (University Park, PA) was developed and run on the premise that the collaborative technology used effectively collapses the spatial and temporal distance of a global environment to that of a location dependent infrastructure.[9] This mode of participation, only achievable through the immediacy and contingency of real-time collaboration and with the various collaborative tools at hand, is essential in shaping an alternative conception of the construction of meaning and knowledge. Ultimately, a different notion of (inter)subjectivity between maker, end-user, artifact is at stake here–a notion that makes it possible for the studio outcomes created from the participatory process to venture beyond the generation of previously available outcomes.

Each studio site, in Pennsylvania and in Ontario, was symmetrically set-up for collaborative sessions that allowed for the investigation of various modes of interaction within the design process (active design, caucus, review and presentation). The components of the toolset, from network and middleware to the physical environments of the studio itself, were implemented as a "staging" intended to allow a dynamic, customizable, shared, and real-time manipulation of a heterogeneous set of 3D and time-based assets from parametric based modeling applications to high-definition video. A fundamental goal in these studios was framed in the research question: "what is only possible in such a situation where, through technology, time and space are collapsed in the service of creative and productive goals?" As a result, what was achieved in the context of these design studios suggested that not only could one achieve a more robust technologically mediated and experiential work environment, but, given this emerging paradigm of work, the very notion of participation could also be re-defined. However, although the studios created a displaced sense of self in participants, they had only partially begun to exploit the rich methodological implications of the design environment relative to the design task.[10]

[§§] An example of an extreme environments studio is University of Houston's Hines College of Architecture's Project for Muraviovka Park in 2008-2009. The area, located on the border between Russia and China, is exposed to extreme cold temperatures during wintertime with short but sometimes hot and windy summers. The studio was run with The Sasakawa International Center for Space Architecture (SICSA), the world's only Master of Science in Space Architecture program. Also see University of Southern California's Space Exploration Architectures Concept Synthesis Studio.[4]

[***] For example, University of Arkansas School of Architecture's studio in collaboration with N.A.S.A. in 2000 in response to the Mars Reference Mission.[5] See also research on controlled environments.[6]

[†††] *Politikon zoon*. See Giorgio Agamben's distinction between the ancient Greek conception of "bare life," or *zoe* and a way of life in the political sphere, *bios politikos*.[7]

Another example of a promising architecture-space studio is Greg Lynn's spring 2007 Space Collective studio at the University of Applied Arts, Vienna. The student's projects for space colonies responded to a brief from Lynn, who challenged his students to consider alternate horizons, and explore the notion of 'ground' in the absence of gravity. With Lynn's awareness of the virtual and of traditional terrestrial models, he asked his students to consider "political and cultural issues in an entirely man made environment." [11] However, the lack of substantial collaboration with students or experts from other areas of expertise failed to give the products more than a beautiful sculptural quality in which the horizon was never along a single plane.

As an outgrowth of this we can propose the subsequent steps in the evolution of studios and their models. To begin, if the goal is immediacy and real-time collaboration unfettered by location or spatial restrictions, then situation and circumstance can be rethought as the basis for forming communities. To the degree that we are dealing with a design community as much as a user-community, why not develop the tools to work accordingly? If ideas are shared by competing designers or design teams striving after similar solutions, why not organize "teams" along methodological approaches rather than circumstantial criteria? Out of these questions the authors have formed the criteria outlined below for the next generation of collaborative studios broaching space inhabitation, as well as the formalizing of the "architectural charrette" process as a design methodology.

IV. A New Type of Studio-Based Collaboration

By linking the distributed aspect of mediated studios to the specific content of those studios themselves, and then further exploring the methodological questions thereby raised, we can identify the following criteria for our own studio to occur in fall 2010 involving the School of Architecture (McGill University, Prof. Michael Jemtrud and Prof. Torben Berns), the School of Industrial Design (Carleton University, Prof. Thomas Garvey), and the students from the Institute for the Public Life for Arts and Ideas, I.P.L.A.I. (McGill, Prof. Paul Yachnin). The criteria are: 1) A studio project suitably complex as to require a multiplicity of disciplinary expertise; 2) An expanded pool of participants beyond the architecture trainees; 3) the possibility of dynamic team formation built on specific models rather than limited by factors of location or circumstance; 4) a set of tools and online spaces that allows audio-visual communication in addition to real-time manipulation and organization of a heterogeneous set of text, image, 3D, and time-based constructions.

The fall studio will lay the groundwork for a biennial space related competition to be opened initially to schools of architecture but requiring the active participation of experts, both academic and professional, in many fields. The intention of the smaller fall studio is to test both the software designed for it and to introduce a user-group not specifically trained in visual modeling to the studio in order to assess the merits of this technical and methodological approach.

The students would be asked to self-organize into teams along lines of common purpose and project development. If need be, they could self-reorganize as discussions progress regarding emerging solutions. Students will discuss and trade files in the team space and be required to constantly upload material to a public forum for discussion. At the end of the semester the teams will make public their presentation page.

The first edition of the competition will take place spring 2011 and will ask teams to design a solar sail docking station. The competition will reward visionary thinking both in terms of how these space stations could be organized and how they might function, but as importantly, in terms of how one begins to imagine communities at different scales and through different modes of linkage and inhabitation. The aim is to open the possibility that the communities could form and develop at different speeds, through different modes of communication, and with different contributions to the human network as a whole. The solar sail, with its simplicity, but distinct technical requirements, becomes a vehicle for imagining different possibilities: simultaneously slow, accretive and localized and at the same time. Students would be confronted with the problem of the material and immaterial‡‡‡ as well as

‡‡‡ Here we draw from Vilém Flusser's conception of the immaterial. In his essay "Designing Cities." he writes, "in order to conceive of this new city model, one must surrender the intellectual categories of geography in favor of topology. This task is not to be under estimated. One should not conceive of the city to de designed as a geographical place (such as a hill near a river), but rather as a fold in the intersubjective relational field. This is what is meant by the assertion that the future civilization must become 'immaterial.' This change is not to be underestimated…But as soon as we are able to think topologically—that is, in terms of networked concrete relationships—the city to be designed allows not only localization, but also localization everywhere in the network. It comes into being forever and everywhere, where intersubjective relationships accumulate according to a connection plan to be designed. To state this 'astronomically': what a heavenly body is to the gravitational field, the city to be designed is to the intrahuman relational field, which is to say, a fold that 'attracts' the relations." [12]

several scales. The competition must therefore incentivize and reward the engagement of alternative possibilities—the process—as much as it rewards specific design propositions.

V. Technical Development

The technical apparatus of the competition comprises six basic areas on one website:

Informational: This front page introduces the problematic, provides links for logon or registration, information on the topic, and directories of additional resources.

Personal Page: All students and professors can see these spaces. Each serves as a history (chronological) of that member's uploads, posts, updates, team changes, etc (It is akin to Facebook's wall.). It contains profile information: expertise, goals, and ideas. It is also be handy for grading each student and is linked to the *Team Marketplace*.

Team Marketplace: All students and professors can see this space. The marketplace is for finding and forming (and reforming) teams. This space also serves as a directory of teams and is linked to the *Team Space*.

Team Space: Each space is restricted to team members. Team Space shows all team uploads and activity with some activity linked to the *Public Forum*. Points accumulated by the team show here.

Public Forum: All students and professors can see this space. It is in post format and is a space for critique, inspiration, progress posts (assignments turned in here) discourse, appropriation and seeking feedback. As each team develops competition work, they gain points by making their work available to the competition public realm as a whole here.

Presentation Space: All students and professors can see these spaces after the deadline for submission. It is linked to the team page, which is now opened up to all participants. Each team will submit their final designs here to be judged. Each site may be developed during the design process or at the end, but should reflect the team's involvement in the competition community as a whole.

Used together, the spaces of the site serve as inspiration, communication tool, a resource, an archive, a tracking device, and a means of judging and awarding points during the competition process.

Teams and projects will be judged by a diverse group of critics and assessed according to the degree to which they use and reinterpret material and models produced by the group as a whole, the way they question, interpret, and investigate the tools they are given to design, the diversity of expertise on their team, the products of the team, their process and methodology and the points accumulated during the competition. In order to be a useful exercise beyond a letter grade, a discussion, or "crit", that involves small groups of participants and critics would take place at the conclusion of the competition.

VI. Aims

The notion of an extreme environment intrinsically different from even an extreme terrestrial environment, and in which the human is inserted as alien, is perhaps revealingly similar to a virtual community in which the human body is at once both superfluous and the essential condition sine qua non. In other words, what a virtual community as much as a space community makes explicit, is the designer is primarily responsible for the means (the apparatus) by which the phenomena, the things as well as the entire network of relations, both natural and positively imposed, may appear and be understood.[§§§]

The role then of the studio relative to the skill set we are aiming to cultivate would be to facilitate not only a shared ground but to produce a range of solutions capable of adapting that shared ground and producing something entirely different. This means the studio must act as a kind of incubator allowing not only a range of "best practices" to develop but also a range of alternative practices capable of transforming the judging environment as much as responding to it.

We recognize this implies an entirely separate field of expertise and tool development prior to the envisaged expertise of the architect and it is this expertise that constitutes the new "given" or new "natural" condition for the models. We would like to stress that this is inherently an "immaterial" or "virtual" set of relations.

[§§§] This definition of apparatus is taken from Gorgio Agamben's essay "What is an Apparatus?". [13] The essay seeks to understand Foucault's term *dispositif*. Foucault says of his own term, "what I'm trying to pick out with this term is, firstly, a thoroughly heterogenous ensemble consisting of discourses, institutions, architectural forms, regulatory decisions, laws, administrative measures, scientific statements, philosophical, moral and philanthropic propositions– in short, the said as much as the unsaid. Such are the elements of the apparatus. The apparatus itself is the system of relations that can be established between these elements. /…by the term 'apparatus' a sort of–shall we say–formation which has as its major function at a given historical moment that of responding to an *urgent need*. The apparatus thus has a dominant strategic function." [14]

VII. In Conclusion

What we are proposing is to see these two different problems—the use of the model as a "natural" (and therefore neutralized) phenomena, and the attempt to treat design studios as ultimately the manipulation or outsmarting of natural conditions—as not only stemming from the same basic set of assumptions but as already circumscribing the limits of the returns they can offer. Whereas we do not wish to undermine these extant methods or assumptions in their usefulness, we do wish to expand the field of possible research precisely to allow other returns. One may see this discrepancy as somewhat analogous to Newtonian physics vs. Relativity. At most speeds and for most conditions, Relativity is mathematically cumbersome and not necessarily worth the investment. Newtonian physics on its own, however, is inadequate to describe many of the phenomena that begin to stand out through the model of Relativity, itself. It is precisely this conundrum that we wish to open up in allowing the training of architects to produce models that function not only in terms of natural simulation, but also in terms of virtual "difference".

In this proposal, the role of assimilating the diverse criteria of several communities—engineers and end users—is given to the architect. With an understanding of the apparatus—the sum total of discourses, forms, regulatory factors, measures, principles and propositions—in effect the resulting network of all these elements—he or she must construct a functional model that is both capable of lending meaningful appearance to the abstracted phenomena and comprehensible and useful to all involved. Starting from this redefinition of the architect's role and value, we can begin to consider an alternative to his or her fundamentally naturally given, problem-solving function, and contemplate alternative contributions for architecture in thinking about nonterrestrial space inhabitation.

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