

Liss C. Werner

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Gordon Pask's 'Cybernetic Theatre': beyond tinkering with Architecture

Liss C. Werner¹

Abstract. Written in the year of Gordon Pask's 90th anniversary of his birth, "Beyond tinkering with Architecture" presents the *Philosopher Mechanics*' proposal for a *Cybernetic Theatre*, conceived in 1964; and projects it into today's digital and analogue networked systems of operation. A performance machine, a space to allow communication, interaction and learning between a theatre audience and actors of a play; a space celebrating the control of control regulated through algorithmic calculation and an active actor inter-actor network. [14, 22] The idea was to integrate members of an audience into a performance to steer plots of a given play and to allow adaptation of a pre-set script. Communication would happen by interfacing through a computational communicator in the form and beauty of a Paskian colourful light display. Conceptually, technically and chronologically, the project locates itself between *Musicolour* (1953-58), *The Fun Palace* (core design phase 1961-64) and the *Colloquy of Mobiles* (1968). The rather unknown project is exemplary for Gordon Pask's influential research and work for architecture and architectural digital theory in the 21st century. At this point in history the incorporation of machine (artificial) intelligence in the human environment, and emergent interaction between them is in the process of naturalizing. The '*Proposal for a Cybernetic Theatre*' prescribes an organization designed by Gordon Pask. The organization integrates structure, material, mechanics, function, individual goals and randomness in one coherent system. Actors of all kinds become participants, interactors with the environment and themselves. The paper concludes with the suggestion that the principles of control and indirect conversation between users and artefacts Pask used in his *Cybernetic Theatre* are akin to the principles of exchange in Cyberspace.

1 INTRODUCTION: BEYOND TINKERING WITH ARCHITECTURE

Andrew Gordon Speedie-Pask (1928-1996) was a British cybernetician. During the late 1950s and early 1960s he regarded himself as *Philosopher Mechanic* [11]. Pask developed reactive and interactive artefacts; machines ranging from sensing electrochemical computers, 'living' installations, training machines for learning by creating human/machine interfaces employing, for that time, extremely advanced methods, a strong network and *Conversation Theory* (CT). The latter extending Claude E. Shannon's linear model of communication theory [28] insofar that Pask's *Conversation Theory* suggests continuous feedback and knowledge evolution between conversation partners: actors in a system, the environment and possible perturbations through the act of conversation (G. Pask, 1976). Conversation is a circular-causal interactive epistemological process and differs from communication. "Communication and conversation are distinct, and they do not always go hand in hand. Suppose that communication is liberally construed as the transmission and transformation of signals. If so, conversation requires at least some communication. But, enigmatically perhaps, very bad communication may admit very good conversation and the

existence of a perfect channel is no guarantee that any conversation will take place." (Pask, 1980, p. 999) Pask's work implied that "Pask's primary role was not that of system builder or inventor, but that of thinker and theoretician, who was impelled [...] at each stage in the development of critical theory to embody the theory in an artefact." [27] For Pask, there was no theory without physical proof of concept. Gordon Pask's main interest and time were committed to the field of learning [3]; focusing on a human/machine interface, but also on a human/human interface and interaction. The translation of his PhD thesis *Conversation Theory* (CT) [21], diagrams and logical formulas into the spatial paradigm—may it be as sketches on paper—investigated the built environment through medium-sized installations and largely sized project proposals, such as the *Fun Palace*. Pask's experiments, physical and theoretical, featuring open rather than closed systems carried a notion of what we could call *an open field* encouraging interconnecting objects, relationships of things and systemic growth. Conversations between inventions, the inventor, the cognitive and physical environment, in which the artefacts were embedded in, took place in his 'architectural' projects as well as in his teaching and learning machines, such as *Eucrates* [13], *SAKI* (Self-Adaptive-Key-Keyboard-Instructor) [24], *Solartron* and *CASTE* [25], [18].

Pask, on one hand, acted as consultant for the army, police and other governmental bodies to improve learning strategies on all levels and on the other, collaborated with and taught in educational institutions (Architectural Association-AA, Massachusetts Institute of Technology - MIT, Biological Computer Laboratory - BCL). Projects included the development of knowledge and its application in the field of interaction and communication between architecture and its environment [23]. Hybrid conversations between humans and machines did not stop at the physical boundary of a chemical or relays based computer but were used to trigger behaviour in exhibition spaces and architectural spaces—in computing environments, if you wish. *The Gordon Pask Archive*, Department of Contemporary History, University Vienna, reveals that his library included an enormous amount of books and reports on computers, learning, systems, cognition and artificial intelligence, and also key literature for architecture, such as *On the Synthesis of Form* [2], *Towards a new Architecture* [6], *Soft Architecture Machine* [15], and a Bauhaus exhibition catalogue dated 1968, the very same year in which *The Colloquy of Mobiles* was exhibited at *Cybernetic Serendipity* curated by Jasia Reichardt at the ICA, London. Pask became a cybernetician for architecture, as a

consultant for Cedric Price's *Fun Palace* and an architectural teacher at the *Architectural Association* in London. While Pask, Littlewood, and Raffles worked on the *Cybernetic Theatre* and solutions for mechanisms to regulate the audience-actor-relationship in a performance in the UK, Charles and Ray Eames, together with Eero Saarinen celebrated their 'theatrical' and cybernetic work designed for the IBM pavilion at the New York World Fair in the US in 1964 [26]. One scene in the Eames documentary 'Think' [7], presented as a multi-screen movie;

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investigated host relationships of dinner parties and hence the form of that very organization [8]. The IBM pavilion itself was a large, spherical theatre stage featuring a vertical stage with performances amidst the displays showing the documentary. The pavilion did not directly make use of any of Pask's inventions or ideas, but it was certainly influenced by the emerging global debate on information exchange and influential data input into social systems and individuals alike. The reality of *ARPANET* (Advanced Research Projects Agency Network), 1966-88, the precursor of the Intranet [1], may also have played a role in the work and the debate.

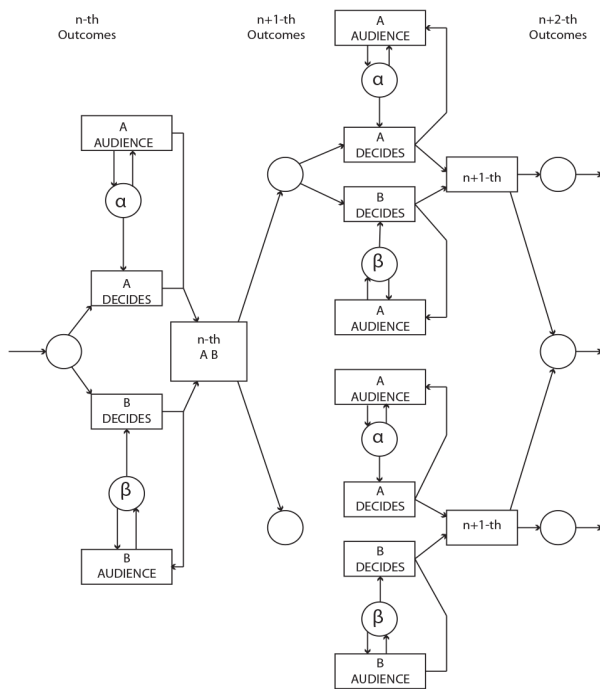
2 PROPOSAL FOR A CYBERNETIC THEATRE

The *Cybernetic Theatre* was a joint venture between the *Theatre Workshop* run by Joan Littlewood, her partner Jerry Raffles and *System Research Ltd.*, Gordon Pask's firm. It was developed as a model in 1964; the privately circulated monograph "Proposal for a Cybernetic Theatre" written by Pask is held at the Gordon Pask Archive, and, at this moment in time, seems the only source of information on the project [17]. Joan Littlewood played a major role in being the initiator of the *Cybernetic Theatre*. A theatre in which not the choreographer of the plot would be in control of the play and set the contents, including all options for the audience' reactions before the play even got rehearsed. Instead, the *Cybernetic Theatre* was a closed system for a living *Entailment Mesh* [5, 21, 30] [22]; a world of overlapping and crossing semiotics and reference frames that would process feedback from the audience to the actors on stage—through a carefully designed computer program—in order to create new knowledge and epistemological networks. Epistemological networks result from coupling thoughts and information collected over time. Memories can be seen as epistemological networks, which are being built up upon. Hence the physical stage was extended and transformed to a multi-dimensional computer, in which the spatial framework of the physical theatre and the cognitive virtual conversation spaces between actors and audience played an equal role. The *Cybernetic Theatre*, as it was designed, thought through and programmed, described living cybernetics in a framework of a cybernetic setup. This is what the *Cybernetic Theatre* really was. Pask proposed the project in two stages: firstly a prototype experimental theatre for an audience of 50-100 with 2 actors, secondly, a larger cybernetic theatre system for an audience of 550-750, and up to 1200, to be implemented into any existing theatre space. Each guest in the audience could become part of the play. In the unpublished manuscript "Proposal for a Cybernetic Theatre", Pask suggests a transferal of conversation-rules to drama, theatre, and performance. As a controller is required in any computer system, a controller is required and existing in a theatrical performance. Traditionally, the dramatic advisor or stage director would carry

out this task in a top-down manner. Pask claims that this is not an efficient enough method for dramatic presentations. He suggests a feedback system that interfaces audience and actors and thus lets both of them act as participants in and control the conversation. In a cybernetic system, audience and actors are equally control systems—identified through the degree of interaction. The system was based on principles akin to the ones used in his teaching machines and the task to include control from the audience over the players, whose reaction again fed back into the audience and so forth. Pask, as the designer of the

system—a scientist and psychologist by trade—defined axioms and rules such as categorizing the audience of a theatre differently to an audience of a lecture or setting out the structure of a play consisting of a plot, and "thoughts that are voiced and the actions that are displayed by the characters in the cast, when they are placed in the situations determined by the plot." [17] The rules were necessary to have in order to set up a system, whose agents eventually would behave in a self-organizing way. [9] The audience would be divided into A-audience and B-audience. Each audience provided input in different channels, to be computed as feedback to the actors iteratively. Iteratively here relates to a constant time-based back and forth of information exchange. A second iteration starts, when the first feedback has been given, a third iteration starts, when a second feedback has been given and so forth. Pask understood the dramatic presentation as a control system: in the first place actors would try and control the audience. The characters had the general systemic task to be representatives, and hence agents, of the audience. Members of the audience would identify themselves within character/actor or a group of characters/actors and start controlling the actors by supporting or disagreeing with their actions. As a pre-set rule, the member of the audience had to act according to his or her understanding of the actor's goal to control the actor on stage. He or she would know the main characteristics and circumstances, possibly also about his or her relationships to other characters in the play in advance. The conversational and cognitive challenge for the member of the audiences was to get to know the representative and vice versa. Direct communication was 'pinched' by the complexity of parallel conversations perturbing a clear path. The *Theatre* converted, reconstructed or even mutated the one-to-one conversation into a collective process of negotiation—taking into account the 'goals' of each individual. [12] Since the 'opinion' of one, many or all 'controllers' in the audience about the play of their agent can change from one situation to another, the play operates iteratively (Figure 1). Figure 2a and b show the setup of the light-control panel with *a and b display* and the light control with A and B identification available to the audience. Each participant could choose yes or no signals and hence trigger the multi-coloured lamps. Gordon Pask earlier used colored lights as information carrier of different data in the project *Musicolour*, developed by his colleague Robin McKinnon-Wood and himself. *Musicolour* performed between 1953 and 1958 in the UK. A combination of the data provided by the audience and computed by the *Memory Control and Cueing Programme* would then be displayed for the actors, the representatives of the audience. Pask refers to other teaching machines that used a similar branching system in accordance with the participants' or students' decision-making. The *Cybernetic Theatre* as designed by Gordon Pask was relays-based rather than operated by an electrochemical computer as used in *Musicolour*. [20] The use of electrochemical processes where limited though and materialized only in "[...] an electrochemical display. It consists of several shallow dishes, one of each output variable, mounted on rotatable frames (one dish is shown in fig. 31). Each dish contains electrolyte and an indicator (which changes colour when the pH of the solution is alters, for example, by local electrolysis). [...] The patterns are projected on the screen." [20]

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original text right of diagram:
Redefine Audience by Re-identification for the Agent A or the Agent B

Figure 1. Diagram 5 of the original text. Structural setup/communication diagram of the Cybernetic Theatre. In *A Proposal for a Cybernetic Theatre*, Pask, 1964, p.13. redrawn by the author.

Pask states, that “Relay circuitry is sufficiently reliable for this application and has many advantages in a system of this kind.” Pask here hints at the extension of the computer with the human and at the same time the extensions of the human with the computer by explaining, “Relays provide the identification memory, some of which is physically located in the audience member response boards.” [17]. He does suggest though that a special electrochemical device could possibly simplify the system [17]. Apart from the missing electrochemical device, the system had far more prerequisites than *Musicolour* in order to function. The Cybernetic Theatre with its relay circuitry was equipped with memory built into a) the audience operation panels, which Pask called the ‘audience member response boards’ that the selected people in the audience (A or B) used to input their instruction as agreeing or disagreeing with the audiences representatives’, the actors’, play and interaction on stage and b) the stage component (Figure 2b). The ‘machine’ had two different kinds of memory, which would combine the identification of ‘players’ and their preferences in each situation using a *Memory Control and Cueing Programme*. Pask explains: “The preference of the A identified audience and the B identified audience are separated by the “Identification Memory Input Selector” and registered un a “Preference Memory” which, unlike the Identification Memory has a persistence.” [17]

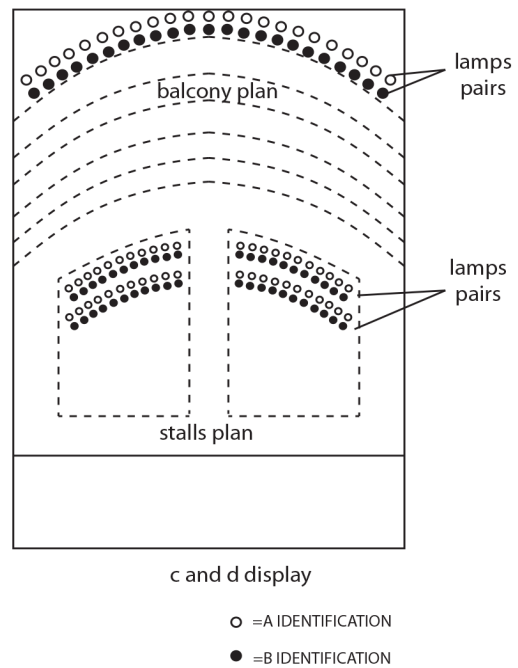


Figure 2a. Diagram 3 of the original text: The so-called c and d display shows to the A and B actors where A and B identified members of the audience were located in the theatre. In *A Proposal for a Cybernetic Theatre*, Pask, 1964, p.9.

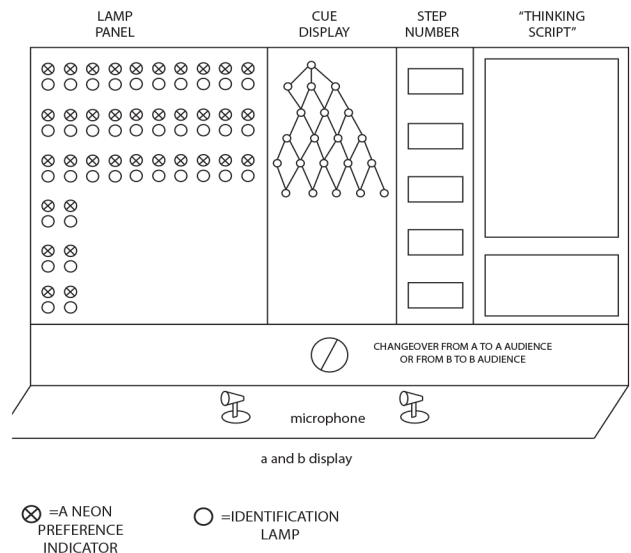


Figure 2b. Diagram 2 of the original text: feedback panel showing the input of all participating members of the audience as computed output. In *A Proposal for a Cybernetic Theatre*, Pask, 1964, p.9. Redrawn by the author.

Pask combines the complexity of human reaction to their counterparts (on stage) with a complex overlap of two different, time-based existences of data, namely the given identity of a member of A or B audience with their reaction, their feedback and changing scenes and situation. Due to interlacing a multitude of dimensions in the *Cybernetic Theatre*, Pask

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succeeded in setting up a cybernetic system for a self-orchestrating dramatic performance, fuelled by an elaborate conversation. The genetic make-up of the theatre play would change from a written, static piece of drama, to a flexible feedback-based evolutionary form of organization.

The *Cybernetic Theatre* was never built. It acted as inspiration and experimental model for the control system diagram to systemically operate the *Fun Palace* (also never built as designed) and later work, like the *Colloquy of Mobiles*. The former was designed to operate on social constraints without any additional computational or digital devices.

3 A CYBERNETIC THEATRE AS MODEL FOR CYBERSPACE

Paskian Artefacts, as I observe them, are cognitive *thinking machines*, artificial organisms for interaction, play, and education [19]. In his theatre design, Gordon Pask extended the typology of theatre, traditionally, a place for entertainment and consumption of joy, to a participative performance setup, a 'theatre 2.0', an experimental living architecture. Pask's theatre was independent of any particular spatial condition or place. It was an autonomously functioning model, a closed system, a module that could be applied or inserted in a variety of situations. Combining a rule-based framework with human social systems laid the foundations for our contemporary research on a) emergence, b) crowd behaviour and c) collective data collection/data mining and d) *design* and *design science*. One could regard the proposal for *The Cybernetic Theatre as one of the first multi-agent, crowd-generated computer supported data-generation, data mining, and interaction machine*. The intriguing issue about the *Cybernetic Theatre*, also *Musicolour* and the *Colloquy of Mobiles* is, that through the interface of a communication device, formerly uncoupled systems merge into one organism, that is not only structurally coupled but also physically as long as all participants are engaged in the system (see [15]). I do suggest that *The Cybernetic Theatre* is a cyberspace-like organization. Cyberspace - as we know it - has been created through relations between human users, artificial algorithms, swarm behaviour and emergence. William Gibson in *Neuromancer* [10] first mentioned the term. In 1991 Michael Benedikt investigated Cyberspace through the lens of Architecture as neural network. In 1991 Marcos Novak translated notion of Cyberspace in *Liquid Architecture*—a formal and systemic approach to architectural design. [16] Benedikt suggested several complimenting definitions, of which one describes "Cyberspace: A new universe, a parallel universe created and sustained by the world's computers and communication lines. A world in which the global traffic of knowledge, secrets, measurements, indicators, entertainments, and alter-human agency takes on form: sights, sounds, presences never seen on the surface of the earth blossoming in a vast electronic night." [4] In another definition Benedikt states that Cyberspace is a limitless place that can be entered from any location on earth. Cyberspace offers a condition of constant information exchange, data flow, communication and conversation. In opposite to the closed system *Cybernetic Theatre*, Cyberspace is an open system spanning around the globe and beyond.

Ostensibly the *Cybernetic Theatre* was a performance space. Given the social structure in which it was envisaged and the social impact triggered through participation and adaptiveness it offered, it elevated itself to a mechanism of collectiveness. In

a *Cybernetic Theatre* as a behavioural meta- system, a typology of togetherness, an actor becomes an extension of a participant in the social system and vice versa. The second notable point is, that a *Cybernetic Theatre* presents a truly collective "Entailment Mesh". In contemporary terms, it represents an organization where crowd behaviour plays the major role in the plot and acts as its main driver. Pask's conversational performance, the system *Cybernetic Theatre* gains consciousness and awareness of its reason for existence through circular recursion—and re-entry [29]—of an emergent behavioural pattern created by the algorithms behind the calculation of the input of the audience and human complexity of cognition. I would like to suggest that Gordon Pask's theatre is a cyberspace-like organization. During its time in 1964, it was envisaged physically—located in an enclosed built structure of an ordinary theatre space. Its principles, however, the principles of *Conversation Theory*, allow it to depart from its physicality and to extend into location-independent cyberspace as we know it now: interweaving, hybridizing complex entailment meshes of bits and atoms, complicating into a constantly changing networked organization of information clustering and reforming, growing and learning, evolving and disrupting the world as we will have known it.

*** Thank you, Gordon.

You taught, guided, influenced and impressed your students in such a tremendous way, that they have passed your knowledge to us, their students, who are now living and materializing your legacy, to feed it back into the world. Happy birthday.

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